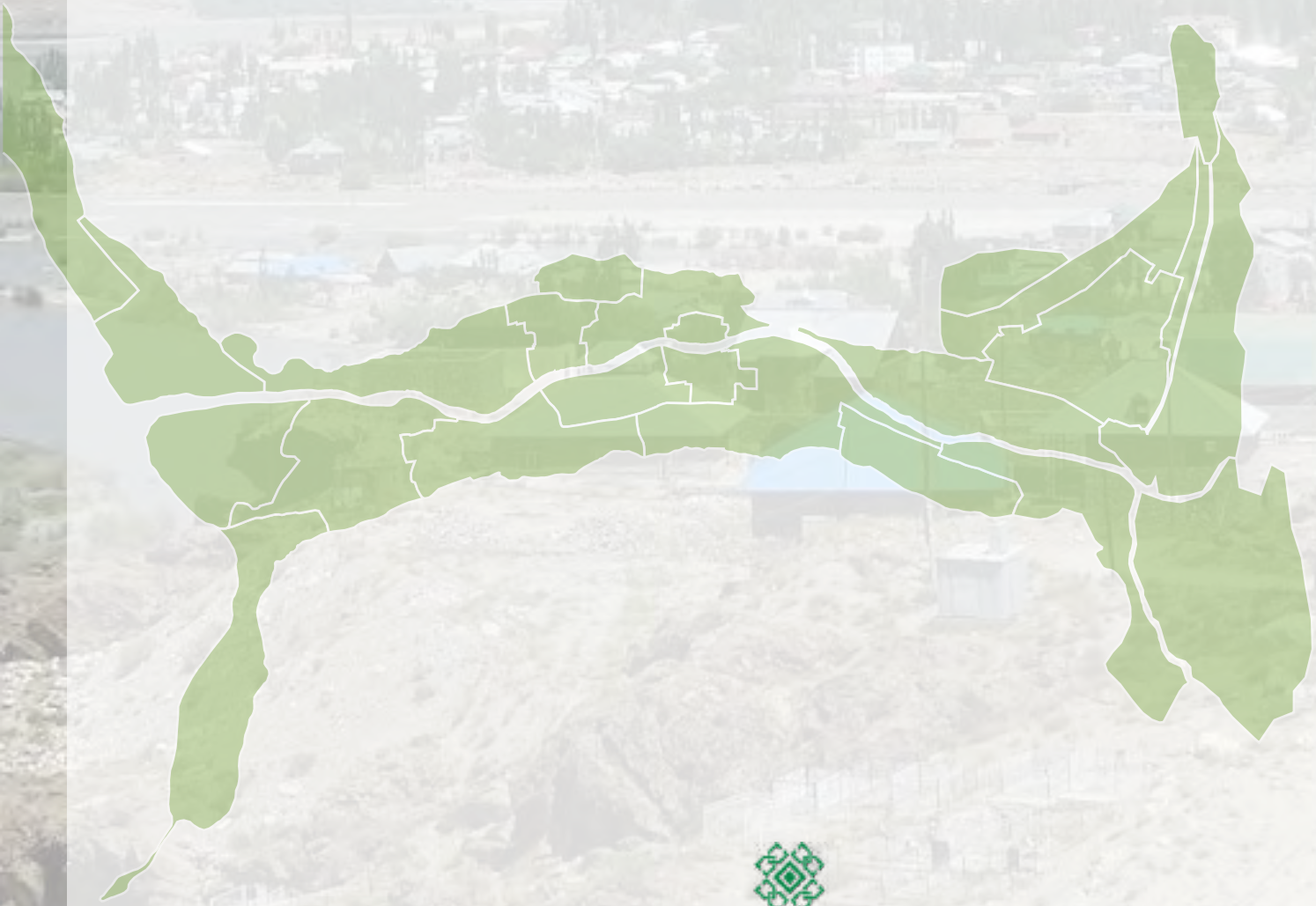
Integrated Spatial Plan for Environmental and Socio-Economic Resilience

KHOROG
Tajikistan

Compendium of Reports
Phase2

May 2023



UN-HABITAT

Habitat Planning
A Programme of the Aga Khan Agency for Habitat

Aga Khan Agency for Habitat

RESILIENT KHOROG 2035

Integrated Spatial Plan for Environmental
and Socio-Economic Resilience
Khorog, Tajikistan

Compendium of Reports Phase 2

Aga Khan Agency for Habitat
www.akdn.org

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And for all who participated in the meetings, field trips, working sessions and trainings from the government, service providers, AKAH, AKDN, UCA, and inhabitants of Khorog.

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RESILIENT KHOROG 2035

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REPORTS

Integrated Spatial Plan for Environmental and Socio-Economic Resilience

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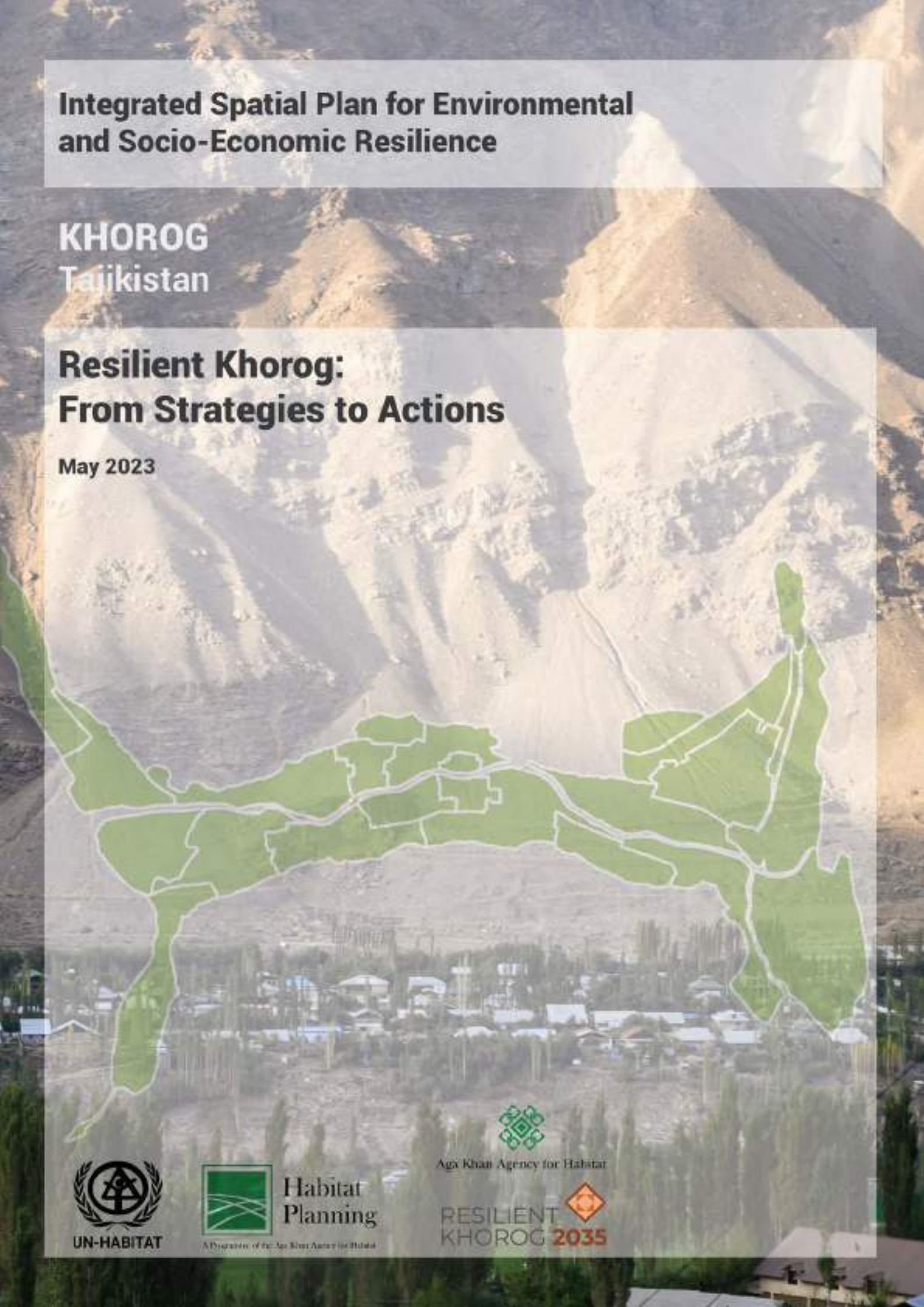
Resilient Khorog: From Strategies to Actions

May 2023



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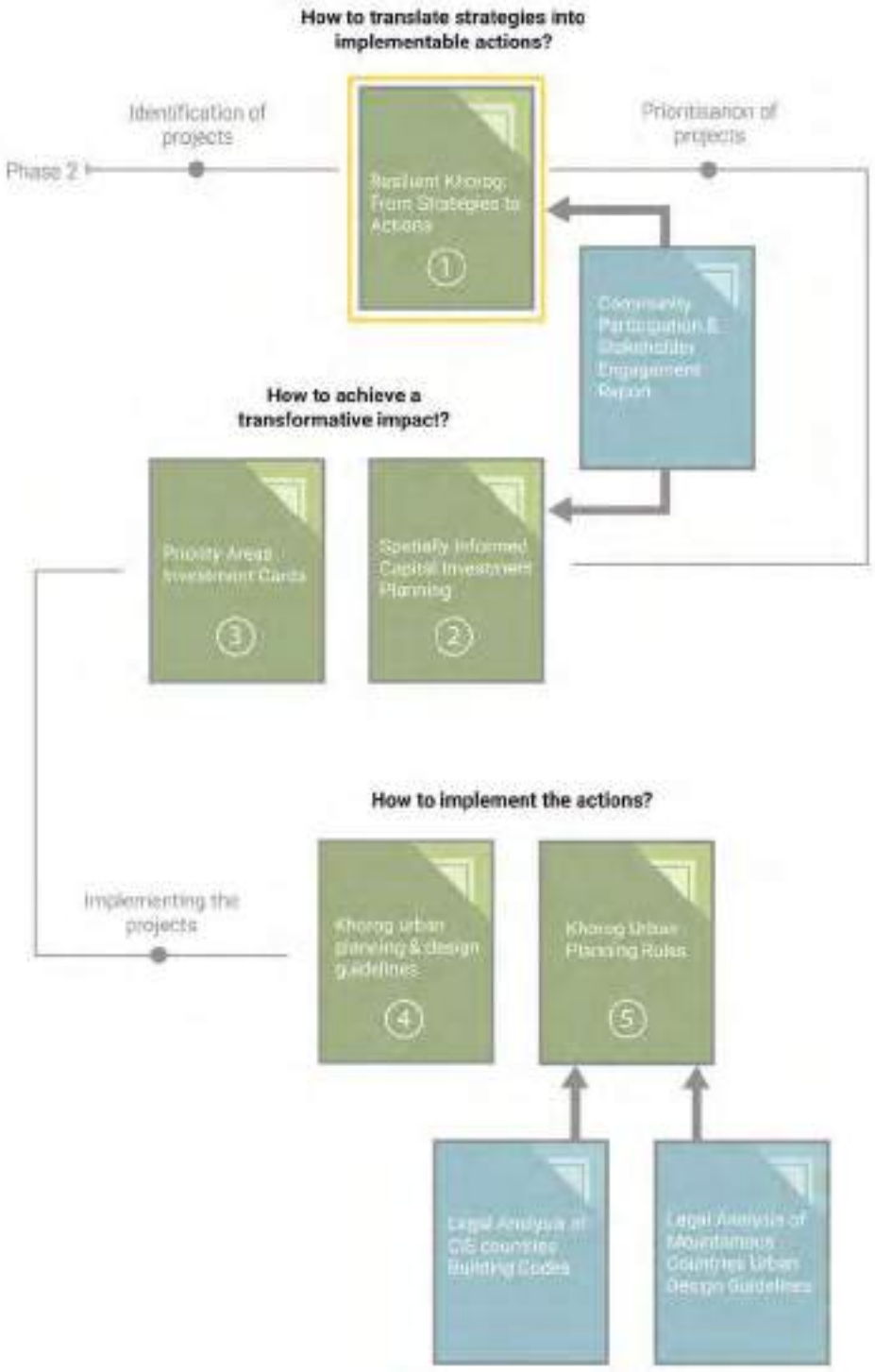
Resilient Khorog:
From Strategies To Actions



CONTENTS

RESILIENT KHOROG:

FROM STRATEGIES TO ACTIONS

EXECUTIVE SUMMARY

UN-Habitat together with the Aga Khan Agency for Habitat (AKAH) and the government of Tajikistan developed the 'Integrated Spatial Plan for Environmental and Socio-Economic Resilience' in Khorog Tajikistan that aimed to provide planning direction to improve urban resilience and social stability for local communities, providing environmental, legal, economic, spatial and infrastructure policies and projections,governance and management recommendations for transformative projects, as well technical capacity building for urban planning actors and stakeholders.

"Resilient Khororg: From Strategies to Actions" report is a part of the second phase of the Integrated Spatial Plan informed by the results of the evidence-based spatial analysis of the 1st phase. While the first phase resulted in the defined development scenarios, six strategic responces and eight spatial strategies, the second phase aimed to translate those recommendations and strategies into implementable and targeted actions that would accelerate the transformative change in the city.

The correlations of planning actions defined by the spatal analysis informed the identification of areas of transformative impact in Andarsitez, Barakat, Tabobatkhona, Saifullo Abdulo and Tircid, which were further validated by the wide range of stakeholders. The under-utilised lands in those areas were selected for the development of the two detailed demonstration projects – Site A in Tabobatkhona and Barakat and Site B in Andarsitez and Gulobod.

Considering the strategic location of the selected areas in different parts of Khorog and different sets of existing preconditions, the demonstration projects aimed to demonstrate tailored urban planning and design principles for sustainable neighborhood and the process of their application in diverse contexts, setting a reference model for neighbourhood planning for future development.

The transformative projects are showcasing the urban layout for the medium-rise mixed-use development (not exceeding 6 floors) with optimal level of density (300 p/ha in everage) ,diverse housing offer, increased accessibility through the design of multimodal street network and a network of open public spaces, the application of regeneration strategies and nature-based solutions. In addition to demonstrating sustainable planning and design principles in practice, the projects are developed to fulfill the need for amenities that are required by the local regulations (schools, kindergartens, community centres, etc.).

The design proposals for the both sites suggest the integration of a multi-functional Techparks within the neighbourhoods, providing a vibrant environment for high value-added businesses and creating an enabling environment for strengthening the entrepreneurship sector in Khorog.

The demonstration projects (Sites A with a total cost of $44 000 000 and B with a total cost of $76 550 000) once implemented will facilitate the transformative process of the entire city by creating mixed-use economic nodes that will provide housing opportunities to 2300 people and 1090 employment opportunities.

The design proposals emphasise the maximum integration with the natural environment. Design takes advantage of the topography for the site A and of the long stretch of the riverbank for the site B. Enhancing local identity and promoting human scale development inspired by vernacular urban pattern will maintain the unique character of Khorog while attracting new residents an tourists.

The transformative projects are within the final outputs of the overall planning process based on the UN-Habitat Urban Lab approach that includes 3 major stages: understanding, planning, and transforming the city, supported by regulatory mechanisms such as planning and design guidelines, capital investment planning, and building codes review to ensure decision makers have the instrument to carry out the implementation process.

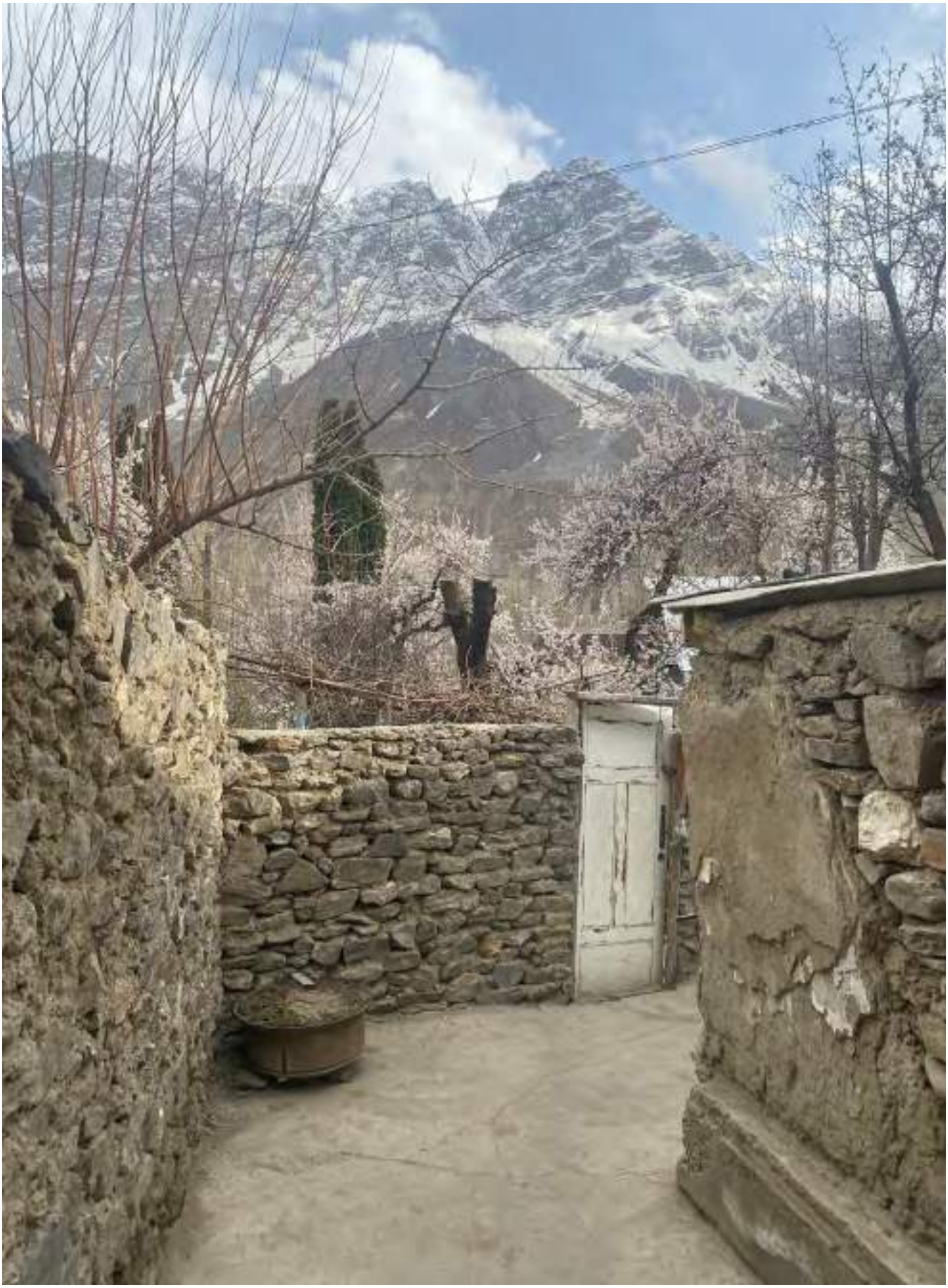


Fig 1. The view on the mountains from the old part of Khorog , UN-Habitat, April 2023

Fig 2. The view on the city of Khorog, UN-Habitat, April 2023

1

INTRODUCTION

1.1. INTEGRATED SPATIAL PLAN FOR ENVIRONMENTAL AND SOCIO-ECONOMIC RESILIENCE

UN-Habitat has partnered with the Aga Khan Agency for Habitat (AKAH) and the government of Tajikistan, through the Aga Khan Development Network (AKDN), to undertake the 'Integrated Spatial Plan for Environmental and Socio-Economic Resilience' in Khorog Tajikistan. UN-Habitat's Urban Planning and Design Lab (Urban Lab), in a collaborative process with other units and branches within the UN-Habitat Planning Finance and Economy Section and the Urban Practices Branch, and with AKAH's Habitat Planning teams in Geneva and Tajikistan, aims to provide planning direction to improve resilience and social stability for existing communities and accommodate the increasing populations in Khorog in a sustainable way through:

1) developing strategies, masterplans, interventions, and regulations.
2) knowledge creation, capacity building, and guidelines.

Moreover, the project aims to provide environmental, legal, economic, spatial and infrastructure policies and projections, and governance and management recommendations for transformative projects, as well as planning and technical capacity building for stakeholders. The UN-Habitat utilises AKAH's Planning methods, advanced data collection, and analysis, to provide planning expertise, drawing on existing methodologies, toolkits, and best practices in a collaborative and integrated way to guide and bolster the growth of the city of Khorog.

This project is one of several outcomes from an assessment of resiliency that was undertaken for Khorog in the years of 2017 and 2018 by the Swiss State Secretariat for Economic Affairs (SECO) and Holinger, with partnerships from the international community that included the European Union for resilient infrastructure, the Government of Japan, the IFC, and the World Bank.

The work of UN-Habitat in collaboration with AKAH is part of The Khorog Urban Resilience Planning and Proof of Concept Initiative. This project, supported by SECO seeks to drive resilient infrastructure investment and access to basic public services, with the goal of reducing risk, ensuring more reliable infrastructure, and creating an overall safer environment. This will, in turn, improve economic growth and the wellbeing of the city. This project has been undertaken in parallel with other initiatives for Khorog, such as the EBRD. Furthermore, SECO funded phase 1 and 2 water infrastructure projects.

AKAH looks to UN-Habitat to support the Revised Town Planning process in a way that can ensure alignment of the town plan to UNDRR resilience principles and best practices. The integrated plan for environmental and socio-economic resilience in Khorog will integrate the disaster risk reduction approaches within the planning processes of identified projects.

1.2. REPORT ROLE & CONTEXT

This report provides a demonstration of the concrete action built on the evidence-based spatial analysis of the 1st phase. It gives a concrete roadmap on how to translate spatial strategies into actions and link them with the city's financial plans. In addition, the report provides suggestions to local legislation on how to implement the design recommendations and ensure alignment with international urban planning and design standards.

This report, therefore, is a stepping-off point, from which to develop further actions, with the close participation from specific stakeholders, government officials, Rais of the Mahallas, and community members. The design recommendation provided here should be integrated into the Town Plan and can be further expanded to ensure alignment with the local requirements for the project approval.

This document is both detailed, providing both a practical and strategic, multidimensional and specific recommendation. The maintenance plan, for example, can be used as a tool for the local government and implementing partners to understand the sustainability aspects of the maintenance processes and how design interventions can generate revenues for the city, while enhancing the collaboration with different actors.

This report is the one of the series of eight reports that make up Phase 2 of the Integrated Spatial Plan for Environmental and Socio-Economic Resilience Project. Additional outcomes of this project have included participatory workshops, technical consultations, presentations, and a wide range of ideation activities. The key deliverables are listed in Table 1, alongside an explanation of the key steps in phases 1 and 2.

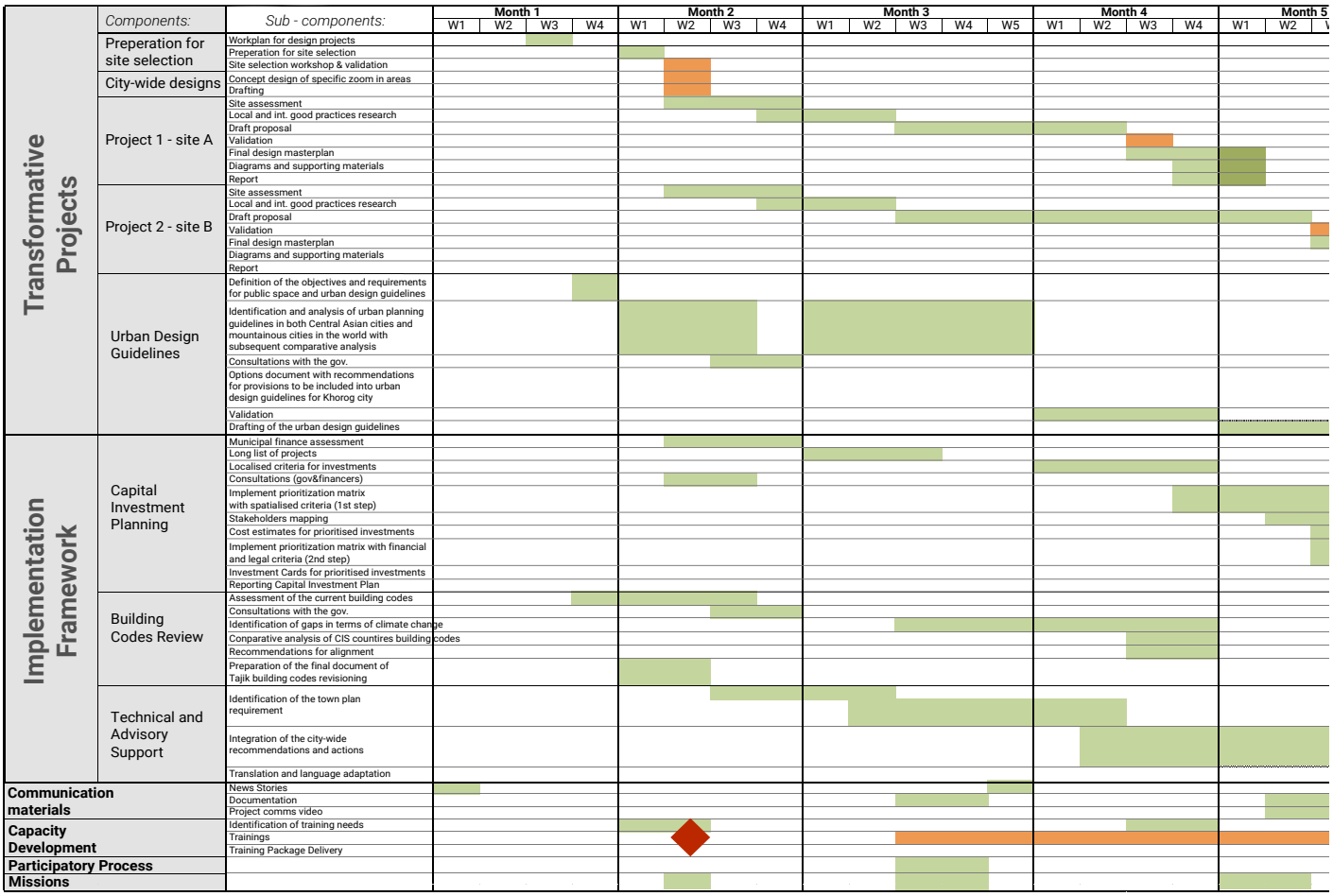


Fig 3. Positioning of the major participatory events within the project framework

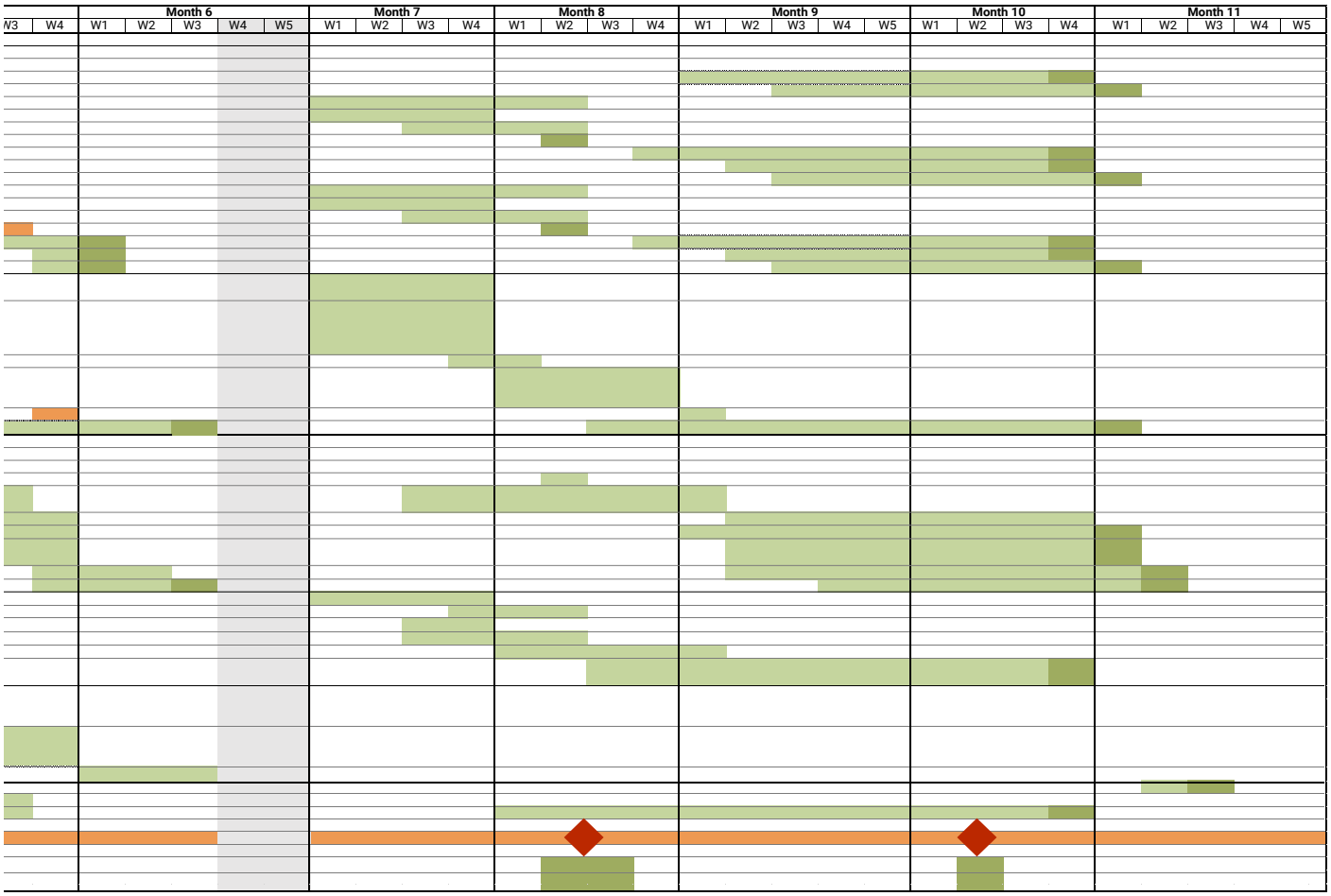
The timeline in Figure 3 highlights the project actions and milestones. The original project scope and timeline was amended to account for travel limitations associated with extreme weather conditions and the COVID-19 pandemic.

1.3. ALIGNMENT WITH FRAMEWORKS AND TOOLS

1.3.1. Habitat Planning Framework

The report "From Strategies to Actions" includes priority actions, transformative projects, and recommendations on implementation. This part of the project aligns with the steps in the Habitat Planning Framework in the phases of "Planning Priorities and Design" (Physical + Land Use priorities, Social + Economic priorities, Integrated Design Alternatives) and "Implementation" (Feasibility analysis + action plan). The Habitat Planning Framework is the core framework that informed the project process. It was developed by AKAH, in conjunction with the Resilience Framework for Action.

AKAH is an umbrella agency for legacy organisations including the Aga Khan Planning & Building Services, the Focus Humanitarian Assistance, the Disaster Risk Management Initiative, the Portfolio Management Office (PMO), the Prince Sadruddin Aga Khan Fund for the Environment (PSAKFE), as well as the habitat-related activities of the Aga Khan Rural Support Programme (AKRSP), and the Mountain Societies Development Support Program (MSDSP). AKAH is part of the wider Aga Khan Development Agency. Its mission statement is as follows:



"To address the increasing threat posed by natural disasters and climate change, the Aga Khan Agency for Habitat (AKAH) works to ensure that poor people live in physical settings that are as safe as possible from the effects of natural disasters; that residents who do live in high-risk areas are able to cope with disasters in terms of preparedness and response; and that these settings provide access to social and financial services that lead to greater opportunity and a better quality of life."

The Aga Khan Agency for Habitat (AKAH) was created to address the increasing threat of natural hazards because of climate change. This, coupled with rapid manmade changes and insecurities, have severe impacts on mountain and urban communities. AKAH created the Habitat Planning Framework in 2018, an eight-step process for assisting state or institutionally implemented mountain and rural urban planning projects through participation, data-driven decision making, design, and implementation.

	Scoping, Analysis, Diagnosis and Spatial Strategy			Deliverables
PHASE 1	Project Scope and Inception Report	What is the scope of the project and what can we achieve?	This involves a desktop review of existing reports and studies to generate an understanding of the city. This formalised the scope of the projectand the steps to be taken, and identified information gaps. In response, requests for specific and updated data sets (GIS and other) were made, and key stakeholders were identified for interviews.	• Inception Report • Data requests
	Discovery and Understanding	What is the context of the work? How should the framework be defined?	At this early stage, discovery interviews were conducted with stakeholders. As resilience was the focus of the project, findings were organised into four key areas: Environmental, Socio-Economic, Infrastructure and Basic Services, and Institutional Resilience. This first step informed the team of the challenges the city faced and directed the next stage of assessments.	• Discovery Workshop • City Profile Part 1: Discovery Report
	Diagnostic and Community Engagement	What are the key challenges and why are they happening?	This stage of work involved a process of data collection, data cleaning and a series of assessments based on the spatial themes of resilience; environmental, socio-economic and infrastructure and basic services. The final theme of institutional resilience was assessed by the urban legislation team and the assessment is included as an individual chapter alongside the data assessments. This step provided the team with a basis of understanding from which to design focused community engagement activities, and on-site validation exercises.	• Diagnosis Workshop • City Profile Part 2: Diagnosis Report • Capacity Assessment Report
	Spatial Strategy	How and where to approach these challenges?	This stage of work involved consolidating the challenges faced by the city and identifying key spatial and non-spatial strategies in order to address them. Not only can this set of plans and strategies support the sustainable development of the city, but their inclusion as part of the process provides local government and stakeholders with a greater understanding of evidence-based, participatory, and collaborative planning approaches that can be applied to future work.	• Validation Workshop • City Profile Part 3: Recommendations Report • Participation & Community Engagement Report • Legal Assessment Report

Table 1. Project phasing and participatory events conducted

	Transformative Projects	How to actualise the plan?	This stage of the project illustrates how the strategic recommendations are translated into targeted actions. This involves identifying key pilot project sites to showcase the practical implementation of the plan. These projects will demonstrate how the SDGs can be localised, setting reference models for future development. In addition, the projects will show how principles for sustainable neighbourhood planning and design can be applied in the local context.	• Fact-finding workshop • Ideation activities with women, youth and children • Validation design workshop • Design proposals • From "strategies to actions" Report
	Capital Investment Plan	How and when to implement?	TThis mechanism prioritises identified projects with an accompanying finance and investment strategies to support their implementation. At this stage, the scoring criteria for the projects is defined as well as the comprehensive project list. Such scoring mechanism will highlight the priority actions to be taken in the city to ensure transformative impact. In addition, the mechanism defines priority areas for future investments.	• Prioritisation workshop • Validation workshop • Capital Investment Planning Report • Priority project and areas for investments • Comprehensive list of projects
	Analysis of Mountainous Countries Urban Design Guidelines	What and how the actions are taken in other contexts?	This stage of the project explores how Urban Design Guidelines are implemented in the contexts of mountainous cities, exploring best practices and solution for urban resilience.	• •Report on analysis of Urban Design Guidelines in Mountainous Countries
	Urban planning and design guidelines	How to guide the future development in Khorog?	This stage of the project defines targeted recommendations for Khorog context across thematic areas to guide the transformative processes in the city. Urban planning and design guidelines set specific indicators to meet (density, permeability, etc.) as well as provide recommendations at the neighbourhood level.	• Validation workshop • Urban Planning and design guidelines report
	Analysis of CIS countries Building Codes	How are actions implemented in other contexts similar to Tajikistan in terms of legislation and institutional framework?	At this stage of the project, the analysis of building codes in the CIS countries is conducted to understand the gaps and alignment with international standards. Such analysis provides a comprehensive overview of the building codes in the region, informing the analysis of Khorog regulatory frameworks.	• Report on the analysis of CIS countries Building Codes
	Khorog Urban Planning Rules	How to implement action in Khorog?	This stage provides clear recommendations based on the comprehensive revision of the Khororg planning rules, including recommendation on law's amendments according to international standards.	• Khorog Urban Planning Rules Report

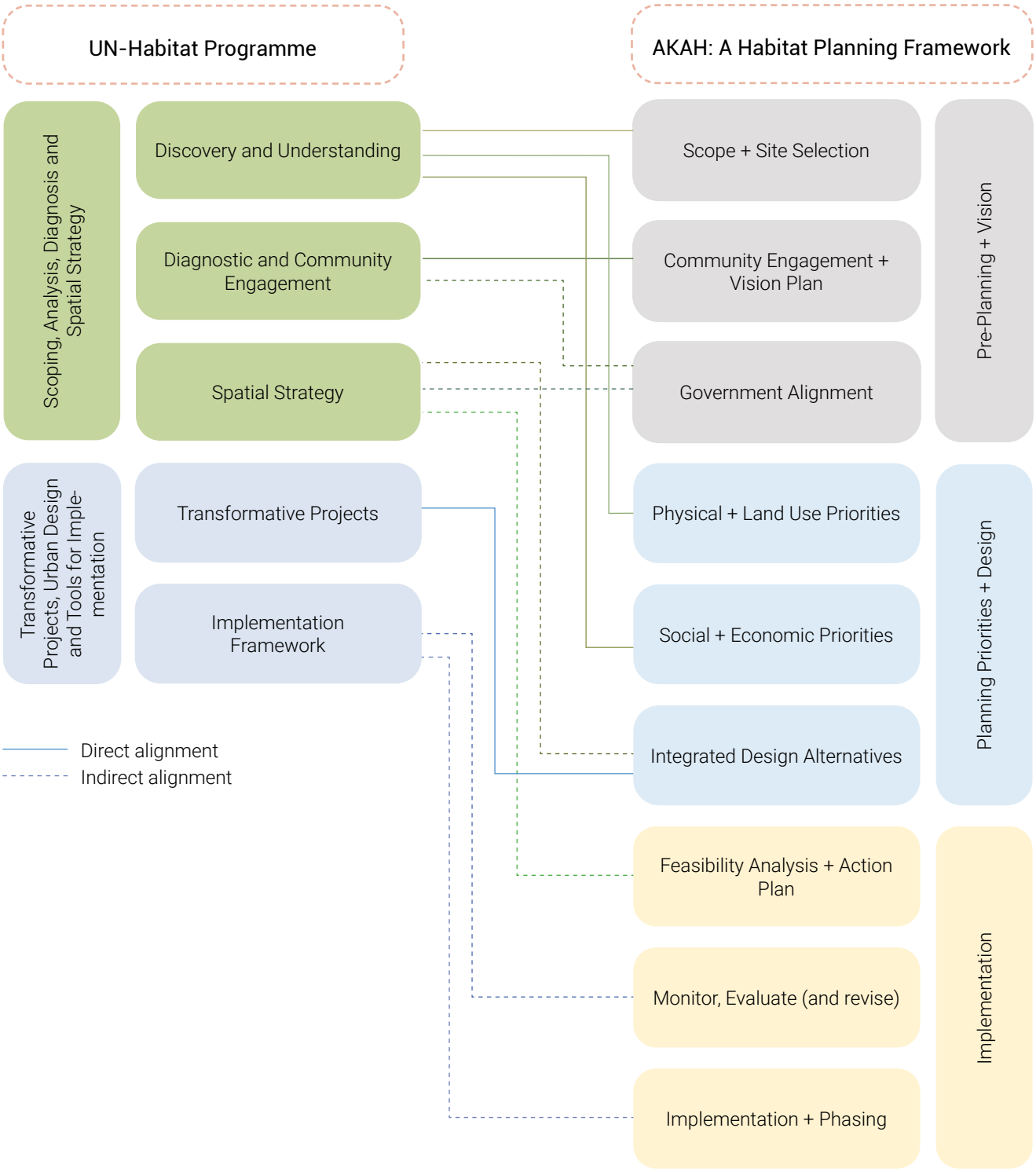


Fig 4. Alignment of UN-Habitat and AKAH's Habitat Planning Framework (using K. Intrator. Overview of Proposed Habitat Planning Process for AKAH, Version 2.0 August 2021)

AKAH's eight-step process aims to support urban planning projects in achieving the balance between the strategic planning and community action planning approaches outlined above. It also aims to set an example of enhancing the capacity of local institutions in both participatory and data-driven decision-making processes. When establishing the process AKAH reviewed the Village Development Plans (VDP) and Village Disaster Mitigation Plan (VDMP) methods used in the core target countries: Afghanistan, Tajikistan, and Pakistan.

Existing spatial and nonspatial data in Afghanistan, Tajikistan and Pakistan were also analysed to understand how the process could build capacity for incorporating data collection and data- driven decision making into the method.

Pluralistic planning mechanisms and processes are required to reduce vulnerability and create a needs-based planning system to help increase quality of life. This is addressed by both the Habitat Assessment and stage 5 - Integrated design alternatives.

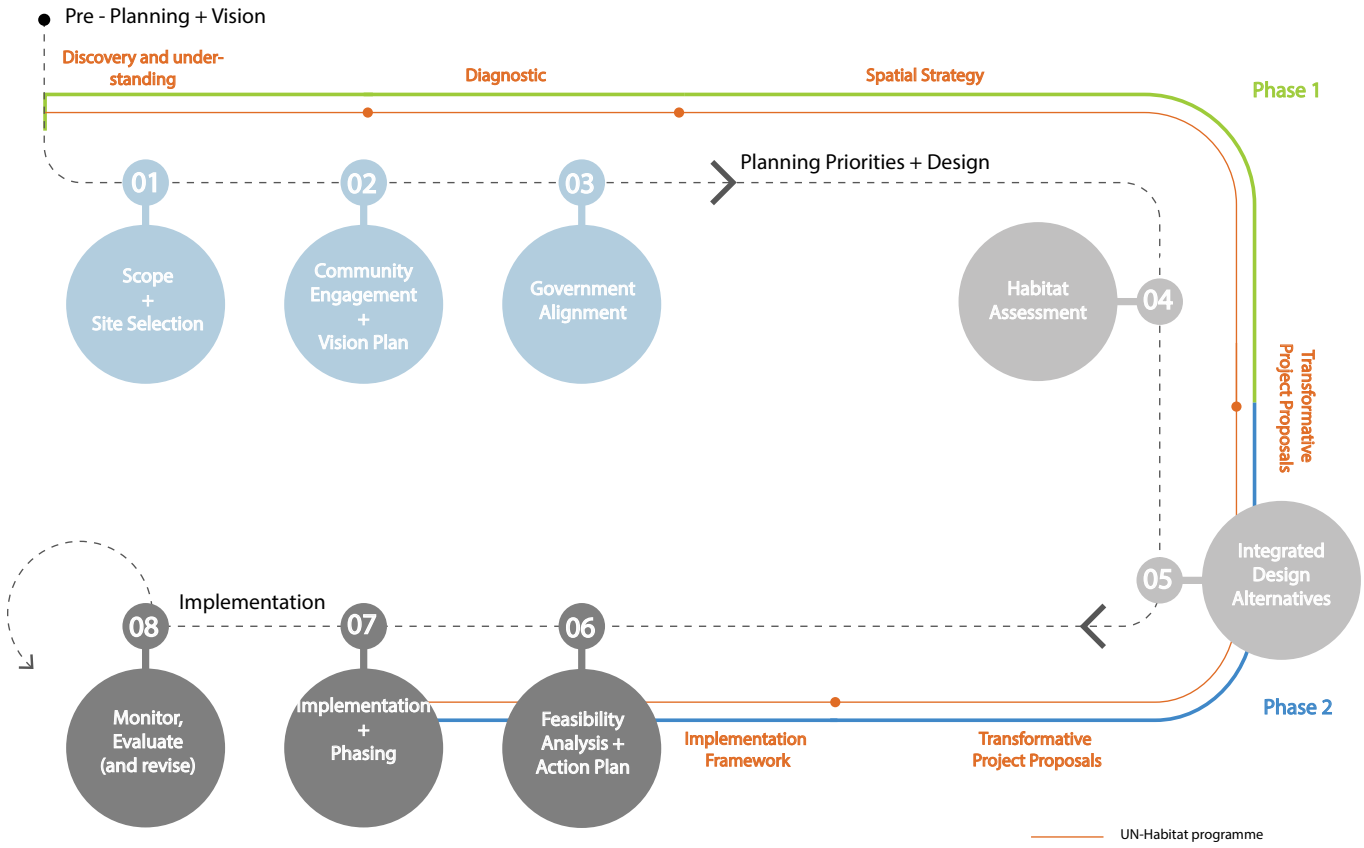


Fig 5. Planning framework (diagram built upon K. Intrator. Overview of Proposed Habitat Planning Process for AKAH, Version 2.0 August 2021)

In addition, Figure 6 shows part of the Habitat Assessment process, including the use of data collection in the capacity building and decision-making processes that will be incorporated in Phase 2 of the Project (see table 1). The engagement of data-driven decision making with the community's input addresses the long-term local planning goals that are co-defined between the community and local authorities and can therefore be aligned and incorporated into wider urban plans. The process of using data in such a decision-making process also enhances community and institutional capacity to use data to support monitoring, evaluation, and future initiatives.

UN-Habitat's project outputs are heavily based on the knowledge and data collected by AKAH's planning team, contributing to the phases and steps of the AKAH's Habitat Planning Framework to ensure a unified, comprehensive, and strategic vision among all stakeholders.

Figure 5 outlines the key elements of the Habitat Planning Framework, alongside the 'Integrated Spatial Plan for Environmental and Socio-Economic Resilience', to highlight the integration of approaches. Evaluating both approaches, UN-Habitat's progress will be monitored against this framework to ensure alignment throughout the project timeline.

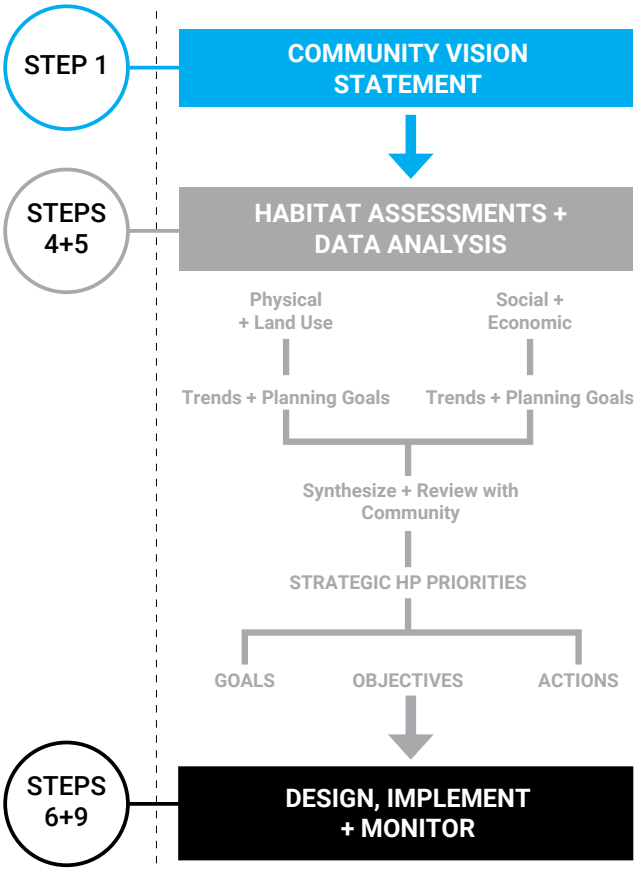


Fig 6. Strategy for developing Habitat Planning Priorities

Fig 7. The development along the riverbank in Khorog, UN-Habitat, April 2023

Fig 8. A view from the central park of Khorog, UN-Habitat, April 2023

1.3.2. Our City Plans Toolbox

The Our City Plans (OCP) Toolbox was used by the UN-Habitat team for Khorog. The OCP, developed by UN-Habitat, is a step-by-step methodology to assess, design, operationalise, and implement urban planning processes. The toolbox provides flexibility to adapt the methodology to various contexts, based on different necessities and focus areas. By structuring a timeline of phases, blocks, and activities, the toolbox assists urban stakeholders with a more comprehensive understanding of urban planning processes. It ensures meaningful stakeholder involvement, both to safeguard the ownership of completed projects, and to create potential for ongoing, multi-stakeholder collaboration.

The toolbox consists of four phases, 15 blocks, and 69 activities, as illustrated in Figure 6. Each block focuses on a specific topic which is further broken down into activities to enhance the adoption of participatory, inclusive, and sustainable practices. These activities are supported by innovative tools and complementary materials produced by UN-Habitat.

The City Profile "From Strategies to Action" aligns with the plan phase of the Participatory Incremental Urban Planning Toolbox, comprised of the following blocks:

- E. Strategic Plan,
- F. Conceptual Plan,
- G. Structure Plan,
- H. Neighbourhood plans.

The outcomes of the prioritisation workshops, identification of priority actions and suggested implementation mechanisms align with the operationalisation and implementation phases of the project and particularly in the following blocks:

- I. Action plan,
- J. land management,
- K. Financial mechanisms,
- L. Institutional enablers,
- M. Legal enablers,
- N. Implementing mechanisms,
- O. Accountability system.

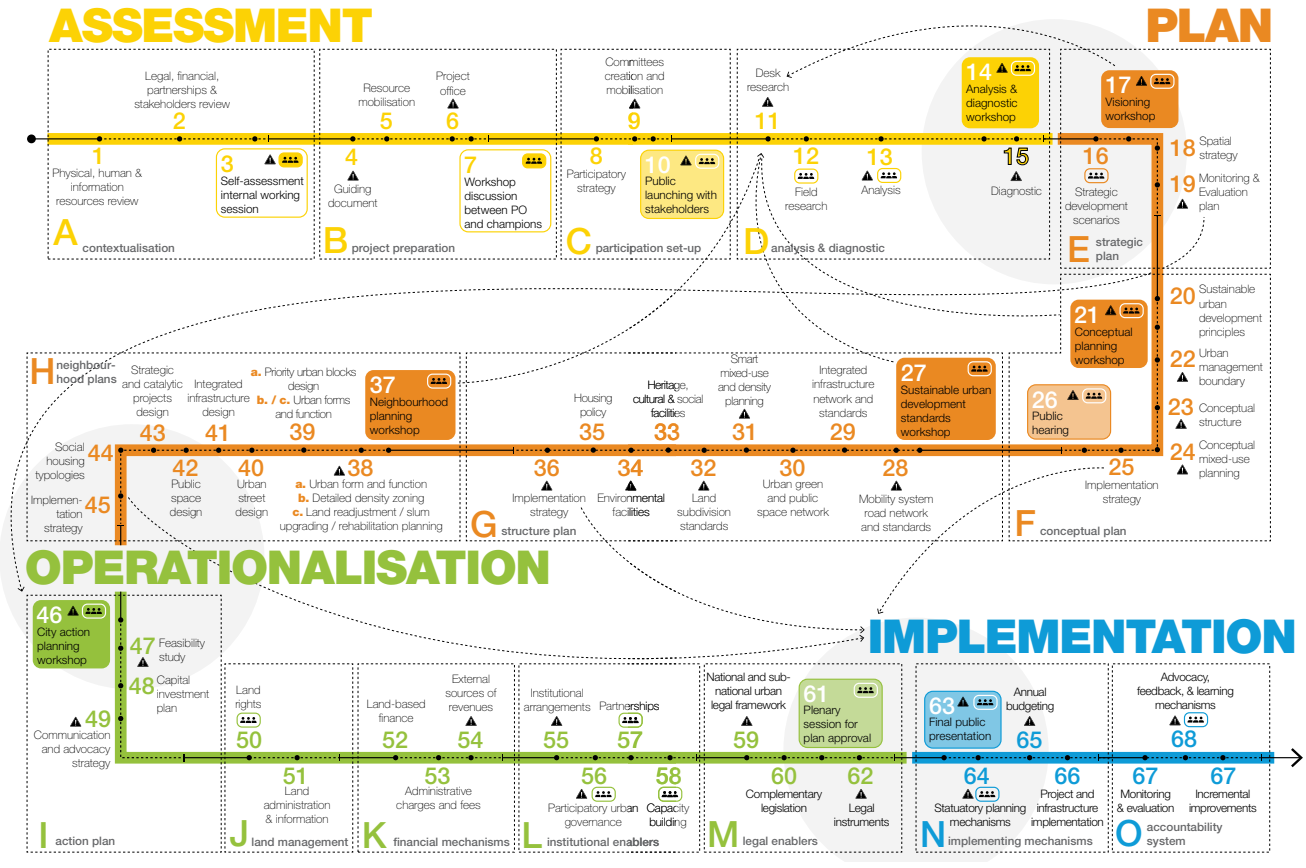


Fig 9. OCP's phases, blocks and activities

1.3.3. Applied Tools

Alongside the Habitat Planning Framework and OCP, additional tools have been engaged to align the project to best practices, processes, and guidelines. These include the following:

- City Resilience Profiling Tool
- City Resilience Action Planning (CityRAP)
- Making Cities Resilient and the "Ten Essentials for Making Cities Resilient"
- Disaster Resilience Scorecard for Cities
- UNDAF
- "MY Neighbourhood" UN-Habitat Urban Planning and Design Guidelines for sustainable neighborhoods

Additional tools used in the project processes, actions and results include the Resilience Profiling Tool, which formed the framework for our assessment, the City Resilience Action Planning. This was used to ensure engagement with local stakeholders and the UN Development Assistance Framework, and to integrate the UN Country Team in the formation of the project goals.

1.3.4. Alignment with Global Frameworks

While all measures proposed within the project are targeted for implementation at the city level, it is envisioned that such priorities could be replicated to address similar challenges in other cities, and thus they can be further scaled to regional and national levels. As such, the project is strategically aligned to various international frameworks, while localising actions and recommendations.

1.3.5. Sustainable Development Goals

Through transformative strategies, the Khorog programme directly supports the realisation of SDG 11 on sustainable cities and communities, with reference to the following targets:

- 11.1: provide access for all to adequate, safe and affordable housing, and basic services.
- 11.2: provide access to safe, affordable, accessible, and sustainable transport systems; improving road safety, notably by expanding public transport.
- 11.3: enhance capacity for participatory, integrated, and sustainable human settlement planning and management.
- 11.4: strengthen efforts to protect and safeguard the world's cultural and natural heritage.
- 11.7: provide universal access to safe, inclusive, and accessible green and public spaces.
- 11.A: support positive economic, social, and environmental links between urban, peri-urban, and rural areas by strengthening national and regional development planning
- 11.B: increase the number of cities adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement holistic disaster risk management at all levels.

In addition, the programme also supports actions for the SDG 9 on resilient infrastructure, industry and innovation, as well as for the SDG 12 on sustainable consumption and production, for the SDG 13 on climate action, and finally for the SDG 17 on partnerships, most notably with reference to the following targets:

- 9.1: develop quality, reliable, sustainable, and resilient infrastructure to support economic development and human well-being, with a focus on affordable and equitable access for all.
- 12.8: ensure that people everywhere have the relevant information and awareness of sustainable development and lifestyles that can exist in harmony with nature.
- 13.1: strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries.
- 13.2: integrate climate change measures into national policies, strategies, and planning.
- 17.16: enhance global partnerships for sustainable development, complemented by multi-stakeholder partnerships that mobilise and share knowledge, expertise, technology, and financial resources, to support the achievement of the sustainable development goals in all countries, and in developing countries.
- 17.17: encourage and promote effective public, public-private, and civil society partnerships, building on the experience and resourcing strategies that these can bring.

1.3.6. NUA

Tajikistan is a signatory of the New Urban Agenda, with specific commitments that are manifested in the recent adoption of the National Development Strategy of 2030, which tackles new and traditional challenges that the country is currently facing. Tajikistan has built on these commitments through the adoption of the 2030 Agenda for Sustainable Development, the SDGs, the Addis Ababa Action Agenda of the Third International Conference on Financing for Development, the Paris Climate Agreement, and the Sendai Framework for Disaster Risk Reduction 2015-2030.

This specific project in Khorog aligns with the Habitat III New Urban Agenda in meeting "the challenges and opportunities of present and future sustained, inclusive and sustainable economic growth". It also aims to provide the strategic spatial framework to "adopt and implement disaster risk reduction and management, reduce vulnerability, build resilience and responsiveness to natural and human-made hazards, and foster mitigation of and adaptation to climate change".

1.3.7. Sendai Framework

The Sendai Framework for Disaster Risk Reduction 2015-2030 outlines seven clear targets and four priority actions to prevent new disasters and reduce risk posed by the existing ones. The Khorog project is well aligned to the four priority areas and their key actions. It addresses priority 1; understanding disaster risk by promoting collection, analysis, management, and use of relevant data to assess disaster risks, vulnerability, exposure, hazards, and their possible sequential effects using technological innovation and collaboration.

The programme analysis of the current governance structure addresses priority 2; strengthening disaster risk governance. The programme's focus on financing and capital investment planning will ensure that prioritised measures are cost-effective and instrumental to save lives, prevent and reduce loss, and ensure effective recovery and rehabilitation. The latter point is further aligned to priority 3; investing in disaster risk reduction for resilience. Finally, through the development of building codes and demonstration projects, the project addresses priority area 4; for effective response and building back better in times of recovery, rehabilitation, and reconstruction.

1.3.8. Paris Agreement on Climate Change

The project's focus on resilience aligns with the Paris Agreement on Climate Change by increasing Khorog's resilience and its ability to adapt to the adverse impacts of climate change. Within the Khorog context, this relates directly to the adverse impacts of flooding, droughts, avalanches, and landslides. Such disasters have become more frequent in the area, with increasing repercussions.

1.3.9. Paris Dushanbe Declaration for the International Decade on Water Action

The Declaration of The Decade for Action on "Water for Sustainable Development, 2018-2028", was launched in an event in Dushanbe in 2018. This event and the resulting declaration highlighted the importance of water access and management in achieving sustainable development. This challenge is of particular importance to Tajikistan, as it will affect the country's ability to build resilience in the face of natural hazards, climate change, and the political vulnerabilities associated with resource ownership and management. The Declaration for the International Decade on Water Action is aligned with the focus on resilience in Khorog in such a way that facilitates the realisation of Sustainable Development Goal 6; to "ensure availability and sustainable management of water and sanitation for all".

Fig 10. The view on Tem in Khorog, UN-Habitat, September 2022

Fig 11. Appartmetnt block in Khororg, UN-Habitat, April 2023

Fig 12. The newly constructed bridge in the market area of Khorog, UN-Habitat, April 2023

2

INFORMING THE DESIGN INTERVENTIONS

The following chapter provides an overview of the UN-Habitat Urban Lab methodology that consists of three steps: understanding, planning and transforming the city.

The transformative projects developed at the third stage, “transforming the city”, are based on the eight spatial strategies and aim to accelerate the implementation of these recommendations at the neighbourhood level, setting a reference model for further development and implementation of urban design and infrastructure projects.

The section provides the overview of the project scope and key objectives of the demonstration projects, emphasising the importance of an integrated and multiscale approach that encourages the synergy of different disciplines and collaboration among various stakeholders.

2.1. THE SCOPE OF THE DEMONSTRATION PROJECT

As an extension of the first phase of the Integrated Spatial Plan for Environmental and Socio-Economic Resilience for Khorog, the second phase aims to translate strategic recommendations into implementable actions that would shift the urbanisation patterns towards a more sustainable development track, preventing urban expansion in hazard areas, and ensuring safe and healthy places for living. The design solutions were developed alongside the strategic vision for Khorog, tapping into the six strategic responses and eight spatial strategies, analysing them at the neighborhood scale.

Spatial strategies and the implementable projects need to be structured through a multi-scalar lens, considering different levels of interventions beginning from the building block to the neighbourhood level, and from the neighourhood level to the broader citywide scale. Defining clear linkages between targeted design solutions and broader city objectives ensure not only spatial coherence, but also allows for the coordination of various actions at the different scales, therefore maximising the impact of structured and systemic urban transformations.

To accelerate the process of citywide transformation, the demonstration projects consider the areas of transformative impact identified through evidence-based spatial analysis and validated with a range of stakeholders. During the second phase, the project team conducted a set of participatory activities (see Community Participation and Stakeholder Report) with a wide range of stakeholders to prioritize actions across different thematic areas and ensure that targeted design proposals include the needs of all the community members with a special focus on women, children, elderly and people with disabilities.

Transformative projects focus on how to establish a safe and healthy urban environment that includes a variety of housing options and diverse public spaces. The projects exemplify a different approach to neighbourhood development aimed to move away from high-rise development to a more context specific urban pattern, including contextual characters, local climate, and cultural peculiarities, while meeting the needs of a more compact, connected, inclusive, vibrant, and resilient urban development model.

The transformative projects are within the final outputs of the overall planning process based on the UN-Habitat Urban Lab approach that includes 3 major stages: understanding, planning, and transforming the city.

The priority area-based projects are supported by regulatory mechanisms such as planning and design guidelines, capital investment planning, and building codes review to ensure decision makers have the instrument to carry out the implementation process.

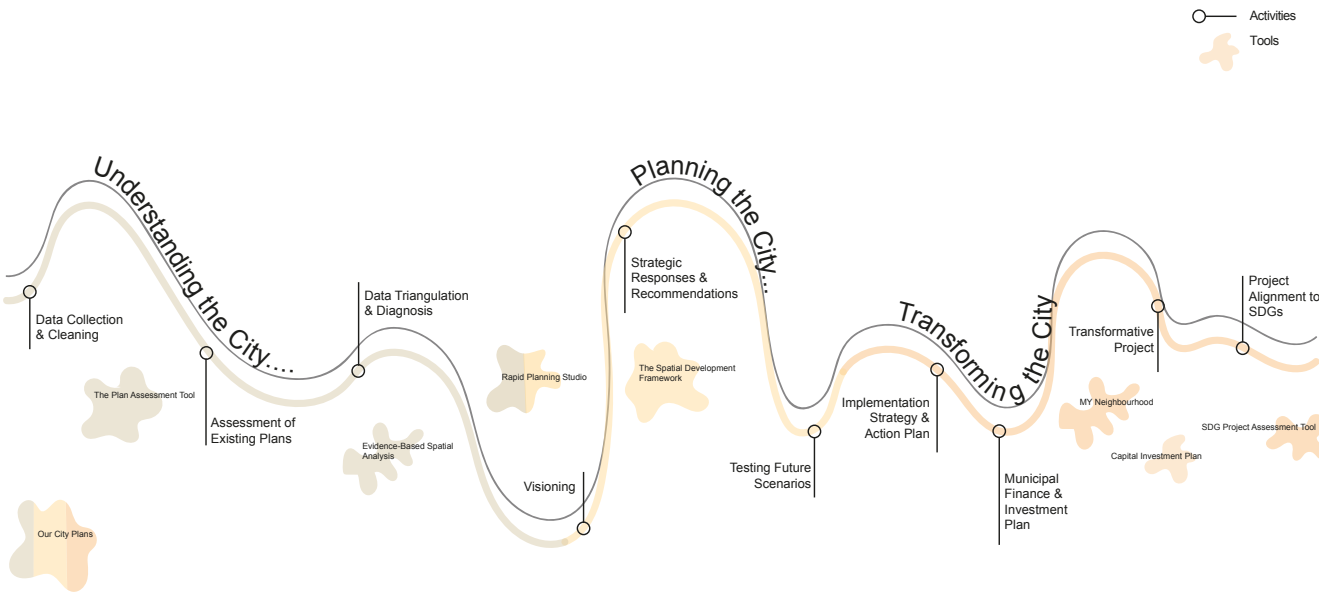


Fig 13. Urban Lab project process and approach

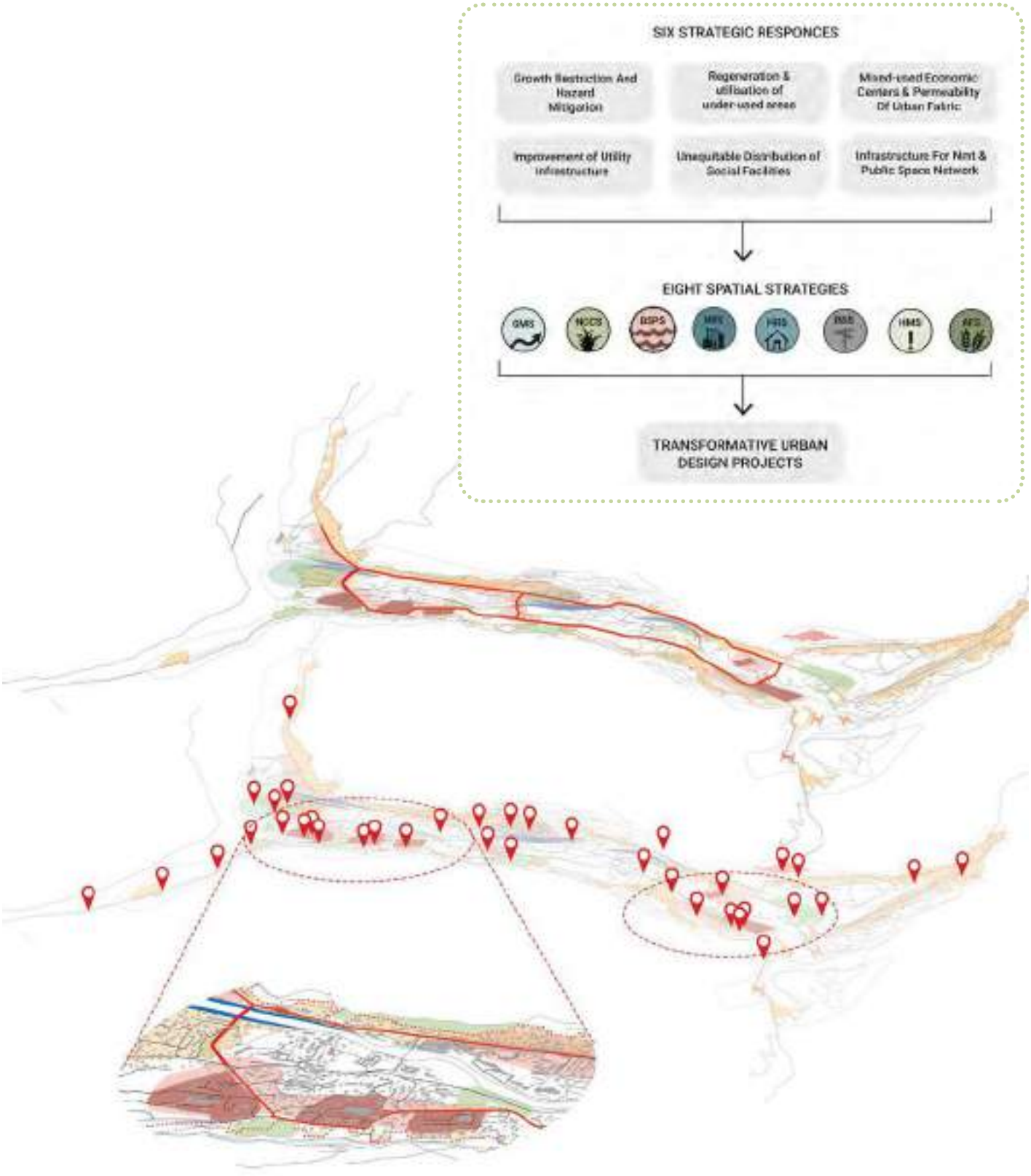


Fig 14. The multiscale project process in Khorog

2.2. THE OBJECTIVES OF THE DEMONSTRATION PROJECT

The design solutions target problematic issues that can be found in the contexts of mountainous areas. As such, the design approach and demonstration projects aimed to set an example on how to address and respond to the challenges represented by urban expansion in areas prone to natural hazards, and where factors such as limited land for development, car dependency, urban fragmentation, insufficient utility infrastructure, and inequitable distribution of social facilities are present.

The transformative projects will set a reference model for neighbourhood planning based on the UN-Habitat principles for sustainable development diversify the housing offer and land-use, encourage mixed-use development in specific nodes of regeneration and along mobility axes, increase the public transport coverage and access to a variety of social and public facilities, which in turn will be connected by a system of green and public spaces.

The proposed, and more efficient urban form, enables an environment that will help increase economic productivity by considering employment opportunities within the design, which is critical to retaining Khorog's population,as well assupporting the future growth of the city.

The demonstration projects explore the ways in which urban design can accelerate the process of city-wide transformations. Using this framework, the project's objectives are:

- Demonstrate how to translate strategic recommendations into implementable actions and how to link urban design interventions to bigger objectives and financial instruments;
- To provide an example of a resilient neighbourhood model that is planned according to safety regulations and that addresses UN-Habitat strategic responses while considering community vision and local way of living;
- To provide design solutions rooted in traditional culture and the local context with the aim to shift from high-rise to human scale development that is appropriate to the context;
- To provide an example of how urban design projects are generated; building on what is already existing on site (existing structures, natural elements, landmarks, etc.);

Fig 15. Pedestrian pathway next to the Ismaili Centre in Khorog, UN-Habitat, April 2023

3

TRANSLATION OF STRATEGIES INTO PROJECTS

The following section provides an overview of the process of translating spatial strategies into concrete projects and actions. The six strategic responses were summarised by the eight spatial strategies that were further interpreted as sets of actions at the neighbourhood level.

The diverse actions and projects were carefully defined in a participatory manner, gathering a wide range of stakeholders together. These actions were further analysed, formulated, unpacked and georeferenced to contribute to a unified database of projects. The database of projects includes detailed project information that is necessary for the scoring criteria described in the "Spatially Informed Capital Investment Planning".

The section describes both the process of project definition and how these projects are considered at the city-wide level, forming the system of interconnected initiatives that aim to activate the broader city objectives. Considering those city objectives at the various levels of urban design ensures that the identified projects are on the sustainable development track.

3.1. APPLICATION OF THE EIGHT SPATIAL STRATEGIES AT THE NEIGHBOURHOOD LEVEL

The diagnosis conducted in the first phase identified 'issues' and 'responses' that were further summarised by eight key urban planning strategies. During the fact-finding and validation workshops of the first phase all the design solutions and ideas proposed by a wide range of actors were collected and classified into the planning strategies. These were further prioritized with local experts during the technical workshop' second phase.

The prioritisation informed one of the scoring criteria for the capital investment planning (see Spatially Informed Capital Investment Planning Report).

Developed as the second phase of the Integrated Spatial Plan for Environmental and Socio-Economic Resilience, the demonstration projects highlight how to concretise these strategies into implementable projects. Following the six strategic recommendations, below is a description of each spatial strategy and its interpretation in urban design considering the 4 levels: neighbourhood, public space, streets[1] , and blocks.

All the projects were defined in a collaborative manner with the AKAH technical team, and the local government and communities using the participatory tools (collaborative mapping, flag exercises, ideation activities, etc.)

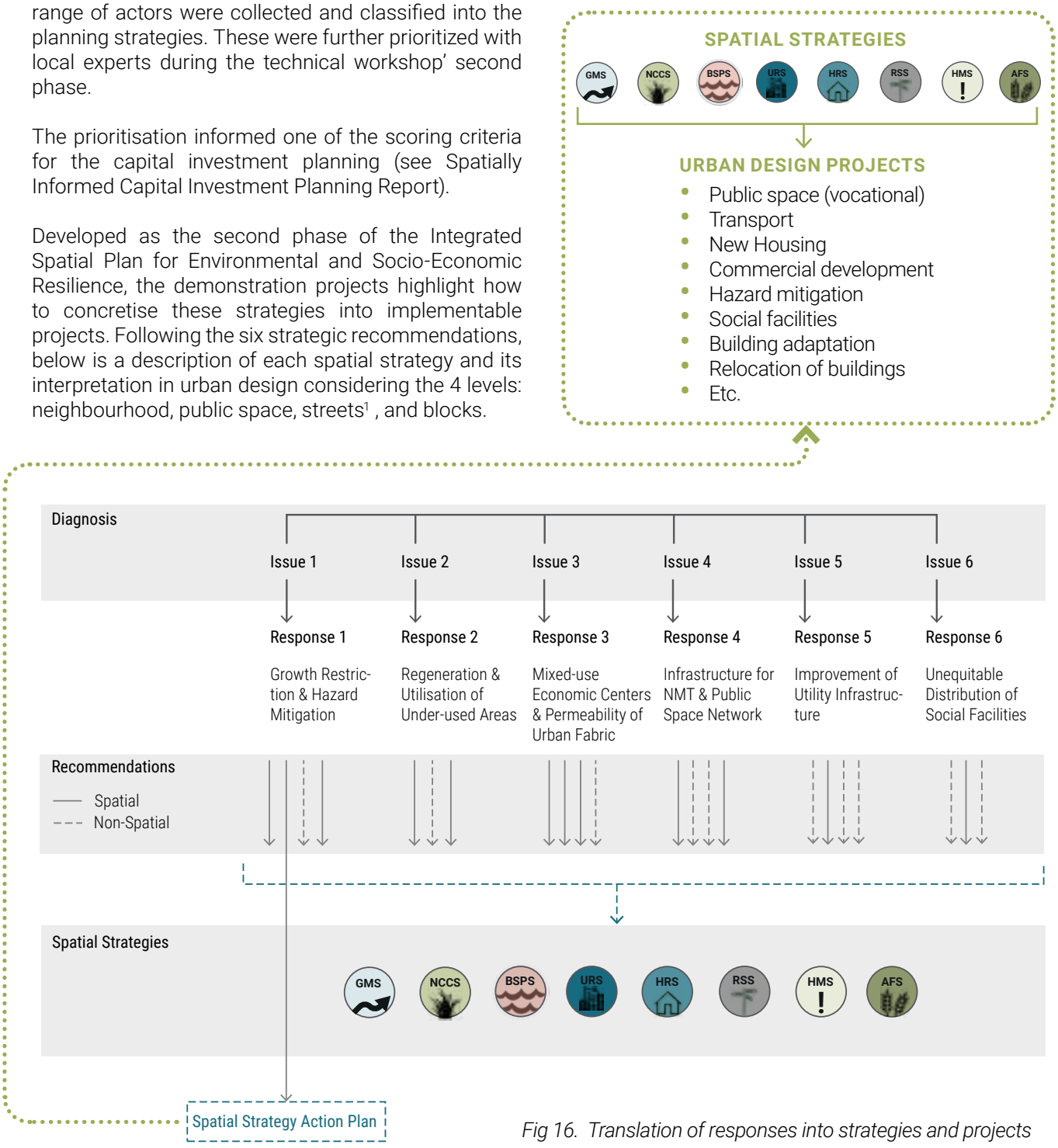


Fig 16. Translation of responses into strategies and projects

1. *Streets are the part of the open public space. The dimensions are considered separately in the table for convenience and due to the different nature of intervention.*

Fig 17. Newly constructed high-rise appartmet block in Khorog, UN-Habitat, April 2023

GROWTH MANAGEMENT STRATEGY (GMS)

This strategy is a city-wide, multi-stakeholder approach that seeks to minimise the impacts of city growth, whilst promoting sustainable urban development principles. This strategy is spatial, and policy based. It requires the support of proper legislation and management plans.

GMS

Growth Management Strategy

The Growth Management Strategy is supported by the following actions:

- Vegetation, afforestation along the Urban Growth Boundary (Green belt) and within the red regulatory zone (areas prone to resettlement strategy)
- Infill mixed-use development within the existing built-up area
- Service provision within the built-up area to cover deficit areas, considering the future growth

- Vegetation, afforestation, public gardens withing the areas dedicated for public space (areas prone to hazards and not suitable for residence)

ADEQUATE HOUSING & RELOCATION STRATEGY (HRS)

This strategy promotes the right to adequate housing for all, not only by considering existing communities at risk, but also through the provision of new housing in the city. This strategy is supported by legislative and urban design guidelines and must be implemented in a participatory manner.

HRS

Adequate Housing & Relocation Strategy

Adequate Housing & Relocation Strategy is supported by the following defined actions:

- Construction of new mixed-use housing blocks with additional functions (maximum 6 storeys)
- Service provision within the built-up area to cover deficit areas, considering the future growth

- Construction of the semi-private public spaces within/adjacent to mix-use block with necessary amenities for the residents'comfort (places to sit, play, socialize, spaces should have possibilities for gardening, etc.)

- Construction of barrier-free environment within the mixed-use development to promote pedestrian movements and universal accessibility

- Constriction of various types of houses (appartements, multi-family) affordable for a wide range of social groups, that consider local culture and modern trends (maximum 6 storeys)

URBAN REGENERATION STRATEGY (URS)

Urban Regeneration Strategies respond to the negative impacts that have arisen as a result from changes in urban growth or productivity in certain areas of the city. This strategy attempts to address the underutilised areas of the city that contribute to its fragmentation to improve the efficiency of the urban fabric (density and design) and incentivise economic growth in a sustainable, socially, and environmentally equitable way.

Urban Regeneration Strategy

The Urban Regeneration Strategy is supported by the following defined actions:

- Street network design for the areas of new development that follows the vernacular pattern
- The design of the new development inspired by local culture to ensure visual permeability and creation of "character areas" in the city

- Upgrading/regeneration of the marketplaces, design of the kiosks and internal public space
- Reconstruction of the marketplace, construction of the new stalls, adjacent public spaces, and internal courtyard
- Construction of the pocket public spaces within the current built-up area and close to the places of attraction with vegetation, places to sit, rest, and play
- Construction of the public space around the existing Jamotkhana to integrate the building into the urban environment, creating a vibrant "character area"
- Promotion of the diverse landmarks and public art to create place identity
- Construction of urban design elements that allow or access to the river (elevated platforms, clear passages)

- The upgrade of the current bus stations (installation of shelter, sitting area, map of the city/public transport routes) to ensure clear accessibility and visibility
- Street redesign to include vegetation, buffer areas, sidewalks, cycling lanes, etc.
- Tarmacking street segments and removal of fences in the areas of strategic regeneration to increase urban permeability

- Renovation of the existing buildings to include multipurpose functions (techno parks, sports facilities, etc.)
- Restoration and regeneration of the current structures of the building complexes and structures. Redesign of the complexes to include public functions and spaces for businesses that would accommodate employment opportunities
- Renovation of several facilities (social facilities, libraries, etc.) and public buildings (theatre, cinema)

HAZARD MITIGATION STRATEGY (HMS)

Hazard Mitigation Strategies not only involve location-specific, targeted projects to reduce or eliminate the impacts of natural hazards, but they are coupled with non-spatial, policy-based strategies that facilitate monitoring, coordination, communication and learning, and promote broader behavioural changes to both prevent, and respond to natural hazards. This strategy is a city-wide approach that underpins other spatial strategies, particularly in high-risk areas.

Hazard Mitigation Strategy

The Hazard Mitigation Strategy is supported by the following defined actions:

- Ensure green coverage instead of housing. These green areas should serve as a mitigation measure (afforestation). Promote areas for public gardening and public spaces in those areas
- Hazard mitigation construction (terracing/gabions, netting, context specific vegetation, afforestation, netting, water reservoirs) to prevent rockfalls, underground flooding, landslides, and debris

- Construction of public spaces with the elements of the wetland park, elevated sidewalks, and “sponge” elements” for flood mitigation
- Construction of public spaces with mitigation measures such as afforestation, context specific vegetation/sponge places, and water retention reservoirs where applicable. Public spaces should include places to rest and play, viewpoints, and places for community gardening
- The reinforcement of the riverbank through context specific vegetation, levelling/terracing with the design of pocket parks along it with places to sit, to see the river, and to fish. The reinforcement includes the improvement of the riverbank to create clear and accessible sidewalks where applicable
- Reinforcement/stabilisation of slopes adjacent to the river to protect both the usersof the facilities and the places designed for outdoor activities

- Construction of street/pedestrian pathway segments in the areas with fire risks to increase accessibility to these areas
- Street design and construction to ensure efficient circulation/movements to the “safe havens”

- Upgrade some of the social facilities’ buildings to ensure their functioning as “safe havens”
- Implementation ofmeasures to protect specific facilities from hazards
- Renovation of schools in poor conditions, and implement adaptative measures to protect these facilities from hazards

NATURAL & CULTURAL CONSERVATION STRATEGY (NCCS)

Natural and Cultural Conservation Strategies address the cultural heritage through an environmental and socio-economic lens, considering architecture, urban morphology, and the design of outdoor areas to promote employment. Furthermore, it provides platforms, spaces, and allows for programming for diversity and inclusion practices, These strategies promote education and capacity-building for natural resource management.

NCCS

Natural & Cultural Conservation Strategy

The Natural & Cultural Conservation Strategy is supported by the following defined actions:

- Protection of areas that have traditional Pamiri houses and vernacular designs
- Construction of a pocket public spaces' network to ensure an attractive environment for pedestrian movements between the neighbourhoods and the landmarks of Khorog

- The design of the public space on the slopes to enhance the natural particularity and attractiveness of the landscape, providing vegetation and structures to rest, while allocating space to socialise and observe the landscape (viewpoints, terraces,and platforms, etc.)
- Construction of specific public spaces for public events, festivals, outdoor activities, etc.

- Construction of pedestrian pathways to connect significant landmarks of Khorog

- Construction of public amenities (libraries, community centers, etc.) to promote local culture

AGRICULTURAL & FOOD SUPPLY STRATEGY (AFS)

This strategy tackles food security, supply chains, and inflation, to improve resilience of several factors including conflict, natural hazards, climate change, and socio-economic change. A legislative adjustment of land- use zoning and/or land-codes is necessary to support the outcome of this strategy.

The Agricultural and Food Supply Strategy is supported by the following defined actions:

- Reservation of the area in Tem for agricultural purposes, promoting a special economic zone

- Ensuring the possibility for community gardening by constructing garden beds for vegetable growing, etc. within the communal public spaces
- Construction of public gardens to improve food security, planting of walnut trees, fruit trees, etc.

- Planting context specific vegetation along the drainage channel to ensure filtration of the water runoff

- Construction green roofs with the possibility to do gardening and harvest rainwater for gardening purposes

Fig 18. The marketplace in the central area of Khorog, UN-Habitat, April 2023

BASIC SERVICE PROVISION STRATEGY (BSPS)

A Basic Service Provision Strategy is congruent with ensuring that the basic human rights are met in a city, supporting governments to supply existing and future populations with adequate and equitable electricity, water, and sanitation services. This strategy comes together with financial planning, maintenance and management frameworks, capacity-building, and community engagement. It requires a city-wide, integrated approach, whilst ensuring local specific needs are met.

Basic Service Provision Strategy

The Basic Service Provision Strategy is supported by the following defined actions:

- Construction of kindergartens / early childhood development centres
- Construction of new schools with an adjacent space for sports and outdoor activities
- Construction of new community centres with spaces for a wide range of activities (indoor/outdoor kids amusement park)
- Construction of health facilities
- Construction of sports facilities with a range of indoor classes and outdoor spaces for activities

- Construction of a park with green areas, places to rest and socialise, areas for children, youth, and elderly people
- Construction of pocket parks and public spaces with some vocational functions to cover the deficit areas (e.g., pocket public space with a playground, learning activity, etc.)

- Construction of street segments to significantly reduce the travel time as well as to increase accessibility

- Construction of a kindergarten within the housing block with an adjacent space for outdoor activities
- Expansion of the existing facilities due to overcapacity
- Renovation of facilities in poor conditions
- Construction of a new small factory for processing herbs, dry fruits, etc. (value adding) as well as for sewing school uniforms. The factory shall not exceed two storeys

RESILIENT STREETS STRATEGY (RSS)

Resilient Streets Strategies encompass several concepts, principles and actions, and involve the active on-going participation of local and city-wide actors and community members. Resilient Streets include the 'Complete Street' concept, where all modes of mobility are accounted for in an integrated approach, prioritising pedestrian and cycling infrastructure.

RSS

Resilient Streets Strategy

This strategy promotes safety for all, with an emphasis on universal design standards, prioritising women and girls, elderly people, and people with disabilities. The approach encourages the creation of green spaces for shade, natural solutions to heat island effects, hazard, and climate change mitigation. It furthermore promotes mixed-use development, economic opportunities, and active human-scale facades.

The Resilient Streets Strategy is supported by the following defined actions:

- Increasing the connectivity by building multi-modal and pedestrian bridges, and by redesiging vehicular bridges to include infrastructure that supports pedestrian movements
- Redesigning the major streets according to the proposed street hierarchy (main streets, "the loop", green boulevards, access roads) to ensure the complete streets concept and multimodal mobility patterns with a focus on comfortable pedestrian circulation.

- Designing public spaces and pocket parks along the street (where applicable) to create a comfortable environment for residents to rest, sit, play, and socialize.

- Redesigning of the streets by improving thepublic transport infrastructure and widening the pedestrian sidewalks, as well as including vegetation and the corresponding infrastructure supporting safety and inclusion.
- Construction of public transport stations that are adapted to the local needs (includes places to rest, sit, etc.)
- Construction of the new roads (with the possibility for multimodal movements, including driving, cycling) with sufficient pedestrians infrastructure for safety and inclusion
- Construction of pedestrian pathways for walking and socialising. Designated places to sit andrest should be considered. Pedestrian pathways should be also suitable for cycling.
- Tarmacking the existing dirt roads and upgrading the roads to ensure multimodal movements (including driving, cycling), sufficient sidewalks for pedestrians, and infrastructure for safety and inclusivity
- Upgrading the existing pathways to make sure the planned pathway is visible and provides opportunity for convenient walking and cycling
- Removal of the physical barriers (fence, dump sites, stone and sand storages, non-capital structures, etc.), that prevent free multimodal (for access roads) and pedestrian movements (for pedestrian pathways)

- Design of the setbacks of the buildings to ensure universal accessibility

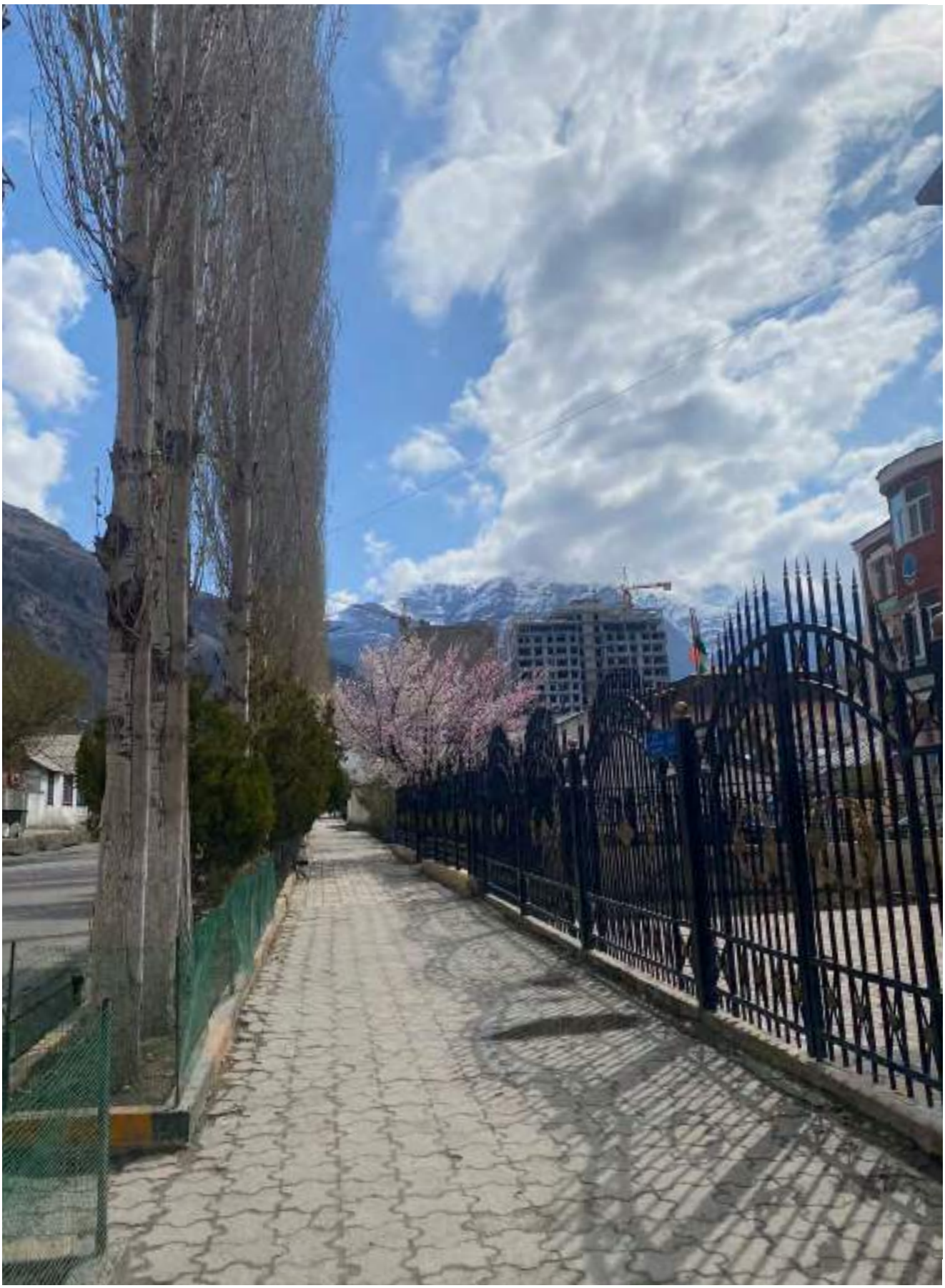


Fig 19. The main street in the central area of Khorog, UN-Habitat, April 2023

3.2. PROJECT MAPPING AND CLASSIFICATION

The process of project/action definition was carried out ensuring an area-based approach considering the functional linkages between the projects. Each project was located on a map in a consultative manner and further georeferenced and added to the database of the proposed projects, a necessary component for the capital investment planning (see report Spatially Informed Capital Investment Planning). The georeferencing of the projects was conducted following the project grouping in thematic areas that have a specific rationale for scoring within the group (capacity, accessibility, etc.). All the projects within each thematic area have necessary attributes (index, address, brief description, etc.).

The project grouping within each thematic area allows to see planning and design solutions as a city-wide system. It also defines hierarchies within the group and analyses the functional relationships between the proposed urban systems of projects. For example, the thematic area of pocket public spaces triangulated with the recommended street network design, together with the suggested landmarks and public amenities (community centers, libraries, etc.) will provide an understanding of the proposed city-wide pedestrian infrastructure and walking experience between specific destinations.

The list of thematic areas for the proposed projects is as follows:

Project name (list will be updated with actual projects)	Project description	Project Code	Global Sector (transport, energy, WASH, etc.)	Sector for Deficit Scoring	Type of infrastructure (Social Facilities, Utilities, Business & Industry, Mitigation)	Type for Scoring	Type (new, replacement, refurbishment, maintenance)	Location (geo reference - if not, Mahala address)
Multimodal bridge 1	Construction of he bridge for pedestrian and vehicule movements	B1	Transport	Roads	Utilities	New	new	Dashti Poyon, Sharifobod
Pedestrian bridge 2	The regeneration of the bridge to include infrastructure for convinent pedestrian movements. Currently the bridge is for technical use (pipes). For safety, the project must include the isilation of technical pipes from the pedestrian movements.	B2	Transport	Roads	Utilities	Renovation	regeneration, renovation	Saifukko abdulo, Tabobatkhona
Multimodal bridge 3	The restoration of the bridge (previosly demolished) to include convinient sidewalks for pedestrians and ways for transport	B3	Transport	Roads	Utilities	Renovation	reconstruction	Saifullo abdulo, Barakat
Multimodal bridge 4	The regeneration of vehicule bridge to include infrastructure for pedestrian movements	B4	Transport	Roads	Utilities	Renovation	regeneration, renovation	Markazi, Barakat, Nosiri Khusrav
Pedestrian bridge 5	Construction of the pedestrian bridge connecting the two park areas	B5	Transport	Roads	Utilities	New	new	Khorugi Bolo, Tircid
Multimodal bridge 6	The regeneration of vehicule bridge to include infrastructure for pedestrian movements	B6	Transport	Roads	Utilities	Renovation	regeneration, renovation	Khorugi Bolo, Andarsitez
Pedestrian bridge 7	Construction of the pedestrian bridge	B7	Transport	Roads	Utilities	New	new	Andarsitez, Botanical Garden
Pedestrian bridge 8	Construction of the pedestrian bridge	B8	Transport	Roads	Utilities	New	new	Chukht-Khorug, Botanical Garden
Multimodal bridge 9	The regeneration of vehicule bridge to include infrastructure for pedestrian movements (designing clear and accessible sidewalks)	B9	Transport	Roads	Utilities	Renovation	regeneration, renovation	Gulmamad, Chukht Khorug
Multimodal bridge 10	The regeneration of vehicule bridge to include infrastructure for pedestrian movements (designing clear and accessible sidewalks)	B10	Transport	Roads	Utilities	Renovation	regeneration, renovation	Sultoni Valli
Multimodal bridge 11	The regeneration of vehicule bridge to include infrastructure for pedestrian movements (designing clear and accessible sidewalks). Important to consider the possibility for heavy transport (trucks).	B11	Transport	Roads	Utilities	Renovation	regeneration, renovation	Andarsitez,Botanical Garden
Multimodal bridge 12	The regeneration of vehicule bridge to include infrastructure for pedestrian movements (designing clear and accessible sidewalks)	B12	Transport	Roads	Utilities	Renovation	regeneration, renovation	Chukht-Khorug
Pedestrian bridge 13	Construction of the pedestrian bridge to connect to river banks (Jamomatkhona)	B13	Transport	Roads	Utilities	New	new	Barkat
Market regeneration 1	Upgrade of the marketplace, design of the kiosks and internal public space with activities	COM1	Public space, open public space	Markets	Social Facilities	Renovation	regeneration, renovation	Dashti Poyon
Market regeneration 2	Reconstruction of the marketplace, construction of the new stalls, adjacent pibli spaces and internal courtyard	COM2	Public space, open public space	Markets	Social Facilities	Renovation	new, regeneration	Saifullo abdulo
New commercial area within new development 1	New construction of the commercial area, a part of mixed use development	COM3	Public space, open public space	Markets	Social Facilities	New	new	Tabobatkhona
New commercial area within new development 2	New construction of the commercial area, a part of mixed use development	COM4	Public space, open public space	Markets	Social Facilities	New	new	Barakat
New commercial area within new development 3	New construction of the commercial area, a part of mixed use development	COM5	Public space, open public space	Markets	Social Facilities	New	new	Khorugi Bolo

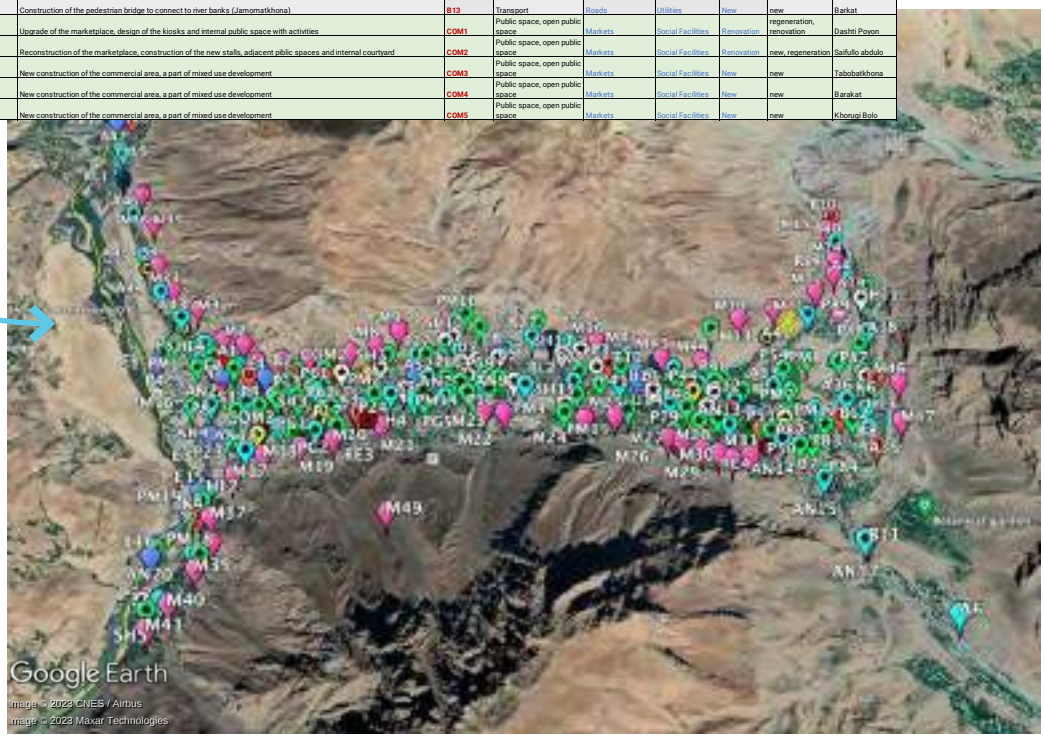


Fig 20. The process of project georeferencing

- Multimodal and pedestrian bridges
- Commercial areas and marketplaces
- Public spaces with their corresponding hazard mitigation
- Green and pocket public spaces
- Riverbank reinforcement
- Bus stations upgrading
- New public transport stations
- New kindergarten / early childhood development centre
- New and renovated community centres
- New health facilities
- New sports facilities
- New schools
- Context specific vegetation
- Mixed-use housing blocks (max. 6 storeys)
- Hazard mitigation (terracing/gabions, netting, context specific vegetation, afforestation, netting, water reservoirs)
- Restoration of the current structures/buildings
- Street redesign (public transport infrastructure, pedestrian sidewalks, vegetation, infrastructure for safety and inclusivity)
- Construction of the new road segments
- Construction of the pedestrian pathway
- Pavement of the existing dirt roads/ upgrading the road to ensure multimodal movements
- Upgrading the existing pathway
- Removal of the physical barriers that prevent free multimodal movements
- Removal of the physical barriers that prevent free pedestrian movements and cycling
- Renovation of the existing facilities
- Adaptation of the existing facilities to serve as "safe havens"
- Relocation of the fuel station from the hazard zone

After the projects were defined, the UN-Habitat project team conducted a prioritisation workshop to identify the most urgent actions per thematic area. The outcomes of the prioritisation informed the scoring criteria for the capital investment planning process (see report Spatially Informed Capital Investment Planning).

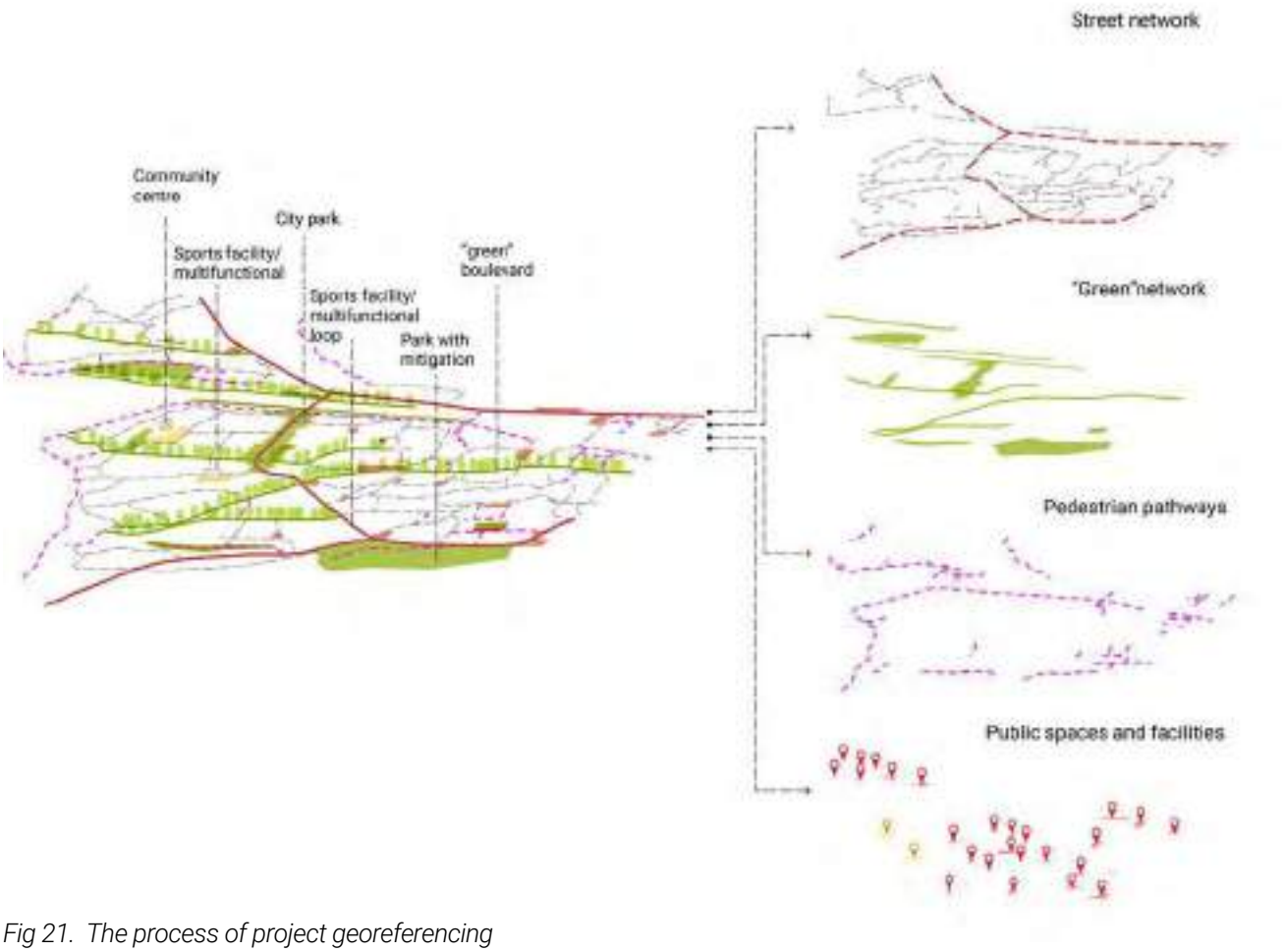


Fig 21. The process of project georeferencing

3.3. COMBINING PROJECTS INTO THE SPATIAL SYSTEMS TO ACHIEVE STRATEGIC CITY OBJECTIVES

Identified projects leverage the broader urban networks, based on the strategic recommendations, and contribute to the achieving the five strategic city objectives: compact, vibrant, inclusive, connected, and resilient city.[2] Considering those five city objectives at the various levels of urban design ensures that the identified projects are on the sustainable development track. This will ultimately facilitate the achievement of the strategic goals.

Fig 22. The five city objectives

3.3.1. The overall vision of the projects

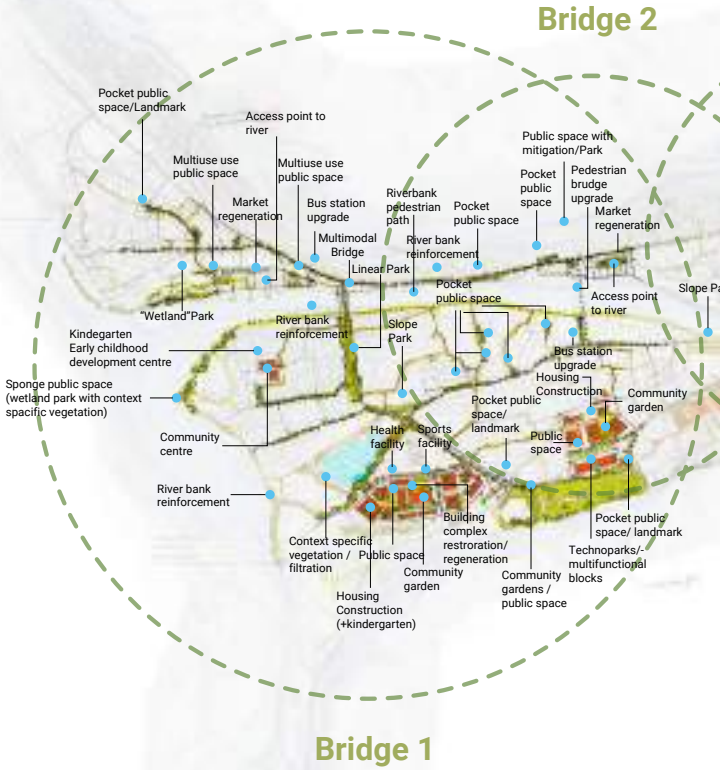
The projects are fully aligned with the strategic responses and spatial strategies; however, it is also important to analyse these as interlinked spatial systems. For example, the numerous public spaces projects should be considered as a network and as an integral part of the green infrastructure. This network includes projects for slope and river reinforcement, stabilisation, terracing, etc.

The system of public transport stops, the identified new marketplaces, and the cultural facilities constitute another spatial system that should be triangulated with the network of public spaces and green infrastructure. This is done to understand the city-wide movement patterns.

Understanding the functional relationship between projects will benefit the process of implementation. Beginning with those projects would enable the implementation of the rest of the initiatives. For example, a bridge once implemented may create an enabling environment for projects that require better connectivity and increased flows of people such as new commercial areas supported by public facilities andopen public spaces of city-wide significance, etc. Therefore, understanding a "viral effect" of a project is a crucial component to achieve both sustainability of investments and urban development.

As shown on fig. 23 the projects for bridge construction have different levels of functional relationships with other interventions. Once implemented, bridge 1 can connect the commercial area with the new mixed-use development, boosting the employment opportunities by increasing accessibility and by creating an enabling environment for the construction of parks, community centres, etc.

Bridge 2 will connect the regenerated market to the green boulevard that leads to the mixed-use development. The bridges 3 and 4 will connect the pocket parks and larger recreational areas, creating an enabling environment for cultural and public facilities.



2. *The five city objectives were defined by UN-Habitat urban lab during the workstream on linking spatial indicators to urban design project that was further synthesised in the normative output "MY Neighbourhood".*

The bridge 5 will connect the botanical garden with the current built-up area, which will significantly increase accessibility to the botanical garden. Nonetheless, in terms of setting enabling conditions for future projects, the impact of this bridge is assumed to be lower than that of the others.

This rationale of interlinkages and proximity between projects is reflected in the scoring mechanism of the capital investment planning. To ensure that such rationale is reflected spatially, the project team developed a consolidated map of urban design interventions, demonstrating how urban designs projects form city-wide networks/systems.

Formed city-wide networks/systems contribute to achieving the five city objectives, defined by UN-Habitat Urban Lab as a part of "MY Neighborhood" guide, that brings a new perspective to urban design, promoting a multi-scalar lens that views the city as a growing continuum from neighborhood to the urban and broader city-region scale. The specific sets of interventions once implemented can increase the connectivity, while other interventions will guide Khorog towards a more inclusive and vibrant city, etc. Below is the description of the five city objectives and how the identified projects can facilitate the achievement of the objectives.

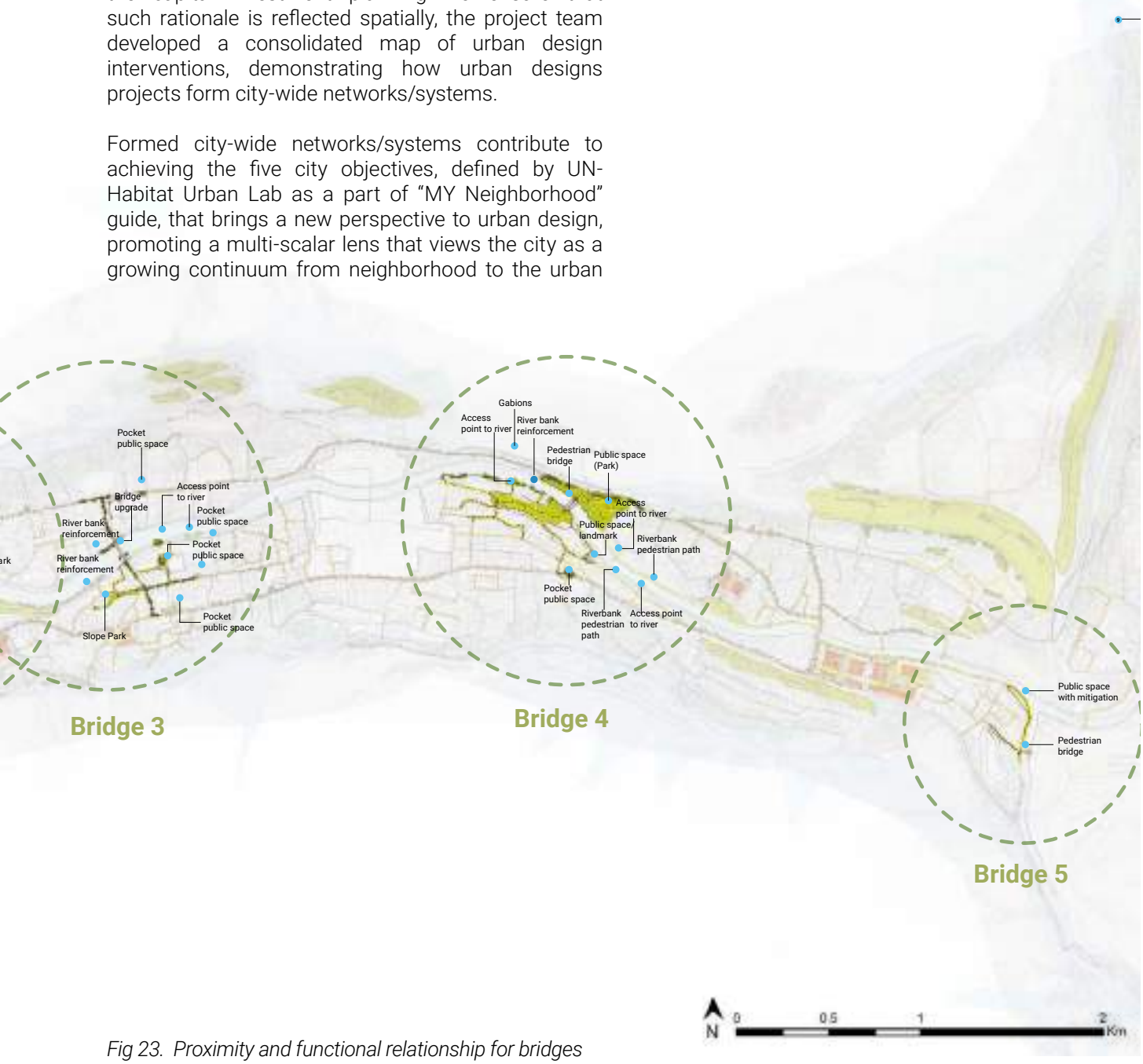


Fig 23. Proximity and functional relationship for bridges

Fig 24. The concept representation of proposed projects


New mixed-use development (appartment blocks)
New mixed-use development (multifamily housing)
Non-residential development
Public space
Pedestrian surface for outdoor activities
Green area/plots for agriculture
Context-specific vegetation for “sponge”surfaces
Context-specific vegetation for slope stabilisation
Context-specific vegetation for riverbank reinforcement
Retention ponds
Terraces
Main road with public transportation (the loop)
Boulevards
Internal access roads
Pedestrian pathways
Kindergarten
School
Healthcare
City park
Plots for agricultural practices
(mini) Market area
Area for sports activities

3.3.2. The Compact City

Residents of the compact city enjoy a highly efficient urban form characterized by their proximity to services and variety of uses. A highly walkable environment that is supported by the urban layout encourages walking and cycling, providing opportunities for people to interact, and for businesses to emerge. An efficient public transport system provides better accessibility for all, bringing multiple economic and environmental benefits. Achieving a compact city implies creating an efficient urban space that is safe, comfortable, and attractive for all its residents.

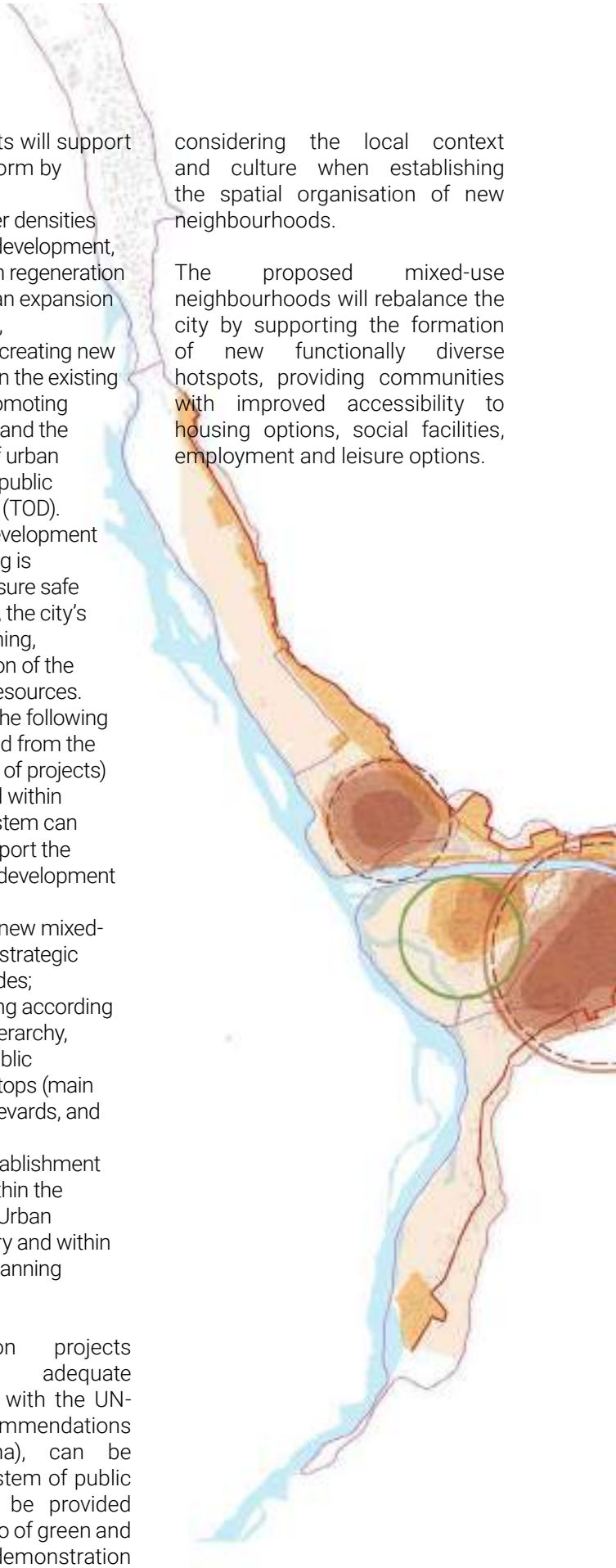
For more information on citywide recommendations see Khorog Urban Planning and Design Guidelines Report

The identified projects will support the compact urban form by

- Promoting higher densities and mixed-use development,
- Promoting urban regeneration and limiting urban expansion beyond the UGB,
- Revitalising and creating new centralities within the existing built-up area, promoting public transport,and the concentration of urban development at public transport nodes (TOD).
- The compact development model for Khorog is necessary to ensure safe housing options, the city's efficient functioning, and the protection of the environmental resources.
- More precisely, the following projects (selected from the consolidated list of projects) once considered within the city-wide system can significantly support the compact urban development model:
- Construction of new mixed-use areas in the strategic regeneration nodes;
- Street redesigning according to each street hierarchy, and including public transportation stops (main loop, green boulevards, and access roads);
- Planting and Establishment of vegetation within the areas along the Urban Growth Boundary and within the areas with planning limitations

The demonstration projects exemplify how adequate densification, in line with the UN-Habitat density recommendations (around 300 pp/ha), can be supported by the system of public transport, and can be provided with an adequate ratio of green and public spaces. The demonstration projects provide design guidance on how to increase density, considering the local context and culture when establishing the spatial organisation of new neighbourhoods.

The proposed mixed-use neighbourhoods will rebalance the city by supporting the formation of new functionally diverse hotspots, providing communities with improved accessibility to housing options, social facilities, employment and leisure options.



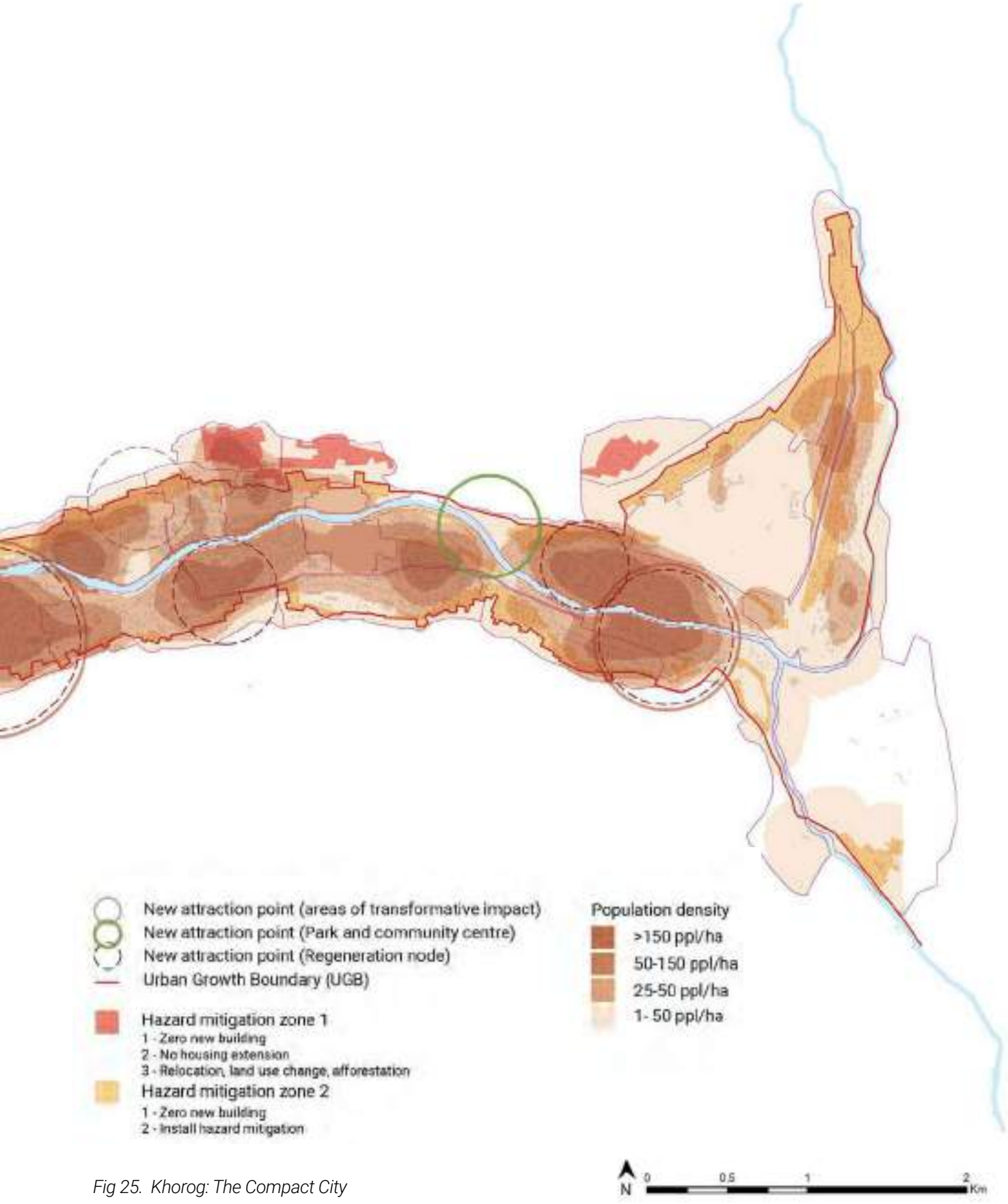


Fig 25. Khorog: The Compact City

3.3.3. The Connected City

Residents of the connected city leverage from permeable and efficient street network with walkable distances and a variety of route options, allowing for convenient travel between destinations and public transport services as intermediate stops. Transportation in the connected city is multimodal and has all the necessary infrastructure for comfortable walking, cycling, taking public transport and safe driving. The urban environment of the connected city considers streets as vibrant, safe, and attractive public spaces accessible for all. A connected city integrates blue and green networks, supports ecosystem functionality, and connects people with nature.

For more information on citywide recommendations see Khorog Urban Planning and Design Guidelines Report

The identified projects propose the revision of the public transport for Khorog, establishing an intermodal network based on the following hierarchy of streets: main transpiration loop, green boulevards, and access road network. To increase the connectivity of the city, the projects propose and support the creation of an extensive network of pedestrian paths and walkways at both the city and neighbourhood levels.

At the city level the pedestrian network aims to encourage longer walking experiences, connecting different parts of the urban network by promoting pedestrian-oriented and multimodal bridges. This provides an opportunity to walk along the riverbanks and the redesigned sections of the street.

Most streets (especially the main loop and the green boulevards) are envisaged as vibrant urban corridors, integrating local public transport, urban services, commercial spaces, leisure activities, and public spaces to encourage safe and pleasant walkable experiences.

More precisely, the following projects (selected from the consolidated list of projects) can significantly support the city connectivity.

- Construction of multimodal/ pedestrian bridges
- Street redesign of the main loop including public transportation options and green boulevards
- Upgrading and construction of the sections of the road, removing possible barriers (fences, ditches, etc) that impede the free flow of traffic
- Construction of pocket public spaces along the major intersections/ connections

At the Neighbourhood level, the demonstration projects showcase how to increase the levels of urban permeability to create a porous, well connected urban structure. This is done by upgrading and/or building the specific segments of the road to connect these into an existing road street, thus creating a well-connected street network.

In addition to upgrading the street network, the demonstration projects will also provide an example of how to maintain linkages with an overall green network by creating a system of green boulevards, linear parks, and pedestrian-only pathways within the built environment and along the renovated riverbank. Furthermore, the demonstration projects seek to integrate the current green open spaces into the urban fabric by transforming some of the slopes into vibrant public spaces.

Design solutions on creating a complete street in the context of Khorog will demonstrate that streets ought to be considered as vibrant public spaces that ensure safe walking, socializing, and resting while providing a better accessibility to a diverse range of destinations.

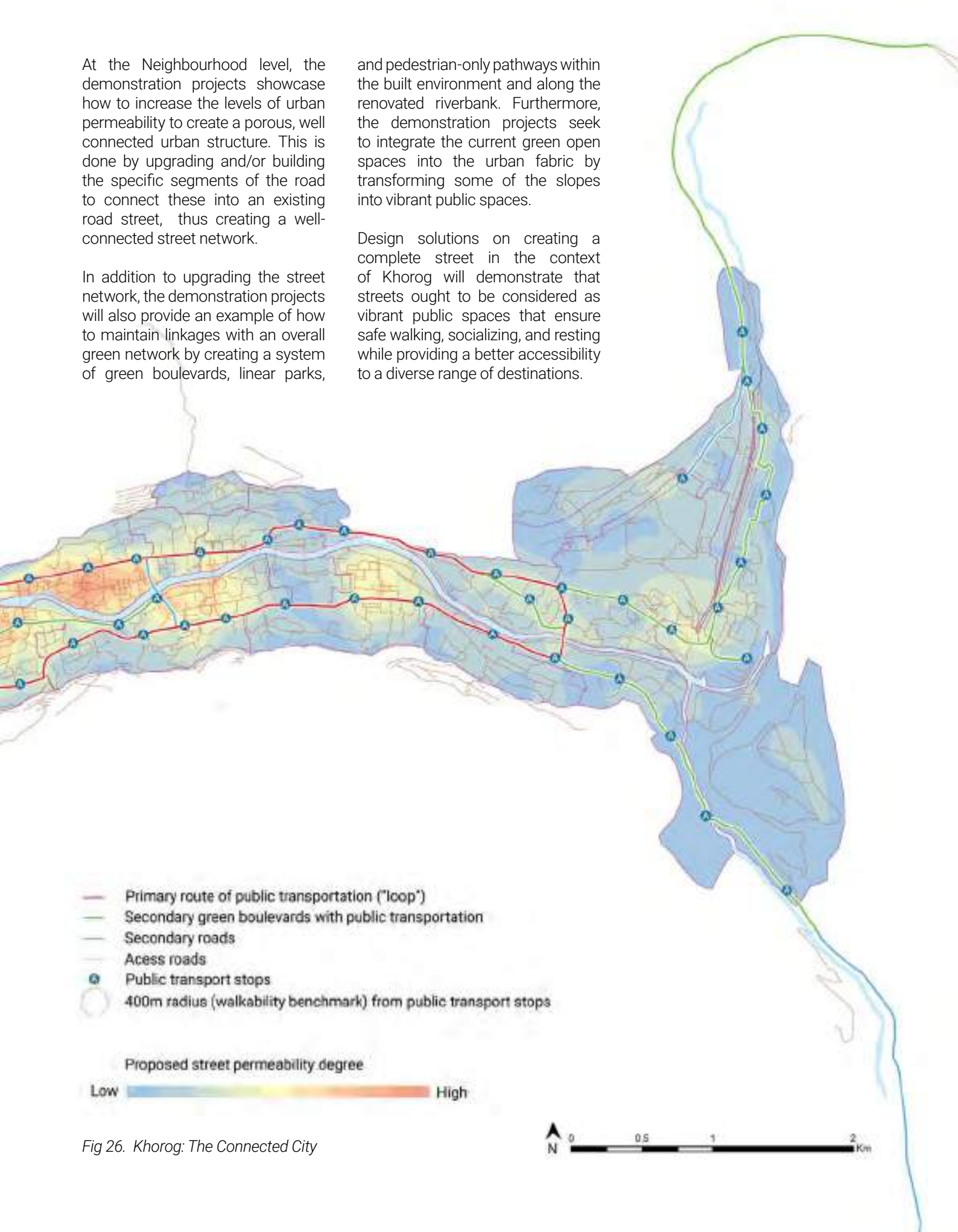


Fig 26. Khorog: The Connected City

3.3.4. The Vibrant City

Residents of the vibrant city have access to a diversity of activities, urban services, and economic opportunities. A vibrant urban environment forms an identity of place that allows forsocial interaction, communication, and physical and learning activities, and attracts people to live, work, and spend time in the vibrant neighbourhood. A vibrant city provides an environment conducive to the creation of social, cultural, and economic capital, in which urban character shines through.

For more information on citywide recommendations see Khorog Urban Planning and Design Guidelines Report

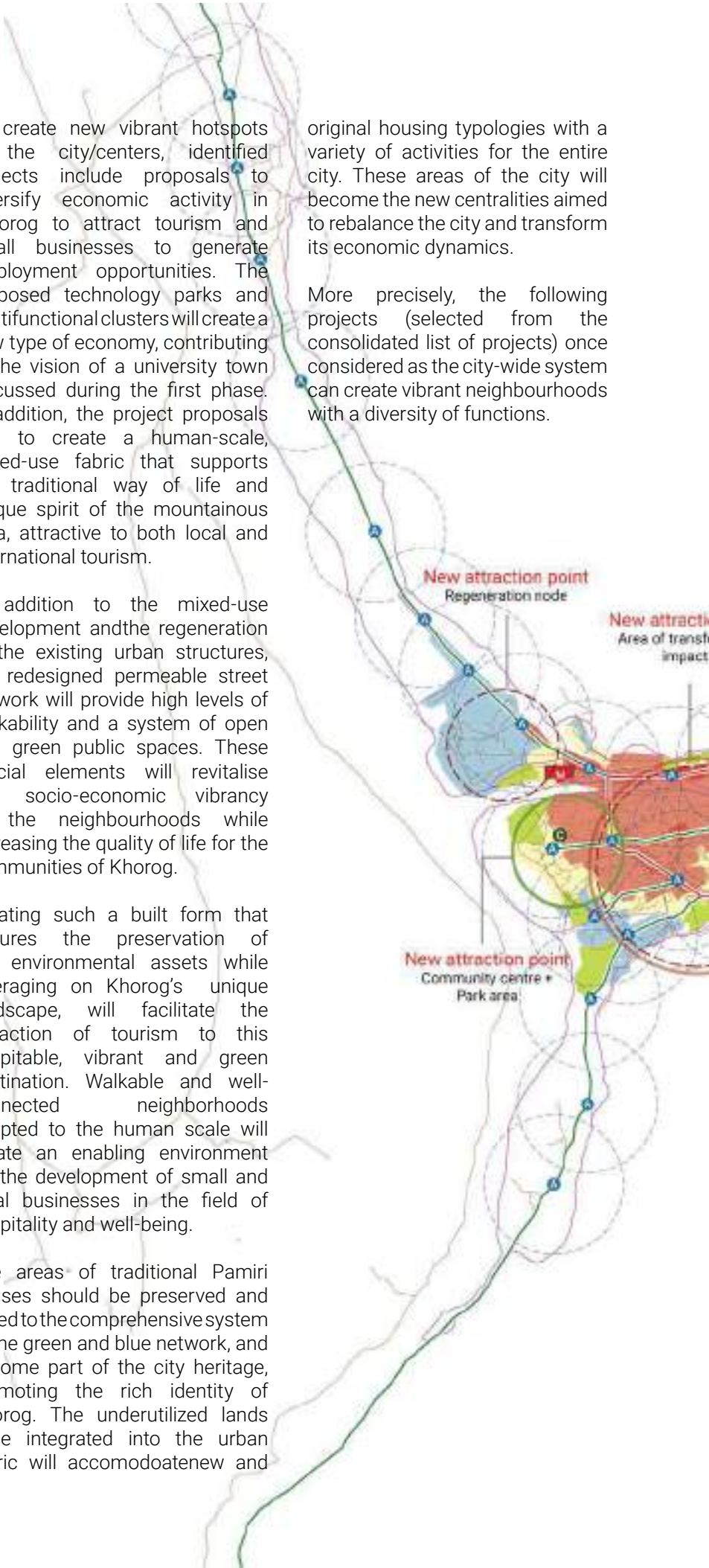
To create new vibrant hotspots in the city/centers, identified projects include proposals to diversify economic activity in Khrorog to attract tourism and small businesses to generate employment opportunities. The proposed technology parks and multifunctional clusters will create a new type of economy, contributing to the vision of a university town discussed during the first phase. In addition, the project proposals aim to create a human-scale, mixed-use fabric that supports the traditional way of life and unique spirit of the mountainous area, attractive to both local and international tourism.

In addition to the mixed-use development andthe regeneration of the existing urban structures, the redesigned permeable street network will provide high levels of walkability and a system of open and green public spaces. These crucial elements will revitalise the socio-economic vibrancy of the neighbourhoods while increasing the quality of life for the communities of Khorog.

Creating such a built form that ensures the preservation of the environmental assets while leveraging on Khorog's unique landscape, will facilitate the attraction of tourism to this hospitable, vibrant and green destination. Walkable and well-connected neighborhoods adapted to the human scale will create an enabling environment for the development of small and local businesses in the field of hospitality and well-being.

The areas of traditional Pamiri houses should be preserved and linked to the comprehensive system of the green and blue network, and become part of the city heritage, promoting the rich identity of Khorog. The underutilized lands once integrated into the urban fabric will accomodoatenew and original housing typologies with a variety of activities for the entire city. These areas of the city will become the new centralities aimed to rebalance the city and transform its economic dynamics.

More precisely, the following projects (selected from the consolidated list of projects) once considered as the city-wide system can create vibrant neighbourhoods with a diversity of functions.



- Construction of new mixed-use areas in the strategic regeneration nodes;
- Street redesign according to the street hierarchy (main loop, green boulevards, and access roads);
- Restoration and/or regeneration of the current structures/buildings
- Construction and regeneration of commercial areas/marketplaces
- Construction of green areas, riverbank reinforcement, and the establishment of a pocket public spaces' system.

The demonstration projects showcase detailed design solutions on how to create vibrant structural patterns, establishing a form of spatial organisation that follows UN-Habitat's recommended density levels which not only is locally appropriate, but also supports the local culture. The demonstration projects provide design recommendations on blocks, streets, and public spaces at the unit level and how each intervention contributes to the city-wide structure.

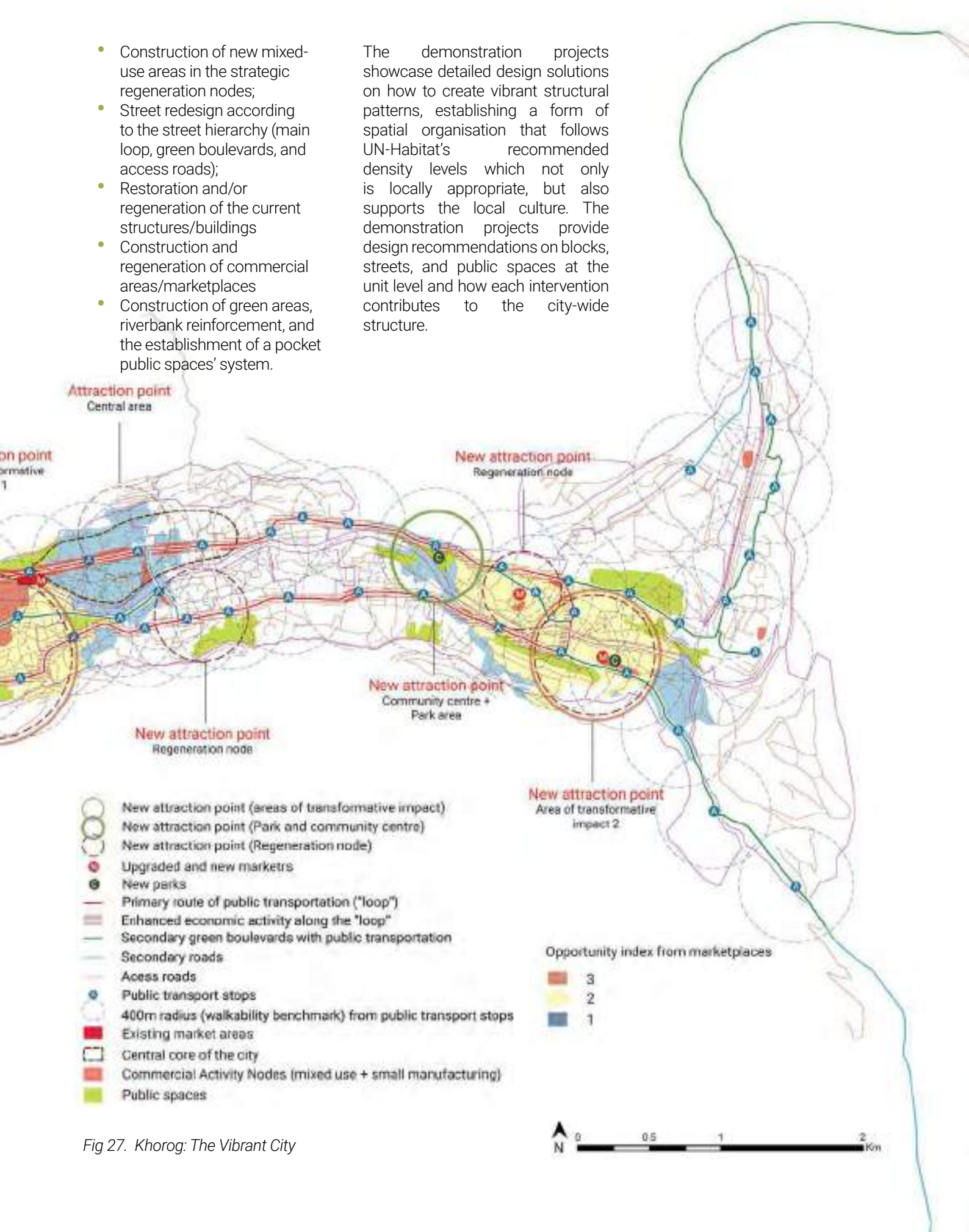


Fig 27. Khorog: The Vibrant City

3.3.5. The Inclusive City

The residents of an inclusive city have equitable right to the city, access to services, employment, public space, public transportation, and other opportunities the city provides. The urban environment of an inclusive city supports physical, economic, cultural, and social needs of all people of all abilities, of all backgrounds and income levels. Public spaces of an inclusive city are welcoming to all visitors, housing is affordable and attracts a diverse range of residents.

For more information on citywide recommendations see Khorog Urban Planning and Design Guidelines Report

The identified projects aim to establish an inclusive urban system with a well distributed level of urban services, ensuring all residents have access to social and public facilities. Each facility was allocated based on the outcomes of the evidence-based spatial analysis to ensure the priority coverage of the areas with the deficit of schools, kindergartens, and health care.

The issue of urban fragmentation is addressed by the projects that increase integration and accessibility between different parts of the city (public transport system, bridges, street redesign and construction, pathways) and promote a network of open and green public spaces, linking the attraction points/centralities of Khorog and public services.

More precisely, the following projects (selected from the consolidated list of projects) once considered as the city-wide system can create the vision of inclusiveness in the city of Khorog:

- Construction of schools, kindergartens, sports facilities, community centres;
- Construction of green and open public spaces;
- Construction of new mixed-use areas in the strategic regeneration nodes;
- Restoration, regeneration of the current structures/ buildings to include additional functions;
- Street redesign according to the street hierarchy (main loop, green boulevards, and access roads);
- Construction of multimodal/ pedestrian bridges;
- Street redesign for the main loop with public transportation and green boulevards;
- Upgrade and construction of the road segments, removing the barriers that prevent free movements.

The demonstration projects aim to showcase how to create a dense, integrated and well serviced urban area that also serves the surrounding neighborhoods, providing all the residents with better access to facilities, leisure, and employment opportunities. The design solutions demonstrate how to create an environment where all citizens have equal opportunities to access the benefits of an efficient urban form.

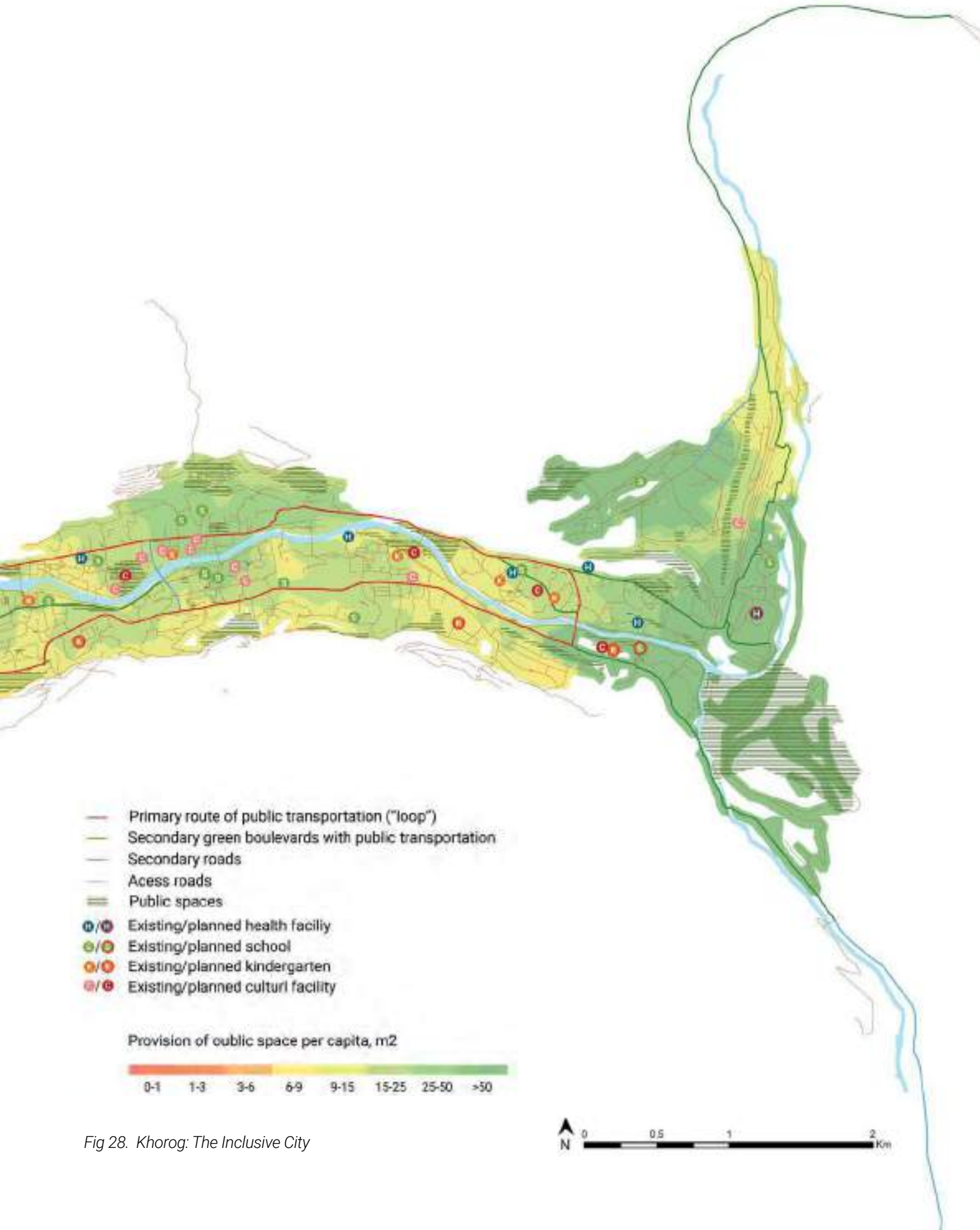


Fig 28. Khorog: The Inclusive City

3.3.6. The Resilient City

All the residents of the resilient city are protected against immediate and chronic stresses within urban systems and are prepared for future potential challenges. Resilient neighbourhoods sustain services and urban systems to withstand any potential crisis and help in facilitating a recovery process. In addition to building adaptation to the changing world, the resilient urban form may ameliorate the social and economic structures, improving the community well-being.

For more information on citywide recommendations see Khorog Urban Planning and Design Guidelines Report

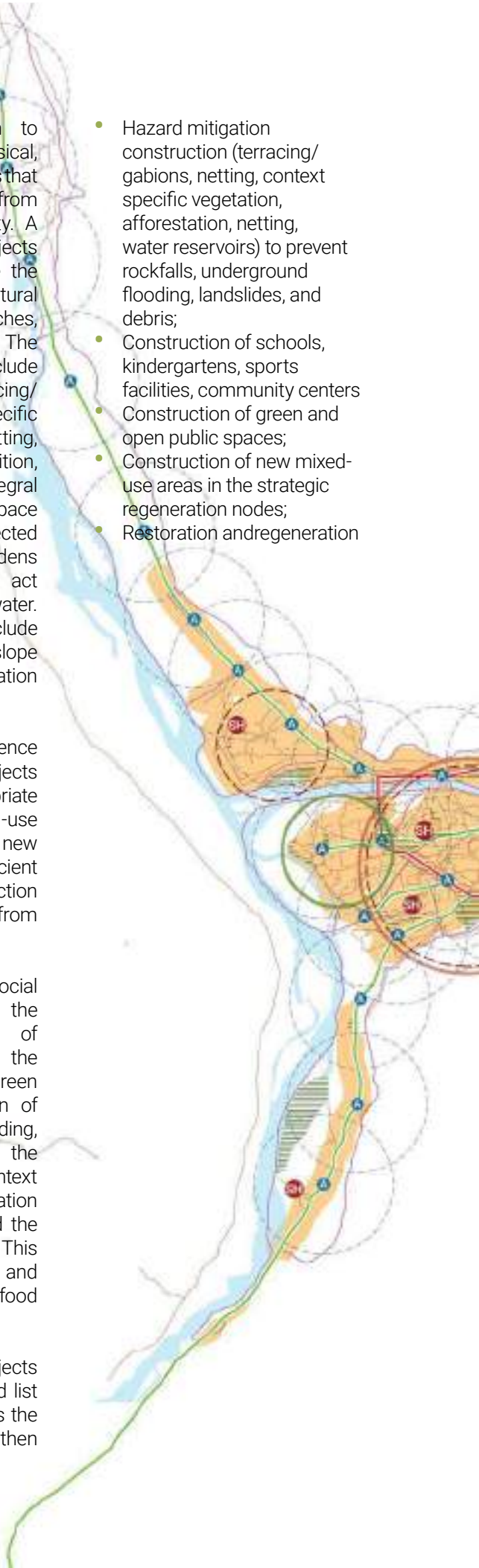
The identified projects aim to increase resilience to the physical, social, and economic challenges that arise from climate change and from a lack of network connectivity. A system of hazard mitigation projects is proposed, aimed to secure the Khorog population from the natural hazards such as avalanches, rockfalls, debris, flooding, etc. The hazard mitigation projects include specific projects such as terracing/ gabions, netting, context specific vegetation, afforestation, netting, and water reservoir. In addition, hazard mitigation is an integral part of the city-wide public space network. This initiative is reflected in the creation of public gardens with permeable surfaces that act as a sponge and absorb water. Furthermore, public spaces include additional afforestation, slope reinforcement, and other mitigation measurements.

In addition to building resilience to hazards, the identified projects aim to achieve appropriate compactness, density, mixed-use development, and formation of new centralities to support the efficient use of land, and proper protection of the environmental assets from encroachment.

Furthermore, to strengthen social and environmental resilience, the project seeks the integration of the natural environment into the city through the system of green and public spaces, restoration of irrigation water channels, upgrading, regenerating and reinforcing the riverbanks, promoting context specific vegetation for filtration and communal gardening, and the restoration of agricultural areas. This creates a walkable, pleasant, and vibrant environment, fostering food and water security.

More precisely, the following projects (selected from the consolidated list of projects) once considered as the city-wide system can strengthen urban residence in Khorog:

- Hazard mitigation construction (terracing/ gabions, netting, context specific vegetation, afforestation, netting, water reservoirs) to prevent rockfalls, underground flooding, landslides, and debris;
- Construction of schools, kindergartens, sports facilities, community centers
- Construction of green and open public spaces;
- Construction of new mixed-use areas in the strategic regeneration nodes;
- Restoration andregeneration



of the current structures/ buildings to include additional functions;
- Street redesign according to the street hierarchy (main loop, green boulevards and access roads);
- Construction of multimodal/ pedestrian bridges;
- Upgrading and construction of water and sewerage network;
- Restoration of irrigation channels;
- Upgrading and construction of the road segments, removing the barriers that prevent free movements.

The demonstration projects showcase how to connect the green, blue, and grey networks to improve the quality of life at the neighbourhood level, which ultimately enhances the overall environmental and climatic performance of the city. The proposed design solutions aim to demonstrate how the environmental pre-conditions of the selected sites can be preserved and transformed into the urban assets such as public green walkways, public gardens with natural water management infrastructure, sloped public spaces, etc.

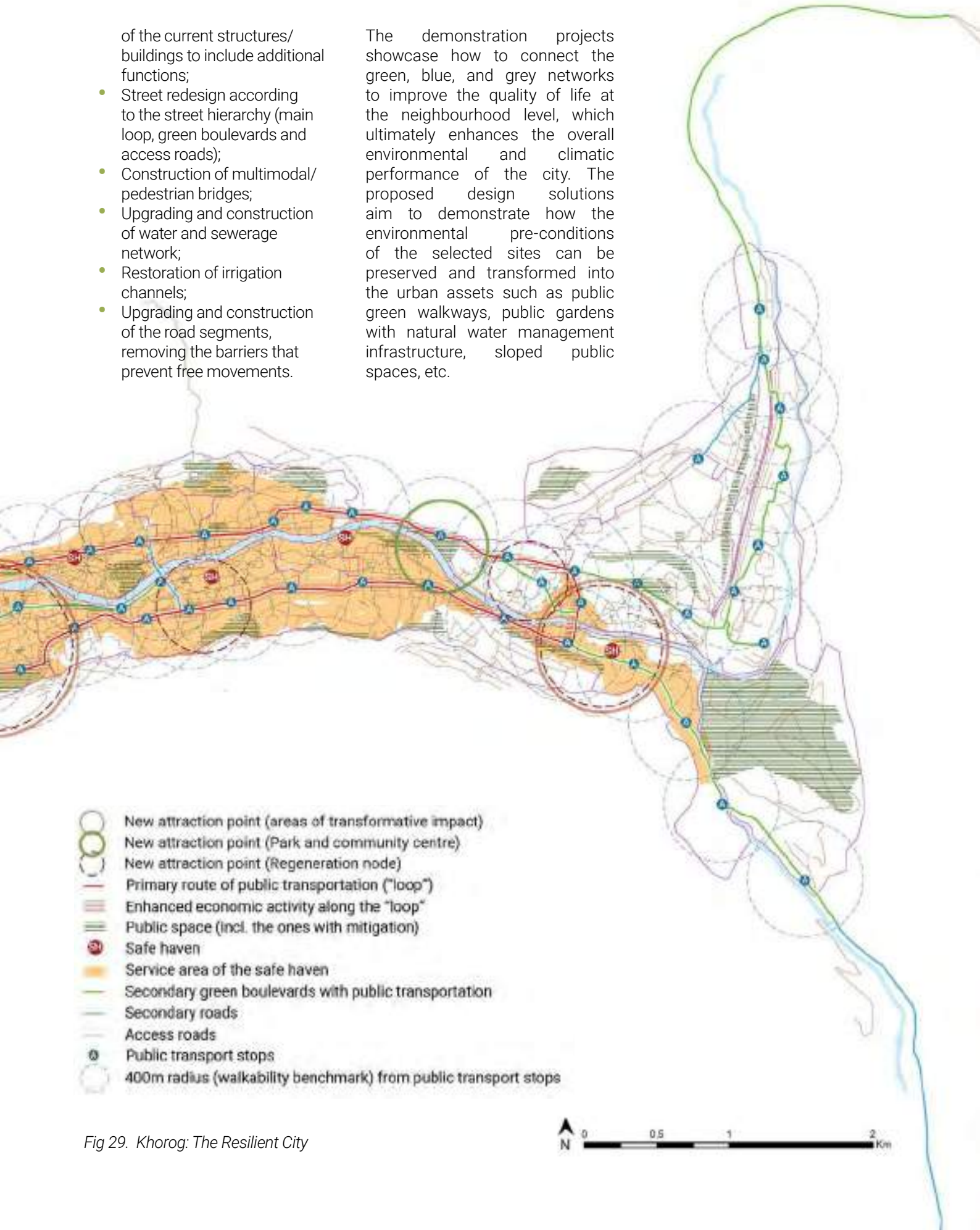


Fig 29. Khorog: The Resilient City

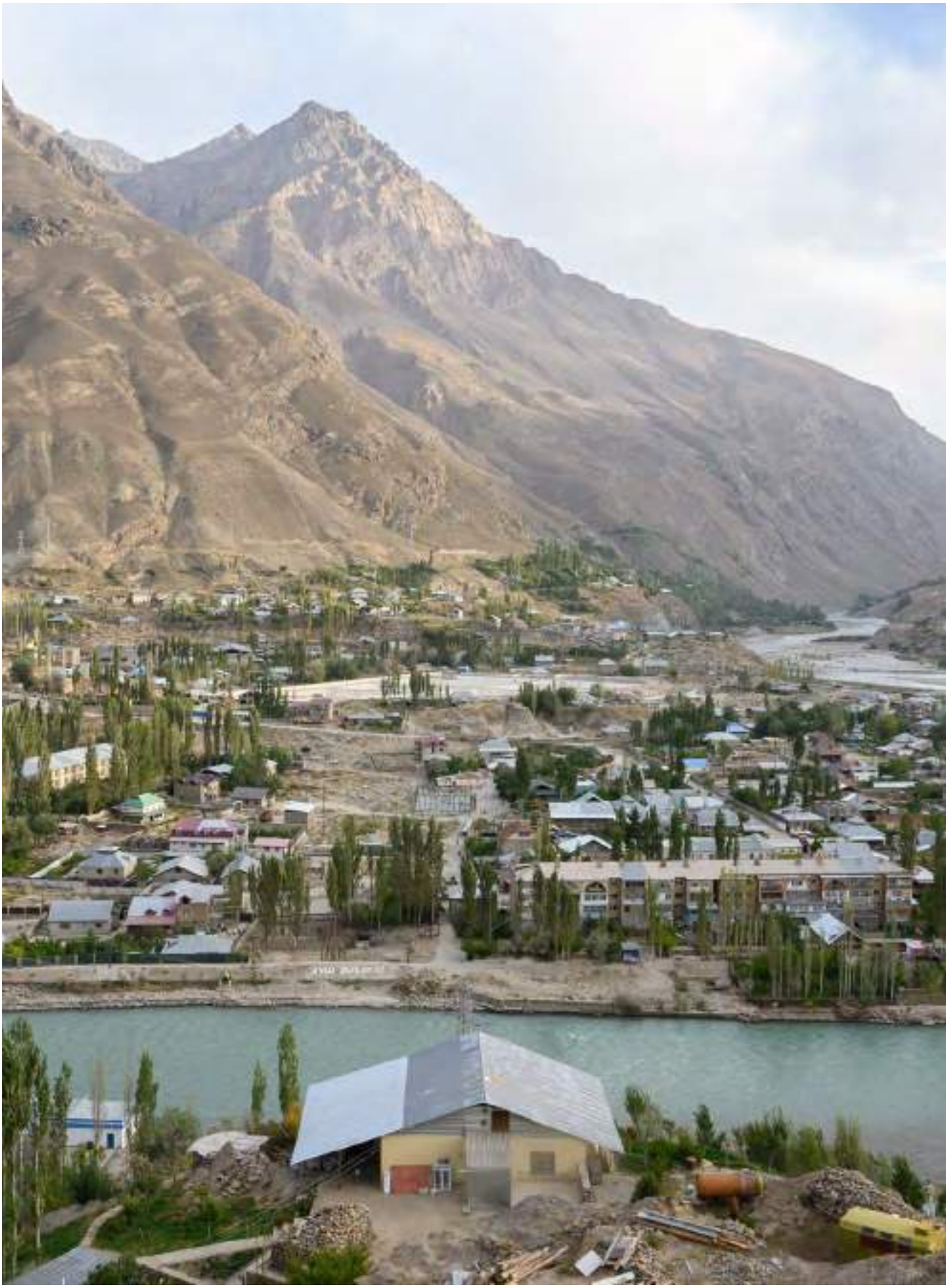


Fig 30. The view on the transformative area in Tabobatkhona, UN-Habitat, September 2022

4

DEMONSTRATING THE ACTIONS

The chapter includes a brief summary of the definition process of the areas of transformative impact, a detailed analysis of the current conditions and the project proposals with information on project costs. The two areas were selected for the development of the pilot projects as the ones that have a larger concentration and diversity of planning actions. The projects actualise these actions and demonstrate how the urban planning and design principles can be implemented in the context of Khorog.

The project proposals include detailed recommendations for spatial organisation, mobility, "green" networks, open public spaces, etc. The chapter provides examples of potential housing typologies that can be integrated into the design proposals and further detailed to follow the local traditions.

The section provides a brief overview of potential employment strategies that were elaborated during the participatory session with a wide range of stakeholders (local government, planning authority "Shakhrofar", communities, technical experts, etc.). These strategies include suggestions for Techparks, diversification of the local economy and the organisation of the built-up area in a way to boost the emergence of small businesses.

4.1. THE RATIONALE FOR SITE SELECTION

As it was identified in phase I of the project, the number of actions recommended in each Mahalla is diverse, however, more actions are proposed in Andarsitez, Dashti Poyon and Tabobatkhona than in other Mahallas. The thematic areas in which interventions are proposed are also diverse in each Mahalla, however, Andarsitez and Dashti Poyon are recommended for the highest diversity of actions across thematic areas.

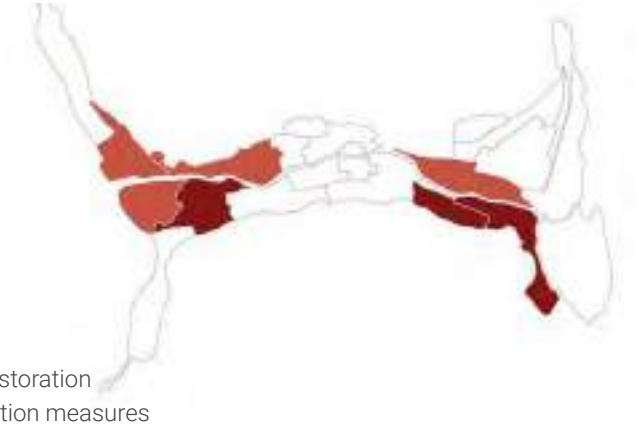
The correlation of actions based on spatial analysis highlighted the areas for demonstration. These areas are: Andarsitez, Barakat, Tabobatkhona, Saifullo Abdulo, Tircid.

Those areas were further validated with technical teams and local government. The identifies areas were also used in the first phase for the modeling of the future scenarios aimed to showcase the impact of densification, gradual rebalancing of residential and mixed- use functions in accordance with the UN-Habitat principles for sustainable development, maximizing the efficiency of urban form. The areas for demonstration projects are located within strategic regeneration nodes 2 and 5 and will play a significant role in transformative process by setting a reference model of urban regeneration and appropriate densification.

Apart from the selection that is based on spatial analysis of the 1st phase, the demonstration projects are located in the parts of Khorog with different geographical and morphological characteristics. That provides an opportunity to showcase the application of design concepts and solution in different setups:

- Within the built-up area adjacent to the treatment facility and near the city core once connectivity is improved;
- Adjacent to the river and along the main street (the loop) with public transportation.

The entire scope of the existing planning preconditions for the detailed design proposals were further analysed using the topographic survey provided by AKAH, google imagery, and mapped mission outcomes.



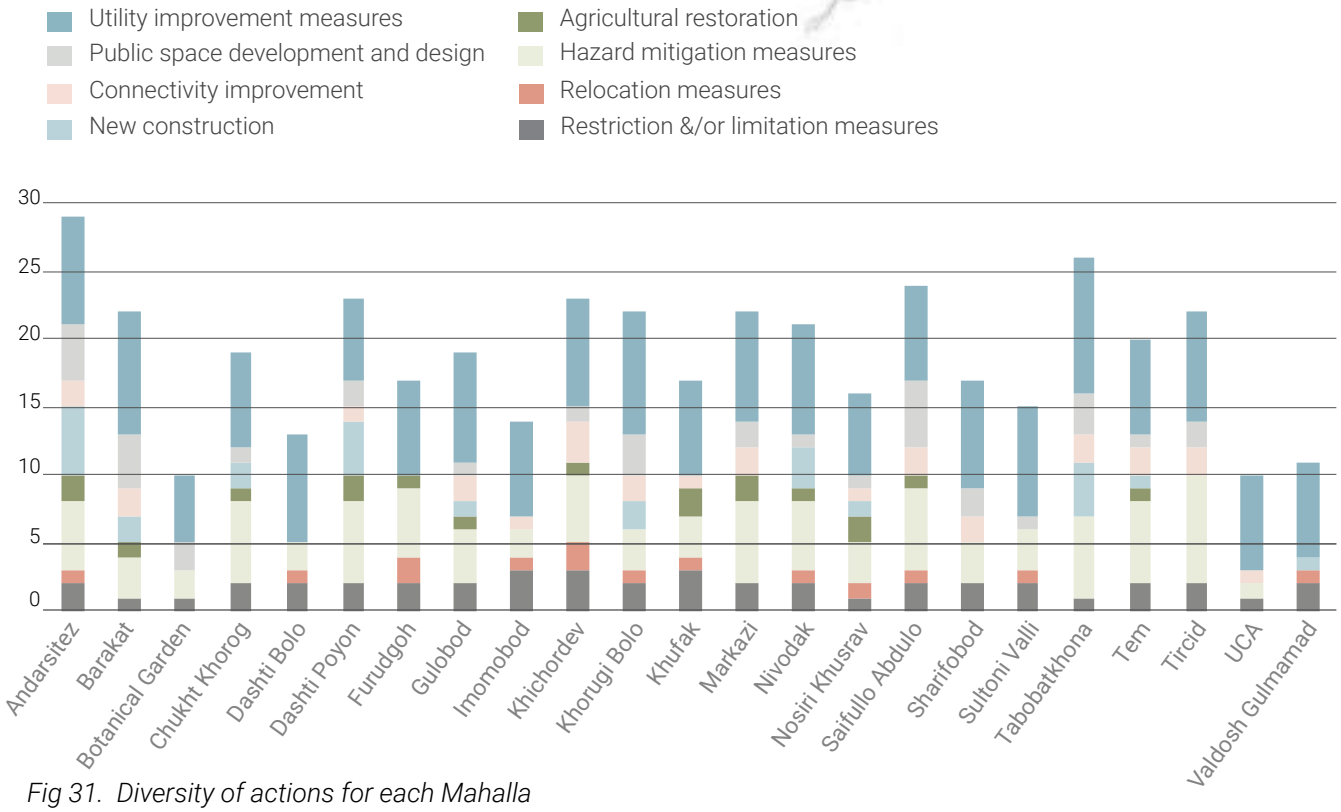


Fig 31. Diversity of actions for each Mahalla

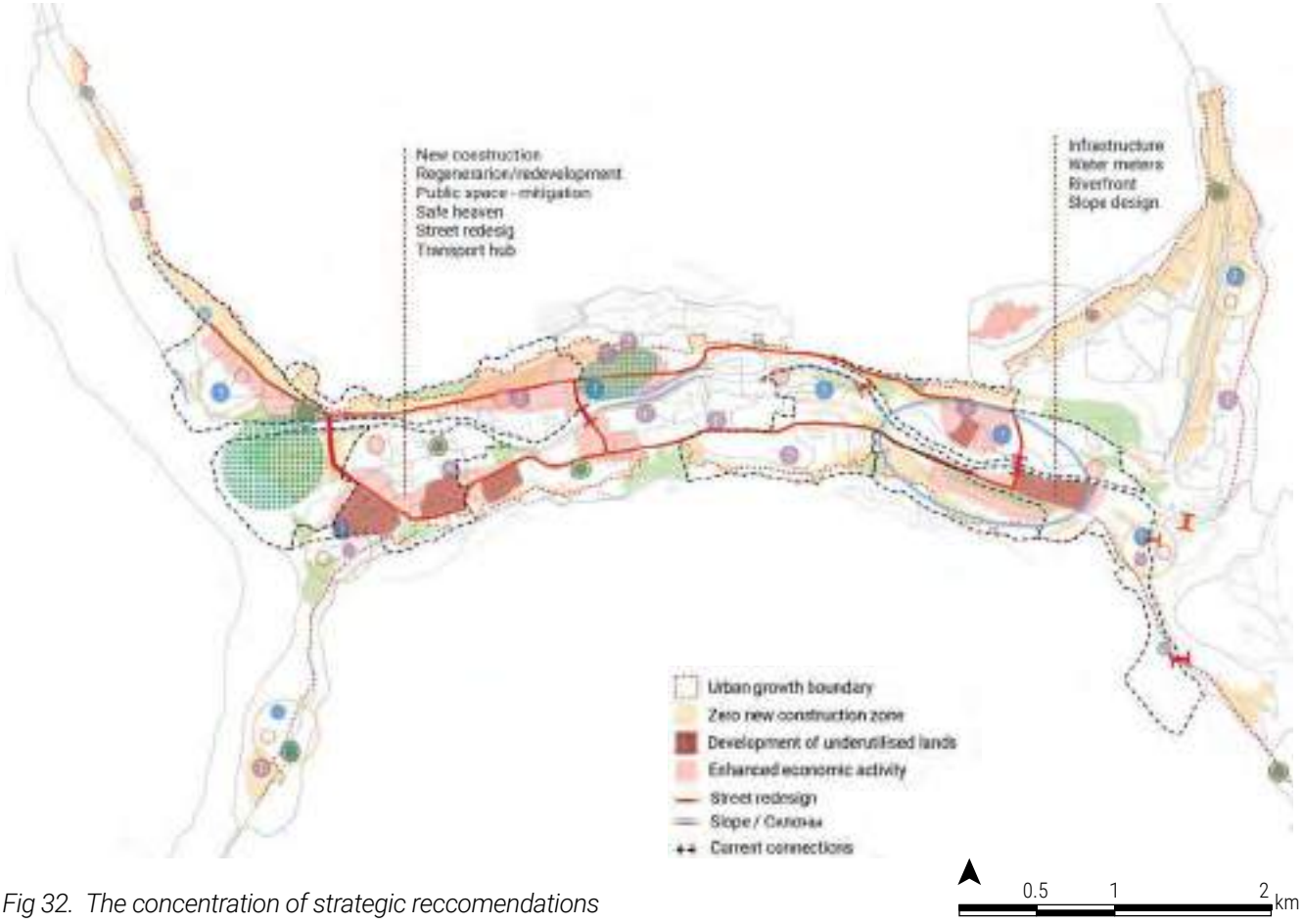


Fig 32. The concentration of strategic reccomendations

Fig 33. Prioritisation workshop with AKAH experts, UN-Habitat, September 2022

4.2. SETTING THE KEY COMPONENTS TO DEMONSTRATE

Considering the strategic location of the selected areas and a variety of existing preconditions, the demonstration projects aim to demonstrate tailored urban planning and design principles for sustainable neighborhood and the process of their application in different environments. The demonstration of the process is crucial to ensure that the design approach and design principles are well-understood and can be replicated in other contexts.

In addition, the projects will build a clear linkage with the spatial strategies, providing practical tips on how to contribute to the specific strategies through urban design. This will be done by respecting the planning parameters that are required by local legislation. The amendments and additions proposed in legislation (see report Khorog Urban Planning Rules) are also demonstrated in the urban design proposals.

4.2.1. Key planning concepts

To support the urban planning and design guidelines for Khorog, the demonstration projects practically demonstrate the physical manifestation of promoted planning concepts that are explicitly described in the Khorog Urban Planning and Design Guidelines. Below is the description of a few planning concepts and how they are addressed in the demonstration projects:

- The design proposals demonstrate **appropriate densification** strategies in the identified strategic regeneration nodes through the new construction of mixed-use development that constituted a range of functions including residential, commercial recreational, cultural, etc. The design of the mixed-use economic nodes will showcase how to integrate ideas that create employment opportunities. The design of the two selected sites (site A and B) demonstrate an intensification of the housing opportunity, economic activities, and jobs that will create a vibrant and enabling environment for the further emergence of small businesses and private sector initiatives.
- To ensure an attractive environment for people and businesses, the demonstration projects promote **diverse urban fabric and fine grain**. The diversity of parcels and plots creates a great diversity of routes to designations, places, and architectural forms vital to create a vibrant streetscape, a necessary element of mixed-use economic nodes. Smaller units create a greater level of urban permeability within the neighbourhood, which supports small commercial outlets by increasing slow moving and diverse, pedestrian street traffic.
- The design proposals include recommendations on how the block exteriors should be designed to positively contribute to the **active street frontages** and to the engaging, safe, and pedestrian-friendly environment. The direct relationship between the buildings' facade and the sidewalk contributes to the commercial viability of the street and to the pedestrians' safety.
- The demonstration projects highlight how to increase connectivity by ensuring a greater level of **urban permeability** instead of widening the street sections. Active street frontages and fine grain development will facilitate the shift of mobility patterns towards walking and cycling. To do so, a redeveloped street section must be multimodal following the concept of the "complete street" to include wide sidewalks for comfortable pedestrian movement, cycling lanes, safety buffers, etc.
- In addition to the planning and design concepts that are included in the design proposals, the projects show how **hazard mitigation** can be achieved through urban design solutions such as upgrading the riverbank, landscaping of the slopes, etc.
- The preliminary concept ideas for the housing typologies (to be developed during the further stages of the project) showcase how the design of the house can contribute to the **broader goals while accommodating the community needs**, based on the traditional way of living, and considering the local culture.

4.2.2. Key planning concepts

In addition to demonstrating the major planning and design principles that, once applied, will significantly transform the city, the demonstration projects include the design proposals for the identified projects that encompass the eight spatial strategies. Below is a table that provides a brief overview of what type of design solutions are demonstrated and their relation to the specific spatial strategy.

Spatial strategies							
GMS	HRS	URS	HMS	NCCS	AFS	BSPS	RSS
Growth management	Housing and resettlement	Urban regeneration	Hazard Mitigation	Natural and Cultural Conservation	Agriculture and Food Supply	Basic Service Provision	Resilient Streets
Urban design interventions							
Densification	Allocation of housing options for the resettling population	Integration of beownfields into the urban fabric	Resilient landscaping (riverbank reinforcement)	Integrated green systems (waste-food-energy)	"Farm to table" approach	Allocation of social and public facilities to cover relocated population and furture growth	Street redesign (multi-modal streets) and pedestrian-oriented spaces
Mixed-use development and new functions to inform centralities	Diversity of housing options for different income groups		Safe heaven/ safety shelter	Protection of environmental assets	Urban farming (communal and private)		
	"Green"building approach			Contexts-sensitive design (integration of culture)			

Table 2. Reflection of eight spatial strategies in urban design

Fig 34. Outcomes of the prioritisation workshop with technical experts, UN-Habitat, September 2022

4.2.3. Local planning parameters

To ensure that the demonstration projects fulfill the need for amenities, the planning parameters required by the local regulations were estimated. Doing so is necessary to ensure that the planning pre-conditions are set in the beginning of the design process.

As there is no specific population benchmark for the number of population to be accommodated in the site A and B, the calculation considers the number of people affected by the relocation strategy (roughly 2500 people from the 3 mahallas: 658 people/115 households from Khufak, 1744 people/226 households from Kichordev and 48 people/156 households from Imomobod).

The capacity of the sites may exceed 2500, however this benchmark is an indication of the quantity of additional amenities and infrastructure that should be considered within the built-up area of the city. The calculated planning parameters as well as the additional facilities and functions, take into account the future growth of the areas and their potential migration patterns.

By estimating a number of required services, it is confirmed that the selected sites A and B (as well as the other identified under-utilized lands) can accommodate a significant number of residents, which accounts for more people than the amount required for relocation (if relocation is carried out).

For some services that should cover the needs of the entire city, the calculation is based on the projected population of Khorog of 44,400. This includes the population increase as a result of the redevelopment strategies for the five strategic regeneration nodes as indicated in the City Profile Part 3: Strategic Recommendations.

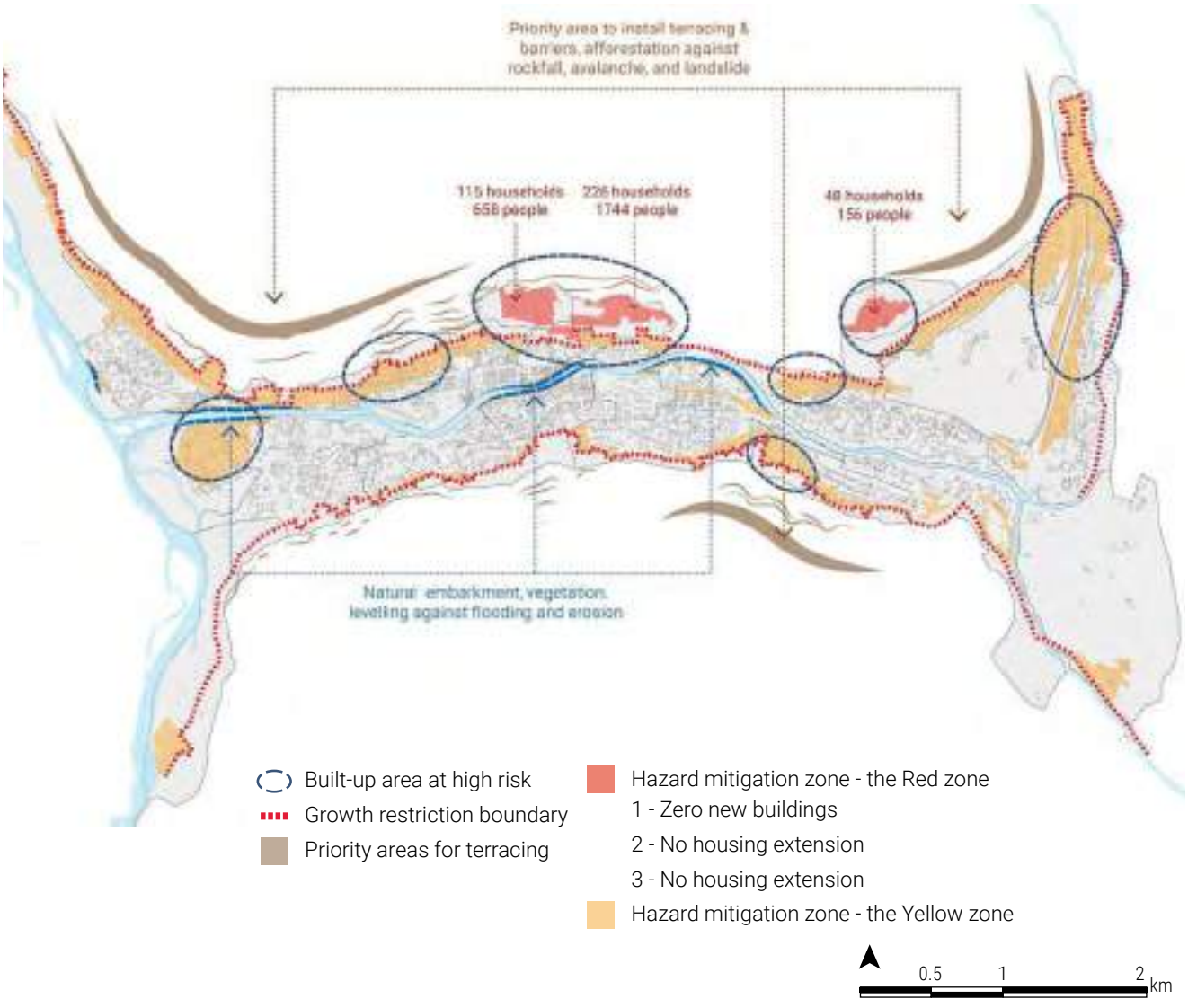


Fig 35. Priority areas for intervention

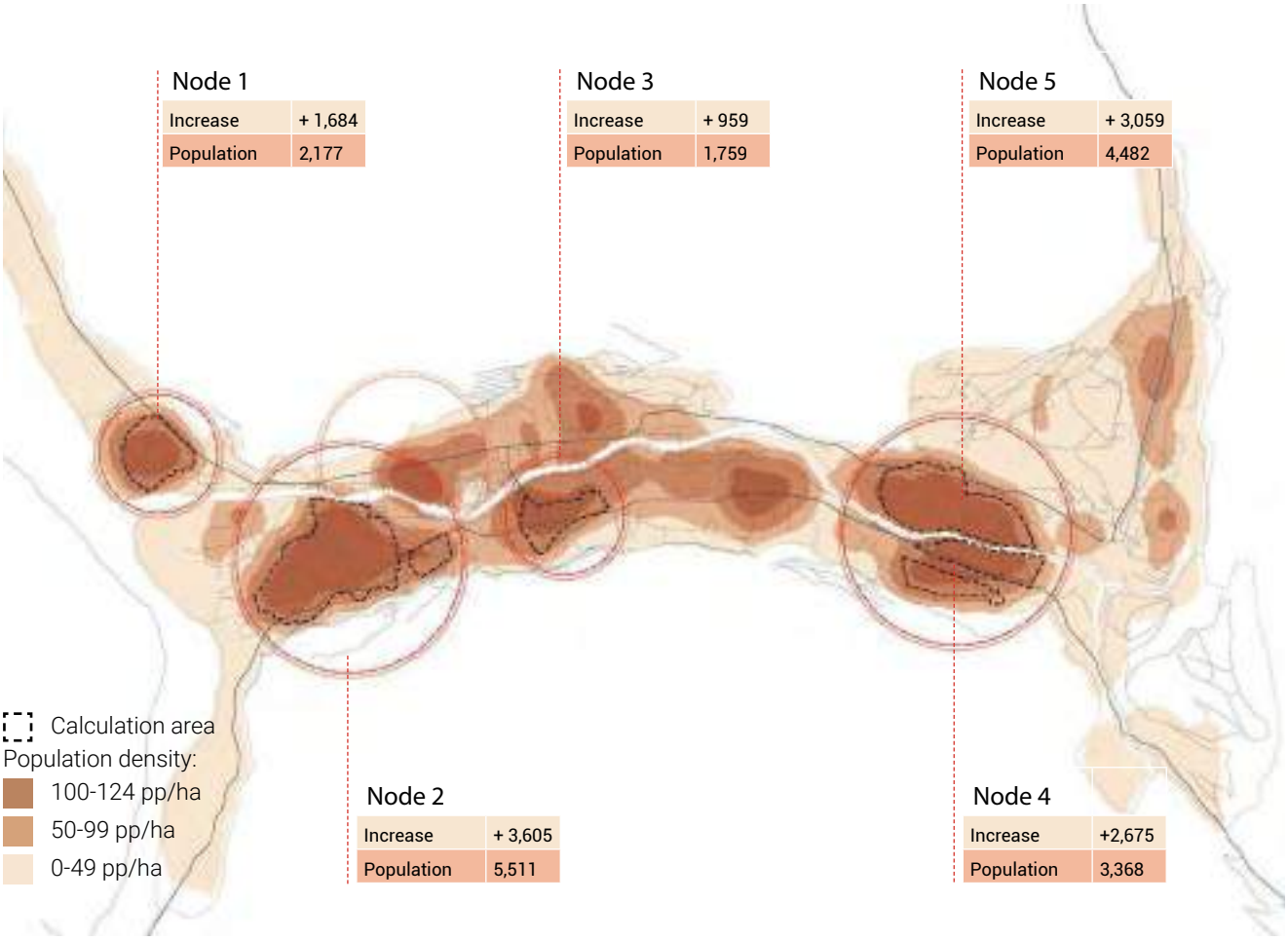


Fig 36. Proposed population densities after application of nodal densification

Fig 37. "I love Khorog" sign, UN-Habitat, September 2022

The calculated parameters that are required by the local planning regulations are summarised in the table below. Recommendations on how/where to locate specific services and functions are also indicated.

Facility/service	indicator	Required per 1000 inhabitants	Required for the 2 sites A+B
Kindergartens, early childhood development centers	Places	80	200 places
Comment: it is suggested to allocate 1 kindergarten per each site. 1 kindergarten for 1 site can accommodate more children than required (120-150 places) to ensure the sites take into account the future population growth.			
Schools (3 in 1 - elementary, secondary, high)	Places	290	725 places – 2 school
Comment: it is suggested to allocate 1 school per site. Though 725 places can be accommodated in only 1 school, it is suggested to reserve the space for 2 schools (1 per site) to ensure no school deficit in the future (considering the future growth of Khorog, densification, etc.)			
Facilities for additional education for children	Places	10% from the total amount of students (1450 considering 2 schools for 725 students)	145 places
Comment: the number of 145 places is indicative, the projects include multi-functional regenerated buildings that have bigger capacity to accommodate facilities for children. In addition, new community centres and libraries are proposed in proximity to the project areas. Also, additional educational facilities can be located within the mixed-use development. The proposed indicators by the project proposals exceed the required numbers.			
Interschool training and production facility (assumed as vocational training centres)	Places	8% from the total amount of students (1450 considering 2 schools for 725 students)	145 places
Though the functionality of the amenity may vary, sites A and B have enough capacity to accommodate 145 places. The sites include regenerated structures adapted for a variety of activities, including multifunctional halls for creative and vocational activities for youth, students, and children.			
Sports surfaces (flat structures)	Ha	0,9	2,25 ha
Comment: The 2 sites include a variety of sports facilities and open public spaces that can be used for outdoor sports facilities. The project proposals also include the seasonality of sports activities and suggests adaptability of such surfaces to include a diversity of activities (such as festivals, markets, open air concerts) to ensure these spaces are constantly active and beneficial for the communities throughout the year.			
Sports classes (halls) for common use and wellbeing	M2 floor area	80	200 m2 of sports spaces
Comment: The projects include mixed-use buildings and multi-functional regenerated buildings that have the capacity to accommodate a variety of sports classes. In addition, sports facilities for the city are also included in the project list.			
Covered public pools spaces for common use.	M2 of water surface	25	62,5m2
Comment: as mentioned above, the covered pool can be a part of the multi-functional regenerated buildings in one of the sites. The pool might be located in a sports facility that is identified in the project list and is in proximity to site A.			

Clubs/Community centers	places	40	100 places
Comment: The projects include multi-functional regenerated buildings within the 2 sites proposed for community centres and with the capacity to accommodate a variety of activities and functions (education, leisure, sports, culture, etc.).			
Dance classes/halls	M2 floor area	10	Hall for 25 people
Comment: The dance classes can be located within the mixed-use development. Also, as mentioned above, the dance classes can be allocated in the community centres (multi-functional regenerated buildings).			
Local museum	M2	5	12,5
Comment: The space for the museum can be located within the community centres (multi-functional regenerated buildings). It may be suggested to also combine the museum with the library.			
Cinemas and video halls	places	50	Hall for 125 people
Comment: The space for the museum can be located within the community centres (multi-functional regenerated buildings) and/or mixed-use development buildings.			
City libraries	Thousands of units of storage	6	Additional 15 thousand units -1 library
Comment: The space for the library can be located within the community centres (multi-functional regenerated buildings). It may be suggested to also adjust the library to schools or/and integrate the library into the public space.			
Grocery Stores (food items)	M2 of the commercial area for the urban population	82	205 m2 pf commerce (food)
Comment: The grocery stores are suggested to be located within the mixed-use development buildings to form an active frontage and a vibrant streetscape.			
Non-food stores	M2 of the commercial area for the urban population	108	270 m2 of commerce (non-food)
Comment: The non-food stores are suggested to be located within the mixed-use development buildings to form an active frontage and a vibrant streetscape.			
Marketplaces/ Market complexes	Trading place	3	135 trading places
Comment: The capacity of the marketplace was estimated to be for the entire population of Khororg, taking into account the population increase as a result of the regeneration and intensification of the five economic nodes. It is suggested to reconstruct the existing market in the central area of Khorog and create smaller markets in strategic regeneration nodes. Sunday markets can also be introduced as an activity for the designed public space.			
Cafes, restaurants, canteens	Sitting places for urban population	29	73 places in cafes, restaurants, canteens
Comment: Cafes, restaurants, and canteens are suggested to be located within the mixed-use development buildings to form an active frontage and a vibrant streetscape.			
Studios, workshops, repair	Jobs	7,5	19 jobs
Comment: Various studios and workshops are suggested to be located within the regenerated structures and/or mixed-use development buildings to form an active frontage and a vibrant streetscape.			
Well-being complexes, saunas	places	5	13 places
Comment: Well-being activities can be located within the mixed-use buildings and/or within the sports areas of the community centers (regenerated buildings)			

Laundry	kg of sheets per shift	90	225
Comment: such services are suggested to be located within the mixed-use development buildings close to the areas of common use (mail rooms, courtyards, etc).			
Dry-cleaning	kg of sheets per shift	8	20
Comment: such services are suggested to be located within the mixed-use development buildings close to the areas of common use (mail rooms, courtyards, etc.).			
Hospitals of all types	beds	10	25 beds
Comment: the comprehensive project list includes the health facilities. The suggested facilities are in proximity to the project sites and cover the healthcare deficit of those areas including the new population of the sites.			
Polyclinics, dispensaries	visits/shift	24	60 visits
Comment: same as above.			
Center for Hygiene and epidemiology	object	4	10
Ambulance station	car	0,1	-
Pharmacies	object	1 for residential district	1 per district – 1 per each site
Housing maintenance organizations	object	1 for microrayon	1 per district – 1 per each site
Hotels and guest houses	Places	5	12,5 places – hotel in one site
Comment: It is suggested to construct some services for tourism and stay within both sites. In site A some hotels can be located within the proposed commercial area. Within site B a small hotel with all the necessary facilities for tourists will be located (bike rentals, tourism offices, hiking and fishing equipment, etc.)			
Public toilets	1 toilet	for 1000 people	3 public toilets
Cemetery	Ha	0,24 ha for 1 thousand people	+0,6 ha to the existing cemeteries
Cemetery service	Object	1 per administrative district	1 per districtw

Table 3. The summary of the required planning parameters and UN-Habitat recommendations

Considering all the required planning parameters and already proposed services in proximity to the sites (within the project list) below is the summary of services to be allocated within each site.

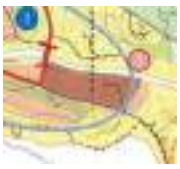
		Site A	Site B
Social facilities	Kindergartens – 200 children, Schools – 735 students, Facilities for additional education for children – 120 places	 1 kindergarten 1 school 1 medical centre Sports centre Open surfaces for sports 1 community centre Commercial activities Sports and well-being	 1 kindergarten 1 school Open surfaces for sports 1 community centre Multifunctional centre with spaces for sports, commerce and culture(librarty, cinema, etc.) Commercial activities Sports and well-being
Public facilities	Community centre, cinema for 125 people, 2 local lobrary, cafes and restaurants - 72,5 places, hotels – 15 places, 3 public toilets		
Commercial areas	Grocery stores 205 m2, nonfood items 270m2, marketplaces 135 stalls		
Sports	Sports surfaces (flat structures) -2,25 ha, classes (halls) for sports and dwell-being for common use 200m2		
Healthcare	1 medical Centre - 25 beds, 1 policlinic - 60 visits, 10 Centets for Hygiene andepidemiology, pharmacies		
Cemetery	+ 0,6 ha		

Table 4. The summary of the required planning parameters and UN-Habitat recommendations

Fig 38. A square next to Khorog administration, UN-Habitat, September 2022

4.3. SITE A

4.3.1. The existing pre-conditions

The urban fabric of Khorog is characterised by the prevalence of under-utilised lands and grey fields, which showcase the area's/ neighbourhood's massive deindustrialisation following the collapse of the Soviet Union. Today, these greyfields provide ample possibilities to introduce innovative urban planning approaches and models based on a thorough analysis of the social, economic, and natural challenges and opportunities in Khorog.

Site A falls within the category of under-utilised land. It was identified as one of the two demonstration sites to localise the urban planning strategies elaborated for Khorog. This site highlights how the guidelines for resilient urban design can be integrated at a neighbourhood scale.

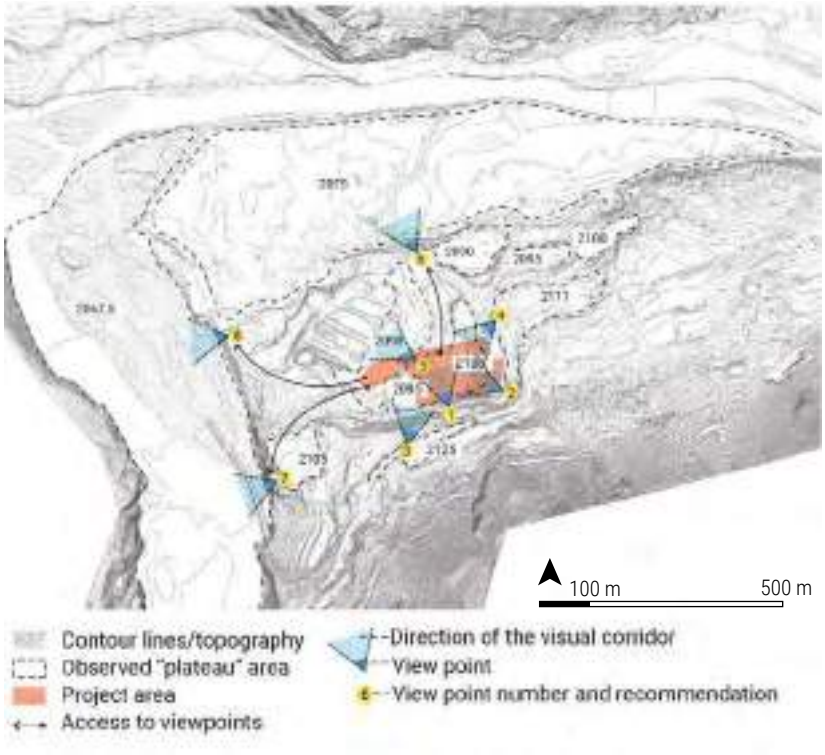
The site comprises four large abandoned industrial buildings that might have been used as warehouses. There are also remains of industrial steel structures that were used in what appears to be a cement factory. A few residential buildings are to be found in the north, east, and south of the site.

The site is characterised by varying topography, which also creates a barrier on the northern side in the form of a steep slope, thus preventing access to the upper main road (name) from the site.

The following diagrams showcase the major characteristics of the site, its situation in relation to its larger spatial context, its development potential, as well as its linkages to the other proposed initiatives.

All these elements and factors form a designframework to achieve the project objective of developing an integrated, mixed-use, and resilient neighbourhood that would serve as an incubator for the development of the area.

Fig 39. The under-utilised lands of the site A, UN-Habitat, April 2023



1 The project area should ensure a pleasant view of the view-points at the upper levels (e.g. green roofs, vegetation, low and medium-rise buildings.). Any visual pollution should be prohibited (high-rise, abandoned structures). The place of the viewpoint can serve as a public space (slope park) to observe the developed project area.

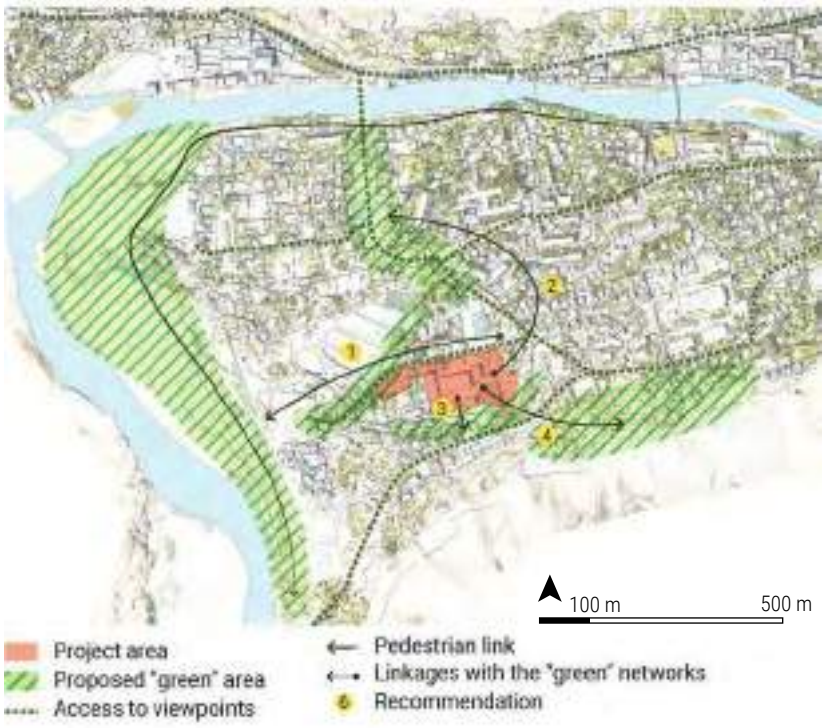
2 Similarly, as for viewpoint 1, the project area should ensure a pleasant view of the viewpoints at the upper levels. Any visual pollution should be prohibited (high-rise, abandoned structures). The place of the viewpoint can be proposed for a landmark/character area considering the location in proximity to the "main loop".

3 Similarly, as for viewpoint 1, the project area should ensure
4 a pleasant view of the viewpoints at the upper levels for the existing areas. Any visual pollution should be prohibited as mentiined above (high-rise, abandoned structures).

5 The project area is overseeing the treatment facility. The context-specific vegetation should be considered around the facility to absorb the smell and create a more attractive view from the project site.

6 The viewpoints have a picturesque view on the river and the
7 environment of the observed "plateaus". The project site
8 should have pedestrian-friendly access (pathways, vegetated boulevards, wide sidewalks) to these places to leverage from the view on the unique environment.

Fig 40. Analysis of topography of the site A



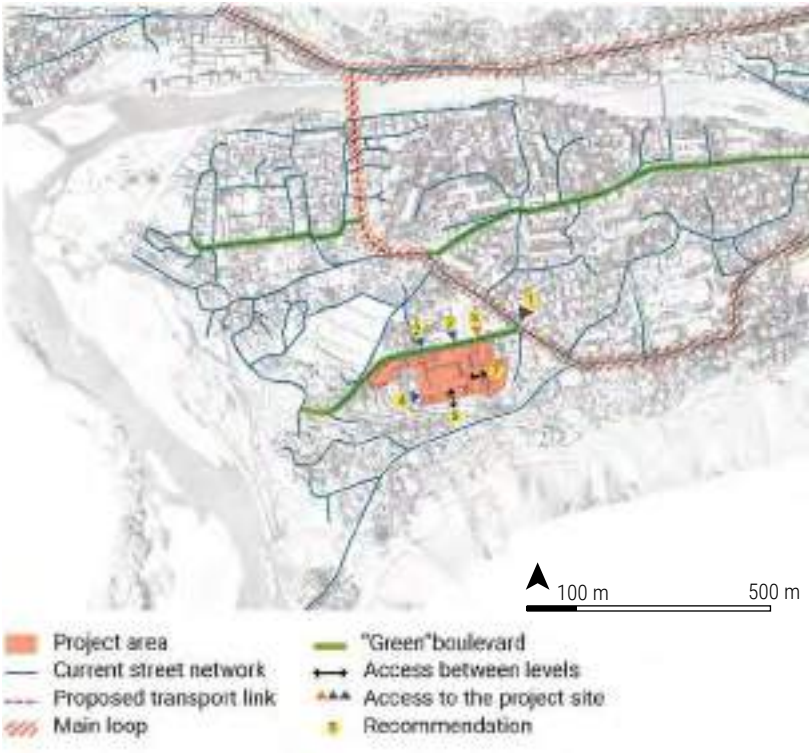
1 The proposed "green" area 1 is a context-specific vegetation that absorbs smell from the treatment facility. In addition, such vegetation should create a more pleasant view. The line of trees should be also planted along the "green" boulevard for a better view, shade and safety.

2 The project site should ensure easy access to surrounding green areas (parks, alleys, boulevards, etc.). The network of pedestrian linkages from the project area should be considered.

3 The project site is adjacent to the slope, which should be integrated into the design proposal. The project proposal can leverage from the slope due to the picturesque view from the upper levels. Organised terraces with places to sit, rest and play can be organised.

4 The area that is reserved for agricultural uses is located in close proximity to the project area. Community gardens and urban farming places can be suggested to ensure better food security in the area. The pedestrian linkages to the community gardens should be ensured.

Fig 41. Analysis of "blue and green" networks of the site A



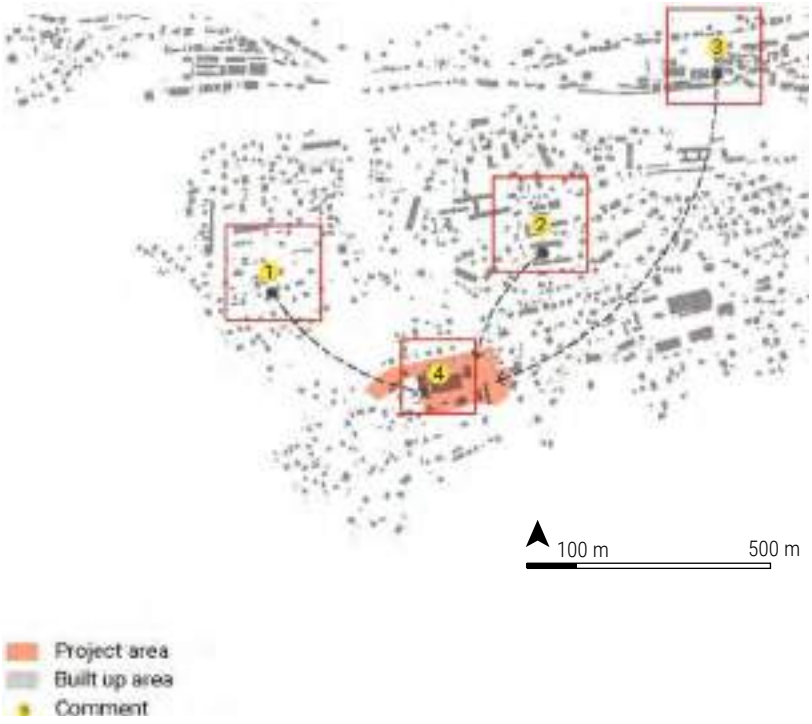
1 The project area has one main access through the proposed "green" boulevard. The proposed street section should ensure safe and comfortable circulation and multimodal mobility patterns, taking into account future flows to the site.

2 The project area should ensure a high level of permeability that
3 can be achieved considering the possibility for transit multi-
4 modal circulation. The current access to the project site should be also considered in the design proposal.

5 The project area should have a pedestrian access due to different levels. In addition, some parts of the project site can be pedestrian oriented.

6 The project area has one main access through the proposed "green" boulevard. The proposed street section should ensure safe and comfortable circulation and multimodal mobility patterns, taking into account future flows to the site.

Fig 42. Connectivity analysis of the site A



1 The surrounding urban pattern includes dispersed private houses, some of the private houses are built according to the traditional Pamiri culture. The project area should include elements of traditional spatial organisation with the possibility to have a parcel of private land, maintaining the levels of high density.

2 The surrounding urban pattern includes des high-density apartment blocks. The project site will incorporate the diversity of housing options, adapting the apartment blocks to the local culture and the diversity of housing blocks. In addition, the apartment blocks should not exceed 6 floors due to safety, visual and maintenance considerations.

3 The surrounding urban pattern includes dense commercial vibrant areas. The project site may also include elements that create vibrancy - commercial streets with appropriate dimensions of the street enclosure, commercial spaces with adjacent pocket public spaces, spaces for Sunday markets, etc.

4 The project site has several abandoned and non-functioning structures. Some of the structures can be renovated and integrated into the design proposals due to their specific aesthetics. These structures can support the identity of the place by becoming creative places with possibilities for public art and the expression of new ideas. The quality assessment of such structures should be conducted.

Fig 43. Analysis of the urban fabric of the site A

Fig 44. Newly constructed high-rise appartmet block in Khorog, UN-Habitat, April 2023

4.3.2. The program

The program of the site is based on a thorough analysis and corresponding diagnosis of the deficits in Khorog, both in terms of housing, services, and economic activities.

In this regard, the following amenities have been identified as priority components to be integrated in the design of the neighbourhood:

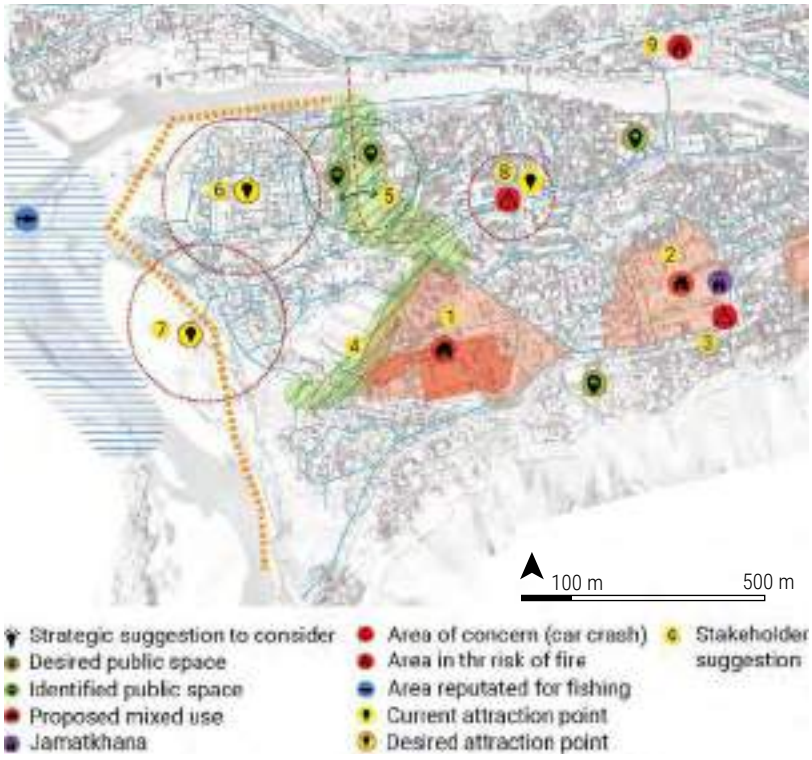
- 1 school
- 1 Kindergarten
- 1 community centre
- Public space
- Sport facility
- Housing

In addition to the identified amenities, the design proposes several spaces and services that complement the aforementioned facilities and contribute to the vibrancy of the neighbourhood.

Following a mixed-use development approach, the design proposes the integration of a multi-functional Techpark within the neighbourhood. The Techpark is a business and innovation hub that offers a vibrant environment for high value-added businesses. Moreover, the Techpark is capable of providing hundreds of job opportunities, especially for the youth, and would contribute to the strengthening of the entrepreneurship sector in Khorog.

The complex contains offices, workshops, a conference centre, a hotel,cafés, restaurants, exhibition spaces, and green open spaces.

The rest of the neighbourhood includes multiple typologies of housing units organized around green spaces and integrated with amenities and retail spaces on the main road. This balance between housing, businesses, services, and open spaces provides the ingredients for a vibrant and inclusive neighbourhood.



1 The selected sites are suitable for development which was confirmed by the local government. Mixed-use development should
2 be promoted and include employment opportunities. Employment strategies will be essential for the proposal. (Compact manufactures, small industries, etc.)

3 The curve of the road should be redesigned to ensure safe and smooth traffic circulation.

4 Context-specific vegetation should be planted to ensure potential water filtration and help in the absorption of the bad odors that are generated in the adjacent treatment facility.

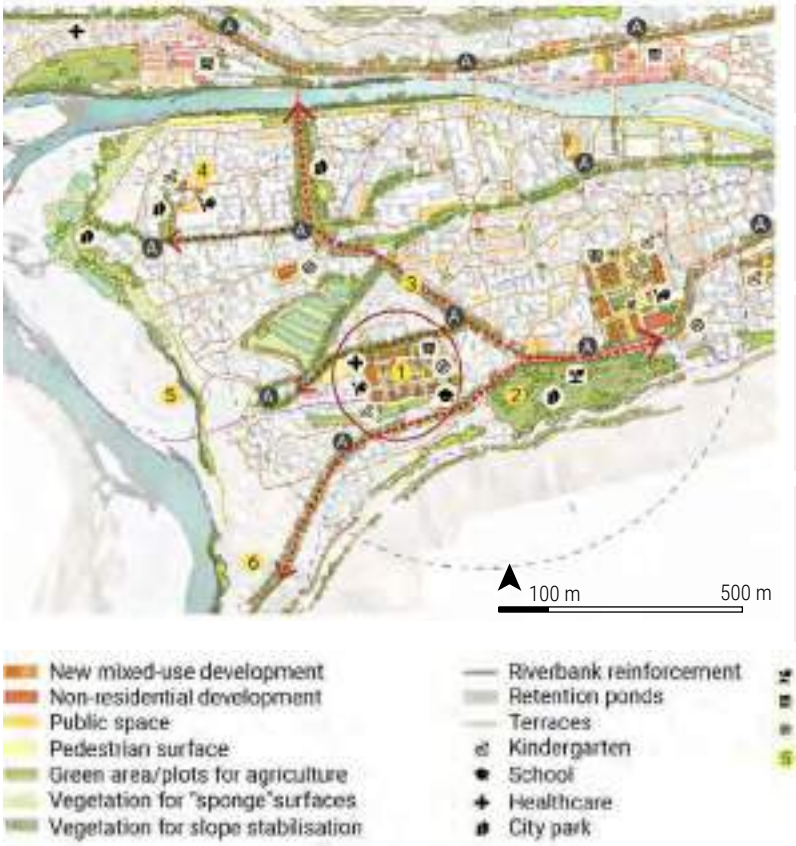
5 The l suggested linear park should include solutions for safe street crossing to ensure that the newly constructed road does not create fragmentation of the area.

6 The suggested community centre (6) and wetland park (7) will
7 create new points of attraction that will encourage citizens to come to this part of the city.

8 Area 8 is known for its risks of car crashes. In the meantime, the place is popular among residents as they use it for gathering and socialising. The project site should demonstrate design solutions on how to ensure compatibility of uses and activities, redesign the street section to promote safety for all.

9 Area 9 has the risk of fire due to the poor level of urban permeability. The project site should demonstrate how greater levels of urban permeability can be achieved through design (streets, parcels, etc.).

Fig 45. Outcomes of the communuty engagement session for the site A



The project area is located in the strategic regeneration node and should include adequate levels of urban density to ensure vibrant economic activities and sufficient capacity to accommodate the required population.

The project has several areas proposed for green public spaces, community gardens, parks, etc. The network of pedestrian linkages should be ensured to allow safe pedestrian circulation with a focus on children (safe routes to schools, kindergartens and public spaces). By redeveloping the under-utilised parcels, many of the safety concerns will be addressed.

The project area has direct access to the "main" loop, along which the economic activities will be enhanced. The access provides an opportunity to create an "activity cluster" with employment opportunities (e.g. technoparks, industries, business clusters, etc.). The proposed public transport coverage and adjacent public transport stations create an enabling environment for business development.

The project area should be linked to its surroundings, increasing the level of connectivity. The community centre and kindergarten (4), open public spaces and riverfront (5) should be linked to create a pedestrian network. The surrounding areas (6) will benefit from increased accessibility, in particular to those provided within the project area.

Fig 46. Linkages to other proposed initiatives of the site A

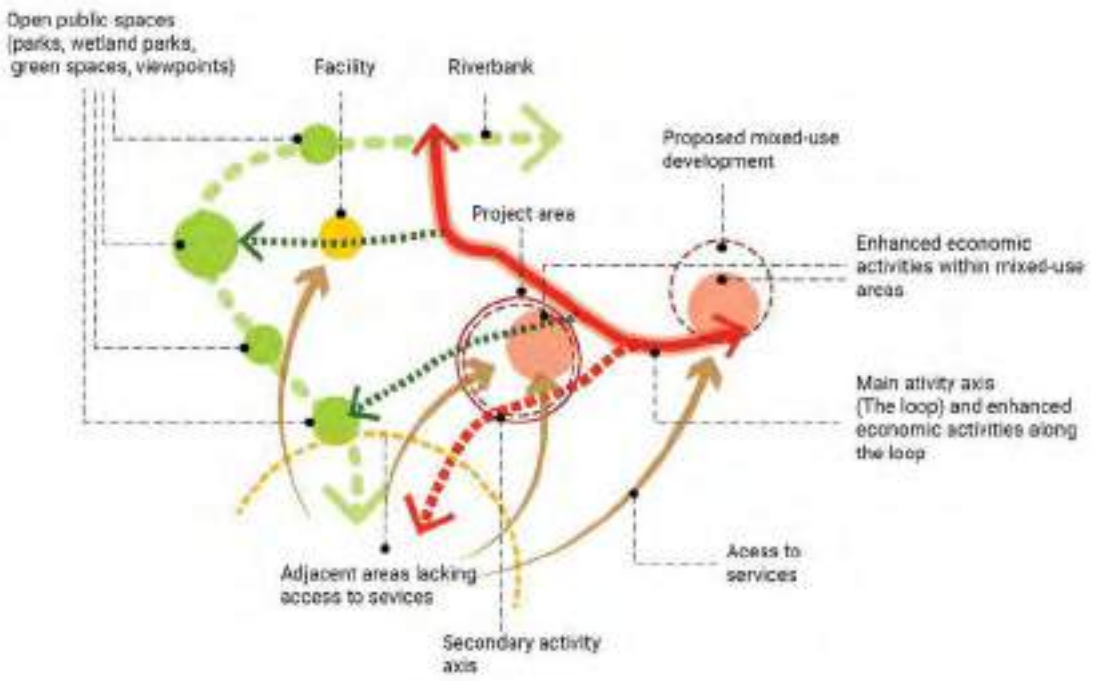


Fig 47. Diagram of proposed peoject correlations for the site A

4.3.3. Spatial organisation

FAR	1.25	
Site area (sqm)	35285	
Population (p)	794	
Density (p/ha)	226	
Jobs	436	
Average number of floors	4,5	
Residential floor area (sqm)*	22579	51.3
Commercial floor area (sqm)	4119	9.4%
Techpark (offices+industry) (sqm)	8852	20.1%
Social/cultural facilities (sqm)	3890	8.8%
Public facilities (sqm)	4605	10.5%
Total FA (sqm)	44044	

Table 5. Projected planning parameters for site A

- Residential housing (multi family)
- Mixed-use development (residential + other functions)
- Social facilities
- Community centre
- Commercial buildings
- Technopark
- Only pedestrian barrier-free surface
- Only pedestrian barrier-free surface of the Technopark
- Areas for communty gardening
- Access street (pedestrian oriented)
- Main multimodal loop
- Sports ground

- School
- Kindergarten
- Community centre
- Hotel
- Cafe/restaurant/cinema
- Multipurpose space with variety of indoor activities (sports, leisure, art, commercial, etc.)
- Commercial area
- Green house
- Area for community gardening
- Sports ground
- Park
- The integration of existing object/art object/landmark

Project integration in the site

One of the major pillars of the design concept is the achievement of maximum integration of the neighbourhood with its natural environment. The design takes advantage of the topography variation to create different characters in the site while enhancing the connectivity between the various levels.

For instance, the western side of the site is a terraced terrain that forms an elevated platform of up to 4m in comparison to the rest of the site. The difference between the two levels is maintained and used to mark the transition between the Techpark and the residential areas in the site. The connection between the two levels is ensured through steps and ramps, while the elevated platform provides excellent visual connectivity to the rest of the neighbourhood.

Furthermore, the difference in levels can be used to seamlessly integrate underground parking, and therefore reduce the presence of parked cars on the street while increasing pedestrian walkability in the neighbourhood.

The design proposal aims to ensure a vibrant neighbourhood. This can be achieved by designing a compact urban fabric that offers the opportunity to reach an optimal density of around 300 inhabitants per hectare.

In this regard, the design proposal opts for a low-rise, high-density urban development model that takes into consideration the aspects of human scale, livability, privacy, risk management and construction, as well as maintenance costs.

In alignment with Khorog's urban design guidelines, the height of buildings is limited to a maximum of five storeys, which is optimal to maintain the human scale and the connection of the users with the street. This leads to a compact and efficient urban fabric designed around green and open spaces to enhance conviviality and social encounters.

The low-rise high-density development is also an adequate model for earthquake prone areas as it allows for a quicker evacuation. In addition, construction and maintenance costs are usually much lower in this type of development than in the high-rise buildings type of development.

With this model, the project would achieve a density of around 300 inhabitants per hectare, which is optimal for mixed-use neighbourhoods.

Fig 48. Natural topography as a defining element of the design proposal

Fig 50. Proposed green network and infrastructure for the site A

Fig 49. Use of natural topography to integrate underground parking

Density and compactness

The design proposal aims to ensure a vibrant neighbourhood. This can be achieved by designing a compact urban fabric that offers the opportunity to reach an optimal density of around 300 inhabitants per hectare.

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With this model, the project would achieve a density of around 300 inhabitants per hectare, which is optimal for mixed-use neighbourhoods.

Fig 51. The current conditions of the under-utilised lands of the site A, UN-Habitat, April 2023

Mixed-use development

The neighbourhood is comprised by two distinct but integrated parts: one dedicated to the Techpark, and another one designated to the residential area. These two areas are defined due to the difference in topography, which is used to mark the transition between the different uses.

Built on an elevated platform, the Techpark hosts innovative and high value-added businesses in a thriving environment that includesplenty of open space, galleries, cafés,restaurants,a hotel, and multi-purpose buildings (retail, offices and residential) to activate the area even after working hours.

The Techpark is characterised by a diagonal pedestrian promenade, which serves as a connection between the different sections of the complex. While the whole area is designed to be fully pedestrian, it allows for the access of delivery and emergency vehicles.

The Techpark overlooks the residential part of the neighbourhood, creating direct visual and physical connection with it.

The design of the residential part of the neighbourhood follows the same mixed-use approach. Buildings along the southern road are designed to have active frontages on the ground floor, which can host stores, cafés, and other services. In addition to their residential use, those buildings could also host multiple functions including offices and other tertiary uses.

The residential part comprises single and multi-family houses and it is designed to create a sense of privacy. Therefore, all retail activities are limited to the main roads. However, several public facilities and social infrastructure are integrated in the project as fundamental design components, providing the community with accessible amenities and services within the neighbourhood.

The mixed-use development model is a crucial element that enhances the liveability of a neighbourhood and creates a vibrant social and economic environment with a transformative impact on the surrounding areas.

Fig 52. Bird's-eye view of the neighborhood (Site A)

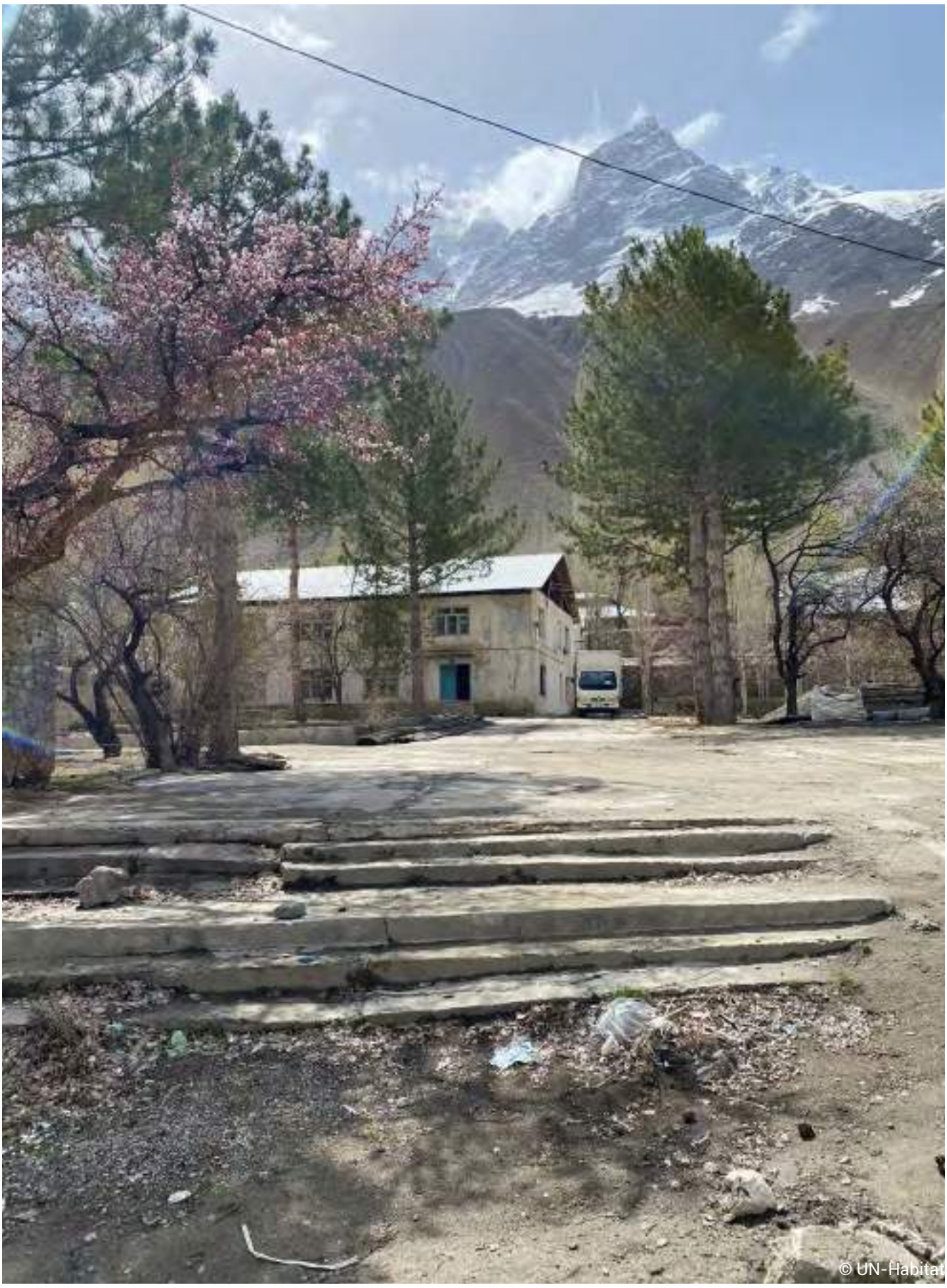


Fig 53. The current conditions of the under-utilised lands of the site A 2, UN-Habitat, April 2023

Connectivity and accessibility

One of the major targets of the design proposal is to enhance the connectivity of the site to the rest of the area and promote a smooth accessibility within the neighborhood.

The main access to the site is ensured through the main lower road, which is designed to become a multi-modal green boulevard. Another access point is created from the upper road by designing a pedestrian pathway that navigates the landscaped slope to reach the heart of the neighborhood through the repurposed steel ramp.

Movement within the neighborhood is ensured through a network of pedestrian streets and “shared spaces” that prioritize walkability and cycling, and guarantee a high level of safety and comfort inside the neighborhood.

Furthermore, a set of accessibility solutions (ramps, elevators, railings, etc.) are integrated in the site to ensure that every part of the neighborhood is accessible, especially to people with limited mobility.

To minimize the presence of cars on the streets, three underground parking spaces are strategically located in the neighborhood to serve the maximum number of users. Moreover, these parking spaces are shared between the residential and the commercial facilities, making it a very efficient option in terms of both cost and ease of parking requirements.

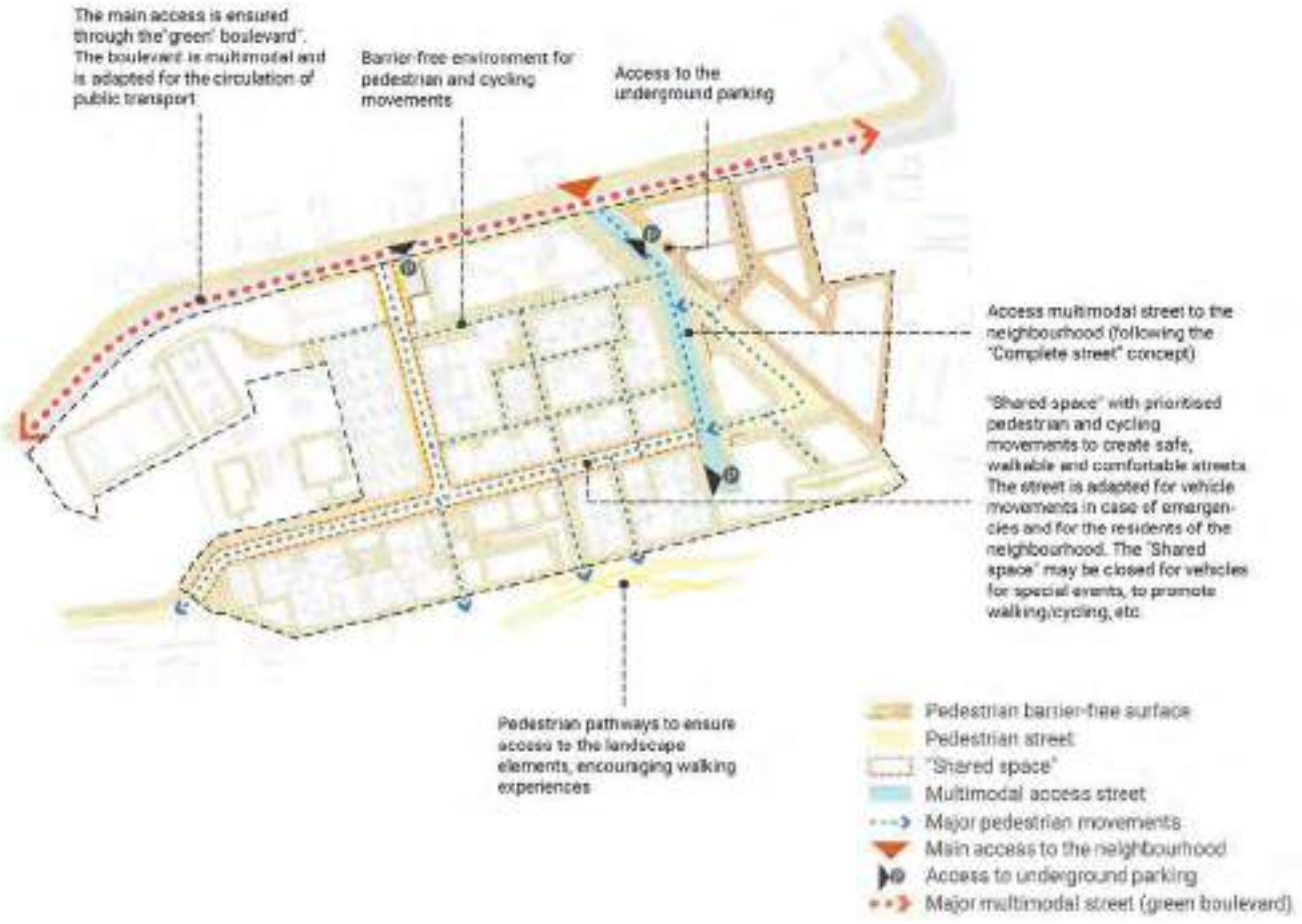


Fig 54. Proposed mobility patterns for the site A

Preserving the spirit of the site

Preserving the identity of the site is a fundamental component of the design proposal. As previously mentioned, the site still contains abandoned industrial relics namely several steel structures and warehouses. Through a sensitive design approach, some of these structures are not only preserved, but are also repurposed to become essential design elements of the site, strengthening its identity, and embracing its industrial heritage.

The old cement tanks can be refurbished to functionally serve as storage for the on-site treated water, which can later be used for the irrigation of green spaces. Aesthetically speaking the tankscan be a canvas for artistic expressions and graffiti from local artists.

Fig 55. Repurposing of the existing structures to be used as water storage tanks for the irrigation of green spaces/community gardens

The site also contains an industrial steel ramp that leads to a platform above the four tanks. The location and characteristics of the ramp provide ample possibilities to integrate it with the terrain by connecting the platform to the slope through a steel bridge. This repurposed structure would allow a much-needed access to the slope, which can become an important green space with viewpoints and terraces, as well as a smooth connection to the upper main road especially for people with limited mobility.

Another steel structure in the form of a cube can be found adjacent to the ramp. This structure can be strengthened and repurposed to host a two-level café with a view on the axis leading to the main road.

The warehouse on the east side of the site is integrated in the neighbourhood design as a multi-purpose facility, which can be used as a market, for indoor sports,for events, etc.

The building's structure will also be modified to support a greenhouse on the roof which will be used for intensive urban agriculture.

Fig 56. Landscaped pathways through the park connect the neighbourhood to the upper part of the road.

Fig 57. Existing steel ramp, UN-Habitat, April 2023

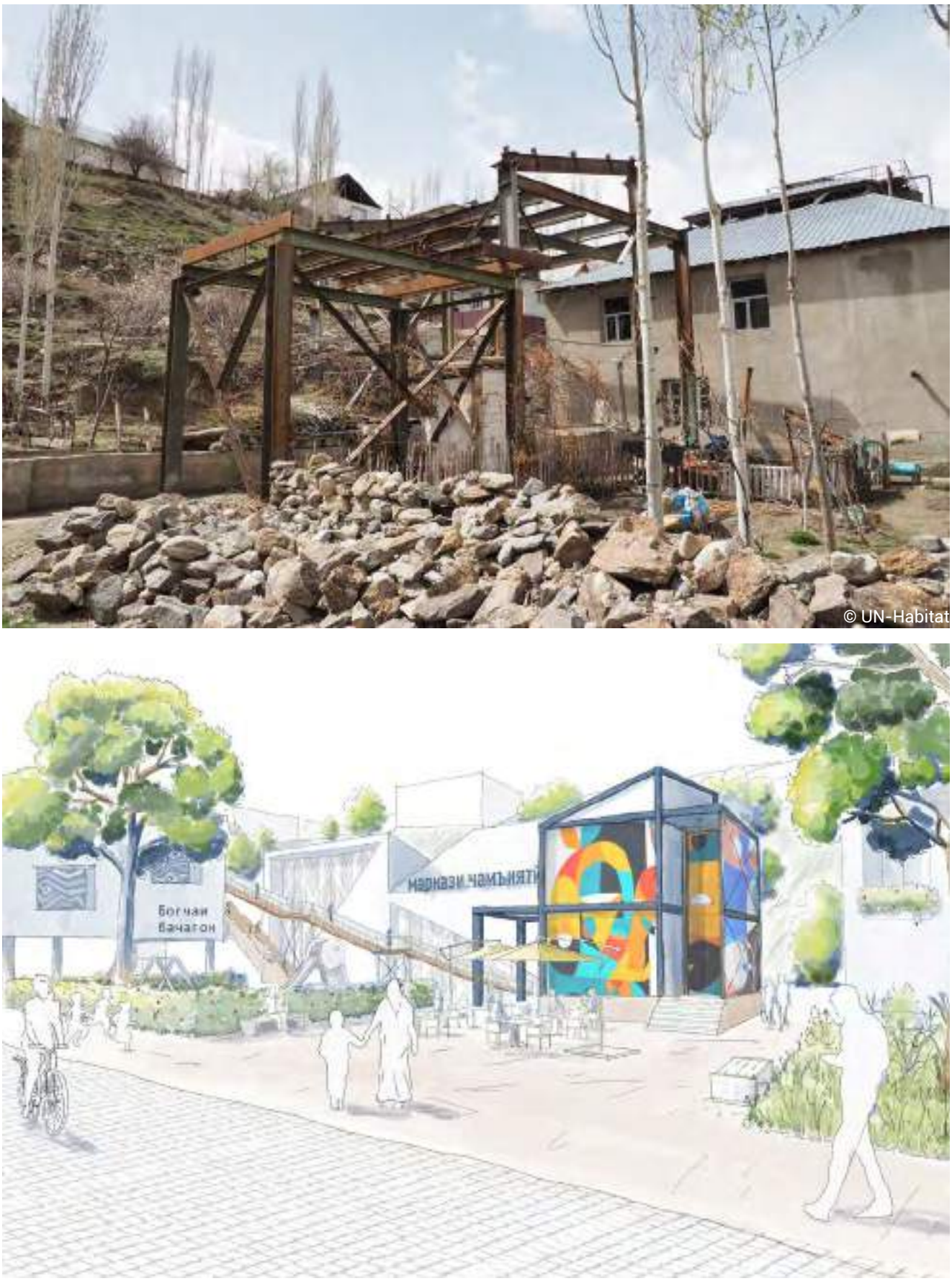


Fig 58. Repurposing of the industrial structures to serve as a ramp and community café

Open space development

Open space is not a residual element in the design, but rather a core component around which all the other urban design aspects should revolve.

Open public spaces take different forms and functions such as: multi-functional green spaces, landscaped and pedestrian friendly streets, roof gardens, and landscaped slopes. All of these elements come together to form an integrated network of open spaces that balances the high density of the site.

Integrated green infrastructure:

The hidden dimension of the design is the green infrastructure that links water, food, and energy systems into/ with the neighbourhood. This nexus is integrated in various design scales. For instance, grey water from the buildings may be treated through an on-site water treatment system located under the central garden. The treated water is then stored in the refurbished cement tanks and used for the irrigation of the community gardens and the greenhouse to produce food and thus improve food security. Organic waste has the potential to be recycled and used either as organic fertilizer or to generate energy in the form of biogas. These closed systems are important for the sustainability of the neighbourhood. They help in increasing the neighbourhood's resilience in crisis situations, and they could serve as a back-up in case of the failure of the centralised system.

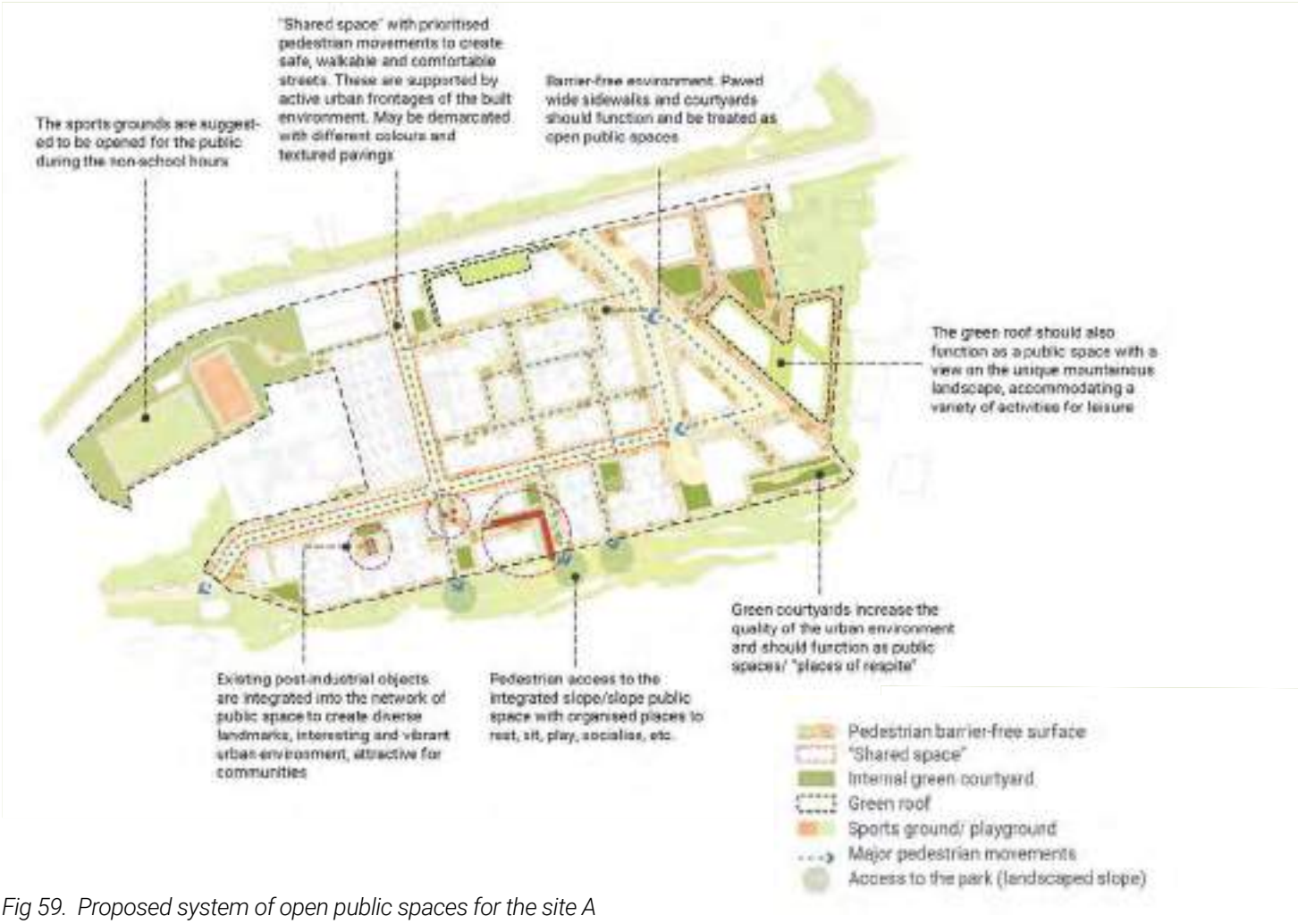


Fig 59. Proposed system of open public spaces for the site A

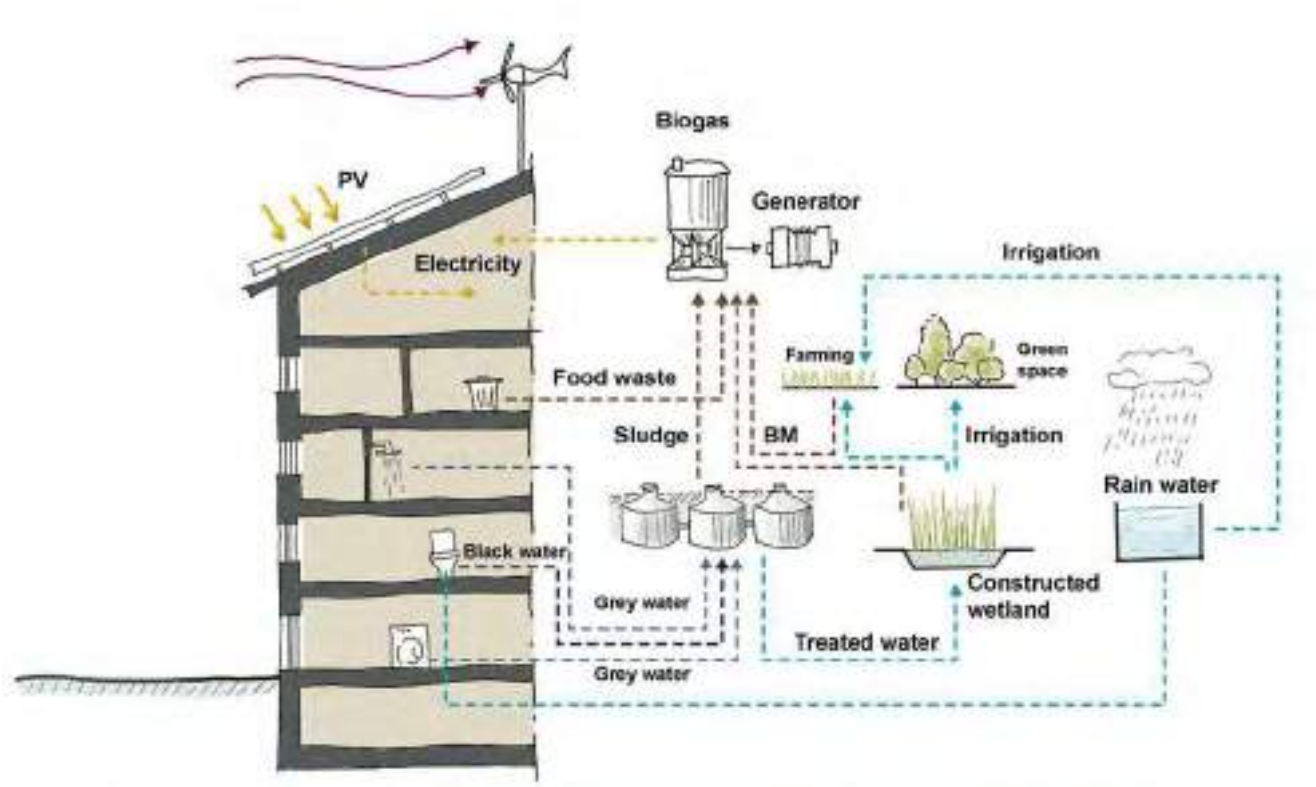


Fig 60. Integrated green infrastrycture

Fig 61. The greenhouse on the under-utilised land of the site A, UN-Habitat, April 2023

Local Economy

The different functions brought into the neighbourhood design give a particular importance to the development of a strong local economy. This is achieved through the agglomeration of creative industries and businesses within the Techpark, the integration of retail and services along main axes, the multiple public facilities and social infrastructure, and the income-generating activities such as urban agriculture. The strategic combination of these elements, coupled with their balanced spatial distribution in the site, could serve as a component of employment generation, creating a spill-over effect as well that would work beyond the limits of the site.

Diverse housing typologies

Inclusiveness is a crucial indicator of a thriving and diverse neighbourhood. The project aims to achieve a high level of social inclusivity through the introduction of a variety of housing typologies that accommodate the needs of different social groups while provide increased opportunities for economic mobility and income gains for low-income residents.

The project proposes three main housing typologies:

- **Single family houses:** Semi-detached, two-story houses with about 100sqm land coverage.
- **Multi-family houses:** Compact and efficient four to five-story buildings designed to maintain privacy while providing a strong connection with the street and the surrounding community spaces. This typology has a strong potential in achieving an optimal density in the neighbourhood. Furthermore, it offers the opportunity of integrating the local architectural elements and principles of the Pamiri house into the new model of shared multi-family dwellings.
- **Apartment buildings:** these are larger, multi-functional housing blocks that contain apartments on the upper floors, as well as retail spaces on the ground floor. They are usually more affordable due to the high number of dwellers they can accommodate within a single building block.

These three typologies are all designed to be tenure blind, meaning that the quality and architecture of the buildings are independent of the tenure type to avoid the social stigmas that are associated with low-cost/affordable housing.

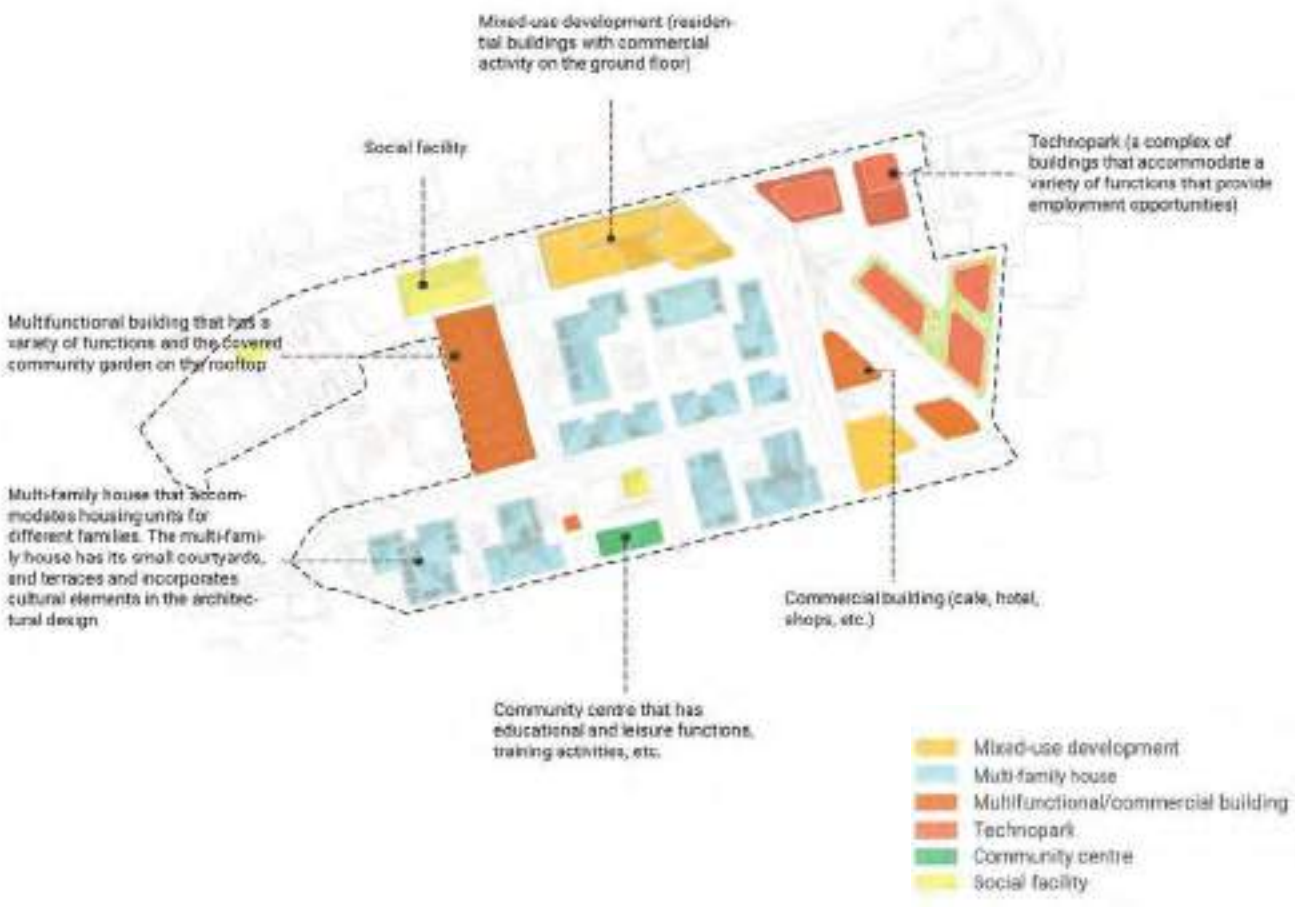


Fig 62. Proposed housing typologies for the site A

Fig 63. Example of the multi-family house

Fig 64. : Example of an apartment building

4.4. SITE B

4.4.1. The existing pre-conditions

As well as site A, site B is represented by a considerable amount of land (XX ha) constituted of under-utilised land, grey fields, abandoned structures, and some residential buildings. The further construction of these structures had to be stopped due to the financial challenges faced by the investor. Based on the spatial analysis, site B was selected for its particular safety character against hazards. Within the site, it was also possible to highlight the application of urban planning aimed at boosting the development of the area, creating an enabling and attractive environment for economic opportunities, and bolstering the emergence of new business businesses and new investments.

In addition to site A, site B provides an opportunity to show how strategic recommendations and actions can be implemented at the neighbourhood scale. The project will demonstrate the principles of adequate density, accessibility and walkability, and an inclusive, vibrant, and resilient urban environment.

The site is adjacent to the riverbank stretching along the northern side of the project area and comprises several abandoned industrial buildings. Such proximity to the river creates an opportunity of integrating the "Blue" network with the built environment. Due to the steep slope and varied topography of the river, the project proposes a series of wooden platforms along the riverbank that serve as viewing points overlooking the river. This design solution seeks to integrate and bring use to the "Blue networks" by creating a sense of proximity to water, while also ensuring safety for the users of the promenade.

The largest building that appeared to be abandoned has dimensions of 122X25 m and is partially in a good condition. The building can be a good opportunity for urban regeneration and upgrade, and a variety of functions can be included in it, which could create employment opportunities in the future.

The eastern part of the site has a stone-cutting industry that might be relocated or remain at the same place if safety measures, a green buffer, and appropriate protection of the zone is ensured. In addition, the industry is adjacent to the strategic zone of Khorog, therefore, the project proposal ensures an appropriate buffer zone from the strategic zone including rows of buffer vegetation. Additional functions such as non-residential functions (industry, commercial buildings) would also act as a buffer between the strategic zone and mixed-use/ residential development.

The site is characterised by a relatively flat topography which creates opportunities to boost accessibility within the area and implement a barrier-free pedestrian oriented space. The intense topography around the site and the view on the site from the other side of the river should be considered by providing pedestrian linkages into the proposed "slope parks" (with specific viewpoint areas) and ensuring a pleasant environment within the project (attractive riverbank, high quality architectural design of housing, landmarks, public spaces, vegetation, etc.). Furthermore, any visual pollution should be strictly avoided/ prohibited.

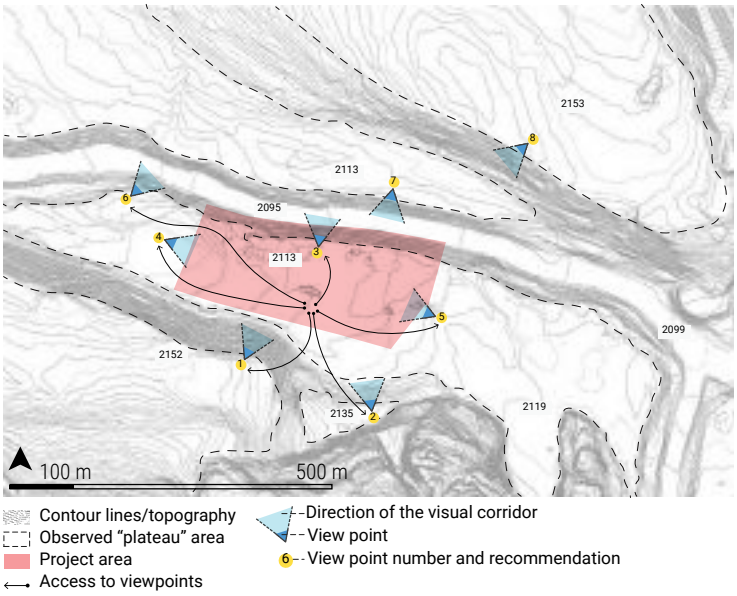


Fig 65. Analysis of topography of the site B

1 The project area should ensure a pleasant view of the viewpoints at the upper levels (e.g. green roofs, vegetation, low and medium-rise buildings.). Any visual pollution should be prohibited (high-rise, abandoned structures). The place of the viewpoint can serve as a public space (slope park) to observe the developed project area.

2

7

8

3 The viewpoints have a picturesque view of the river. The project site should be pedestrian-friendly with access to the green boulevards and to wider pathways and sidewalks, ensuring access to the river.

6

4 The project area is significant in terms of dimensions and includes a vast area of the riverbank. The project areas should be designed to provide a variety of pedestrian links, access to the river and public space. Due to potential high levels of pedestrian circulation, the architecture should create a pleasant and attractive built environment.

5

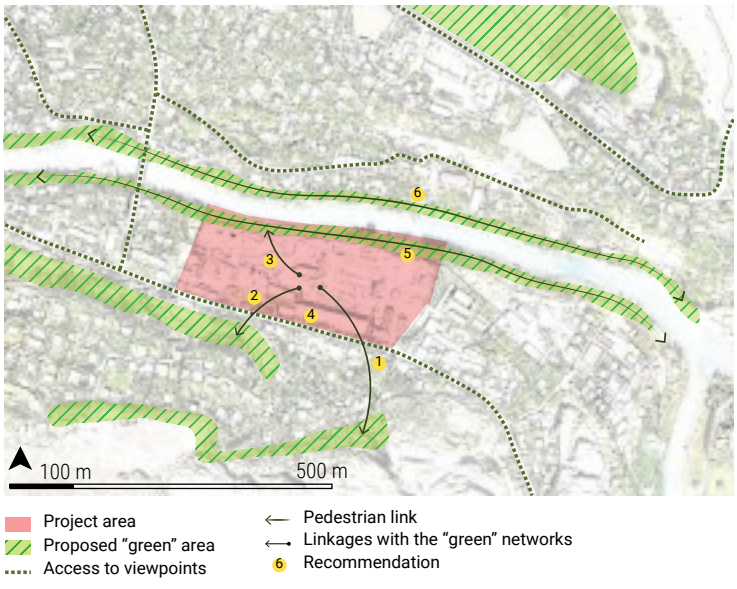


Fig 66. Analysis of "blue and green" networks of teh site B

1 The project site is adjacent to several slopes, which should be integrated into the urban fabric. The project proposal can leverage from the slopes due to the picturesque view from the upper levels. Organised terraces with places to sit, rest and play can be organised. The pedestrian access to the sloped public spaces should be ensured.

2

3 The project has a vast area adjacent to the riverbank. This provides an opportunity to create a walkable riverfront for communities to enjoy. The project proposal should include a variety of pedestrain linkages to the riverfront.

4 The project area is adjacent to the "main loop" which is multimodal and includes the public transport loop. The street should include vegetation for comfortable walking and cycling.

5 The riverfront should serve as a vibrant public space with access points to the river to allow communities to enjoy the view. The riverfront should be free from any capital development. Pocket public spaces, pocket parks and context-specific vegetation for the bank stabilisation should be ensured.

6 The project area should also create a pleasant view for the other side of the riverbank. Any visual pollution (high-rise development, industries, etc.) should be avoided. Furthermore, low and medium rise residential development, with a good architectural quality should include public spaces and green open spaces that would also benefit the communuties located on the other side of the river.

The project area is adjacent to the "main loop" providing an opportunity to demonstrate how the current street section can be redesigned following the concept of the "Complete Street". Due to the flat topography, the site may include several entrances to the mixed-use neighbourhood and promote a pedestrian oriented space within the built environment.

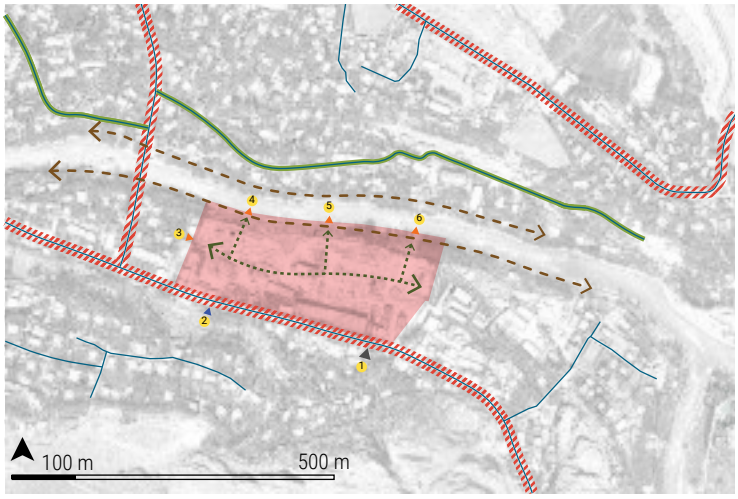
The surrounding area is represented by scattered patches of houses with plots of land and/or private gardens. Once site B is developed, including opportunities for economic development and employment, it will accelerate the development of the surroundings, and its urban and economic densification. The project proposal demonstrates how the densification process should happen, bolstering the local traditional culture of spatial organisation (e.g., having a possibility to do gardening, semi-private courtyards, etc.)

During the second phase of the project, the team conducted participatory activities (see Community Participation and Stakeholder Engagement Report) to collect feedback and data on the two pre-selected sites A and B. As a result of these activities, it was determined that site B has the potential to significantly change the accessibility to services for the surrounding communities by including school, kindergarten, sports playgrounds, and other services. In addition, the design proposal addresses several identified concerns in terms of road safety and lack of green spaces.

As seen and suggested within the scope of the proposed projects, site B is a strategic regeneration node that will emerge into a new centrality and a new point of attraction for the city. The strategic location of the project area next to the major route of public transportation, a long stretch of the riverbank which itself is subject to reinforcement and improvement, a multimodal bridge, and secondary green boulevards, are critical determinants for the activation and economic viability of the new mixed-use development.

In the meantime, the new multifunctional mixed-use development together with high levels of density will ensure the increase of economic activities, which will later support the viability of . For example, the new mixed-use development will create an enabling environment for small business along the riverbank as well as green boulevards. Furthermore, the increased pedestrian circulation will facilitate the emergence of small businesses in the surrounding areas.

The objective of the design proposal is to develop an integrated, vibrant, and resilient mixed-use neighbourhood that would accelerate the transformation not only of the area, but also of the entire city.



1 The project area has one main access through the proposed
2 "main loop" via public transport. The proposed street section should ensure safe and comfortable circulation and multimodal mobility patterns, taking into account future flows to the site. To ensure pedestrian-priority space, the access to the underground parking should be located in proximity to the access.

2 The secondary access is insured through the "main loop". To ensure pedestrian-priority space, the access to the underground parking should be located in proximity to the access.

3 The project site is located within a dense urban area and should be connected to the surrounding areas. The pedestrian linkages should be ensured in the design proposal to provide the surrounding areas with walkable and pleasant routes.

4 The project area has a vast area adjacent to the riverbank. That
5 provides an opportunity to create a walkable riverfront enjoyable for communities. The project proposal should consider
6 pedestrian access to the river, decks as public spaces and small pocket parks.

Project area
Current street network
Proposed transport link
Main loop
"Green"boulevard
Access between levels
Access to the project site
5 Recommendation
Recommended pedestrian pathways
Recommended pedestrian-pathway within project area

Fig 67. Connectivity analysis of the site B

1 The project area has one main access through the proposed
2 "main loop" via public transport. The proposed street section should ensure safe and comfortable circulation and multimodal mobility patterns, taking into account future flows to the site. To ensure pedestrian-priority space, the access to the underground parking should be located in proximity to the access.

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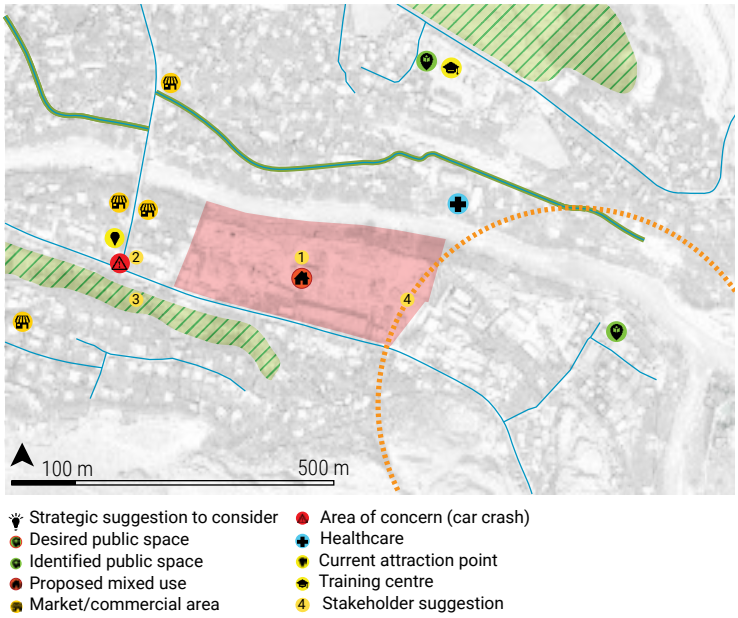
5 provides an opportunity to create a walkable riverfront enjoyable for communities. The project proposal should consider
6 pedestrian access to the river, decks as public spaces and small pocket parks.

Fig 68. Analysis of the urban fabric of the site B



1 The selected sites are suitable for development which was confirmed by the local government. Mixed-use development should be promoted and include employment opportunities. Employment strategy will be essential for the proposal. (Compact manufactures, small industries, etc.)

2 The intersection should be redesigned to ensure safe and smooth transport circulation. The project proposal should demonstrate the appropriate street section that ensures safety and comfort for all street users.

3 The slope that is adjacent to the project area may be used as a public space or have some terracing for slope stabilisation with some pedestrian paths that would facilitate the integration of the slope with the urban environment.

4 The surrounding areas are lacking several social facilities (schools, kindergartens), sports and playgrounds. The project area should include those services to cover the deficit in this part of the city. The capacity of these facilities and the number of services should be estimated.

Fig 69. Outcomes of the communuty engagement session for the site B

As seen and suggested within the scope of the proposed projects, site B is a strategic regeneration node that will emerge into a new centrality and a new point of attraction for the city. The strategic location of the project area next to the major route of public transportation, a long stretch of the riverbank which itself is subject to reinforcement and improvement, a multimodal bridge, and secondary green boulevards, are critical determinants for the activation and economic viability of the new mixed-use development.

In the meantime, the new multifunctional mixed-use development together with high levels of density will ensure the increase of economic activities, which will later support the viability of . For example, the new mixed-use development will create an enabling environment for small business along the riverbank as well as green boulevards. Furthermore, the increased pedestrian circulation will facilitate the emergence of small businesses in the surrounding areas.

The objective of the design proposal is to develop an integrated, vibrant, and resilient mixed-use neighbourhood that would accelerate the transformation not only of the area, but also of the entire city.

4.4.2. The program

The program of site B is based on the thorough diagnosis of deficits in housing and services, as well as on the analysis of planning parameters that are required by the local legislation. In this regard, the following amenities have been identified:

- 1 school
- 1 Kindergarten
- 1 community centre
- Public space
- Sports facilities
- Housing

In addition to the identified services, the design proposes specific spaces and services that complement the ones mentioned before. These functions will significantly contribute to the vibrancy of the built environment. Furthermore, the initiative aims for a mixed-use development involving neighbouring different functions within the neighbourhood while also promoting vertical zoning. Encouraging mixed-use development will enable and facilitate employment opportunities and thus the activation of the area. The first floors of the apartment blocks are suggested for commercial and public purposes, uses that are compatible with residential units (e.g., shops, offices, cafes and restaurants, small workshops, leisure, etc.)

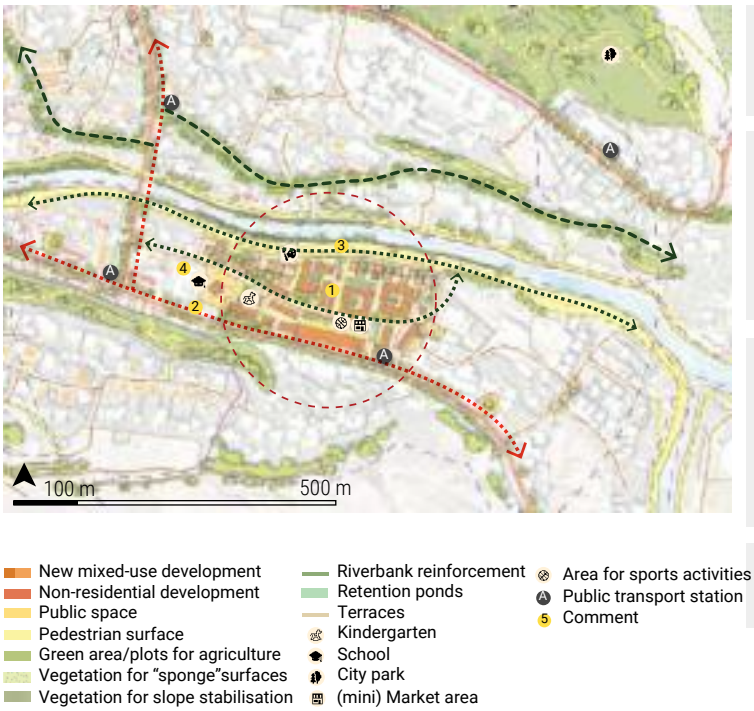
The blocks with commercial functions on the first floor are in proximity to each other to form a street section with specific proportions of the street enclosure, thus creating a positive perception of the built environment while facilitating higher levels of walkability. These commercial streets with stalls create a vibrant environment, attracting pedestrians to pass by and thus, enabling an environment for small businesses.

The small commercial buildings, cafes, restaurants are scattered along the riverbank, attracting people to use the pedestrian pathway along the river. Commercial functions support and activate the public spaces along the riverbank.

As well as within site A, following the mixed-use development approach, the design proposes the integration of a multi-functional Techpark within the neighbourhood. The Techpark is a business centre for innovation, technologies, and production. Site B offers an opportunity to integrate the Techpark by regenerating the under-utilized building block that is adjacent to the “main loop”. The Techpark of Site B may contain exhibitions spaces, workshops with different equipment, laboratories, green houses (on the rooftop), conference rooms, computer classes, cafes, as well as green open spaces for a diversity of outdoor activities.

The rest of the neighbourhood is represented by a diversity of housing typologies (apartments blocks that are tailored for a diverse composition of families as well as multi-family units) that have access to public, semi-private public spaces, and courtyards.

The diverse network of public space supports the idea to create a pedestrian oriented space, free of motorised transport. Social facilities (schools, kindergartens) are in such a way as to ensure that they can be accessed access those facilities using the car-free space. The project proposal aims to create a balance between a diversity of functions and spaces to ensure an inclusive, vibrant, compact, and resilient neighbourhood.



1 The project area is located in the strategic regeneration node and should perform high adequate levels of urban density to ensure vibrant economic activities and sufficient capacity to accommodate the required population.

2 The project area has direct access to the "main" loop, along which the economic activities will be enhanced. The access provides an opportunity to create an "activity cluster" with employment opportunities (e.g. technoparks, industries, business clusters, etc.). The good proposed public transport coverage and adjacent public transport stations create an enabling environment for business development.

3 The project area has direct access to the riverbank. Due to the steep slope, the riverbank should be designed in a way to provide visual access to the river and a safe walkable environment along the riverbank. The project area provides an opportunity to demonstrate the design solutions for the riverbank, linking it with the surroundings through the system of pedestrian pathways, boulevards, sidewalks, etc.

4 The project area is free of any risks and can accommodate a significant number of people. In addition, the proposed facilities will cover the deficit in services of the surrounding areas.

- New mixed-use development
- Non-residential development
- Public space
- Pedestrian surface
- Green area/plots for agriculture
- Vegetation for "sponge"surfaces
- Vegetation for slope stabilisation
- Riverbank reinforcement
- Retention ponds
- Terraces
- Kindergarten
- School
- City park
- (mini) Market area
- Area for sports activities
- Public transport station
- 5 Comment

Fig 70. Linkages to other proposed initiatives for the site B

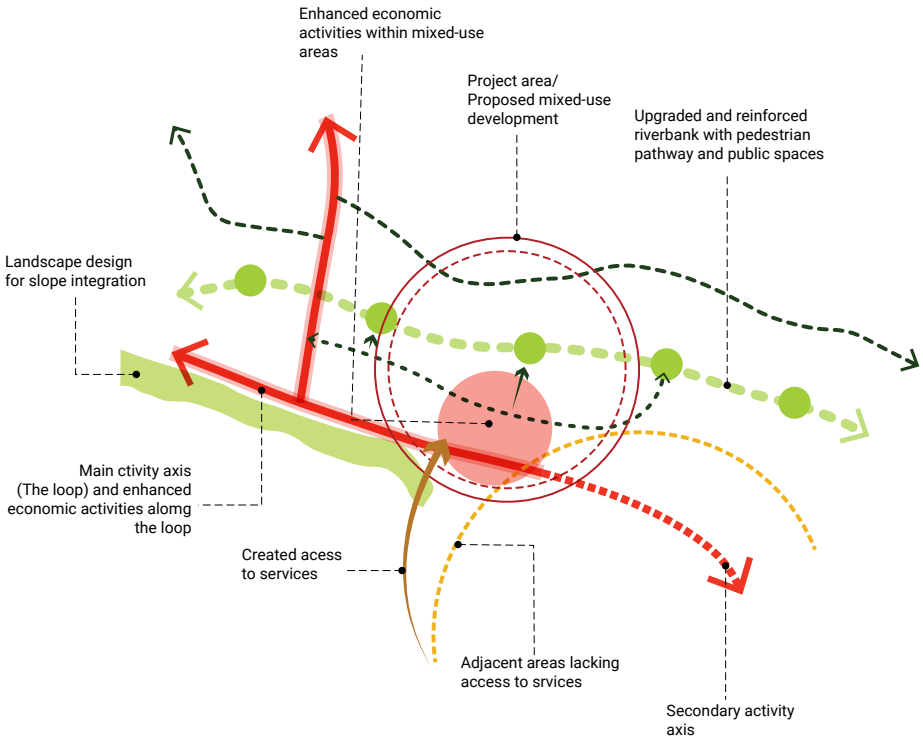


Fig 71. Diagram of proposed peoject correlations for the site B

4.4.3. Spatial organisation

FAR	1,2	
Site area (sqm)	58673	
Population	1500	
Density	260 p/ha	
Jobs	650	
Average number of floors	4,5	
Mixed use development	24738	37 %
Residential	16575	25 %
Commercial	8323	12,1 %
Social	2645	3,8 %
Public	4504,5	6,6 %
Technopark	8995,5	13 %
Industry	1671	2,5 %
Total FA (sqm)	67452	

Table 6. Projected planning parameters for site B

- Residential housing (multi family)
- Mixed-use development (residential + other functions)
- Social facilities
- Community centre
- Commercial buildings
- Technopark/Multipurpose space with variety of indoor activities (sports, leisure, art, commercial, etc.)
- Only pedestrian barrier-free surface
- Only pedestrian barrier-free surface of the Technopark
- Areas for communty gardening
- Access street (pedestrian oriented)
- Main multimodal loop
- Sports ground
- Pedestrian oriented access surface to the riverfront
- Bike lane
- Pedestrian pathway

- School
- Kindergarten
- Community centre
- Hotel/guest house
- Cafe/restaurant/cinema
- Multipurpose space with variety of indoor activities (sports, leisure, art, commercial, etc.)
- Commercial area/complex
- Green house
- Area for community gardening
- Sports ground
- Park
- Industry
- Viewpoint/platform with a view on a river

4.4.4. Design approach

Project integration with the natural environment

As it was mentioned above, site B has a set of planning pre-conditions such as proximity to the water. One of the major objectives of the design proposal is to demonstrate how relatively high density can be achieved in harmony with the surrounding environment and natural features.

The project proposal has a high concentration of green open spaces as well as direct access to the riverfront. The buffer zone from the river is approximately 40 to50 meters to the edge of the façade to ensure the riverbank is preserved for public use. The riverfront has been designed to include pedestrian pathways with adjacent pocket public spaces and vegetation that create a pleasant walking experience. Due to the steep topography, it is suggested to accommodate decks/platforms that can be used as elevated public spaces to maintain the feeling of being close to the river, providing "spaces of respite" along the active riverside walk These spaces can serve as quiet rest areas, allowing for the observing the water along the lively and active riverside promenade.

The context specific vegetation along the riverbank will ensure the stabilisation of the slope, preventing erosion. The vegetation patches planted along the riverbank will create a smooth transition from the from natural to the built environment. The housing along the riverbank is represented by the 4-storey multifamily houses of different shapes to create a human-scale environment, pleasant for the communities including those on the other side of the river.

The network of pedestrian paths includes rows of trees to create shade and comfortable walking and cycling experiences. Pedestrian pathways are connected to the surrounding footpaths. On the southern side of the project area, pedestrian pathways are connected to the landscaped slope, that is proposed as public space in the form of terraces and staircases.

Fig 72. Proposed green network and infrastructure

Fig 73. The current condition of the site B, UN-Habitat, April 2023

Connectivity

The design also takes advantage of the location which is within the built-up area in proximity to the multimodal bridge that connects the main transportation loop. This allows for high levels of urban permeability and connectivity within the neighbourhood and the city. The project proposal should set a model of spatial development to show how new development should be linked with the existing urban systems rather that promoting isolated patches of monofunctional development that can only contribute to the fragmentation of the city.

Urban permeability is achieved through a variety of pedestrian routes within the neighbourhood: pedestrian sidewalks along the major streets, "shared spaces", and fully pedestrian pathways that ensure connections with the riverbank and with the surrounding areas. The internal space of the mixed-use neighborhoods is designed to be fully pedestrian, ensuring large-scale public space for community gatherings, festivals, Sunday Markets, and a variety of outdoor activities. This space allows it to function both as a vibrant space, and as a car-free circulation area safe for pedestrians and cyclists. The social facilities are located in the main car-free space, providing safe accessibility to the facilities and for users, particularly for children.

Mobility patterns

Site B has 4 defined street typologies: the main multimodal loop, access streets, "shared space" streets, and fully pedestrian streets. Each type aims to create a safe circulation for each mobility type while encouraging more walking and cycling experiences within the neighbourhood.

The project proposal aims to encourage pedestrian and cycling movement and a car-free environment within the neighbourhood. For this matter 4 parking sites have been allocated in an underground car park, along the major transportation loop, as well as on the internal access roads. These parking areas are aimed to host transport opportunities for both residents and visitors. The parking spaces are i close proximity to all neighborhood amenities, thus once the user has parked their vehicle, there is no need to use motorized transport.

Regarding The "Shared Space", it is designed to be used mainly by pedestrians and cyclists, however, it should be always flexible to be used by emergency vehicles and for any special need. In addition, the "Shared spaces" have on-street parking that may be used for special occasions that require significant number of visitors such as forums, festivals, etc.

Furthermore, the "Shared Space" should be signalised using pavement or tiles to indicate priority for pedestrians.

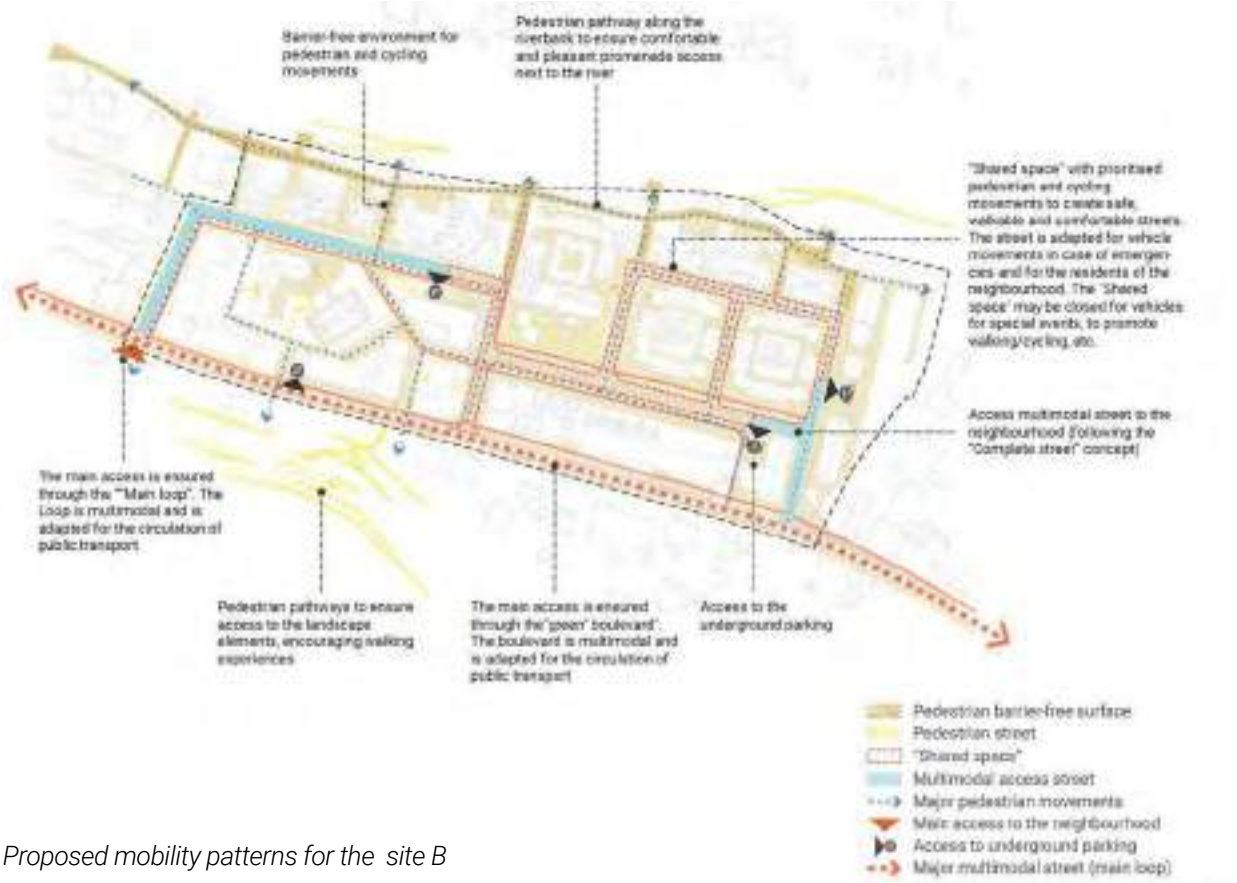


Fig 74. Proposed mobility patterns for the site B

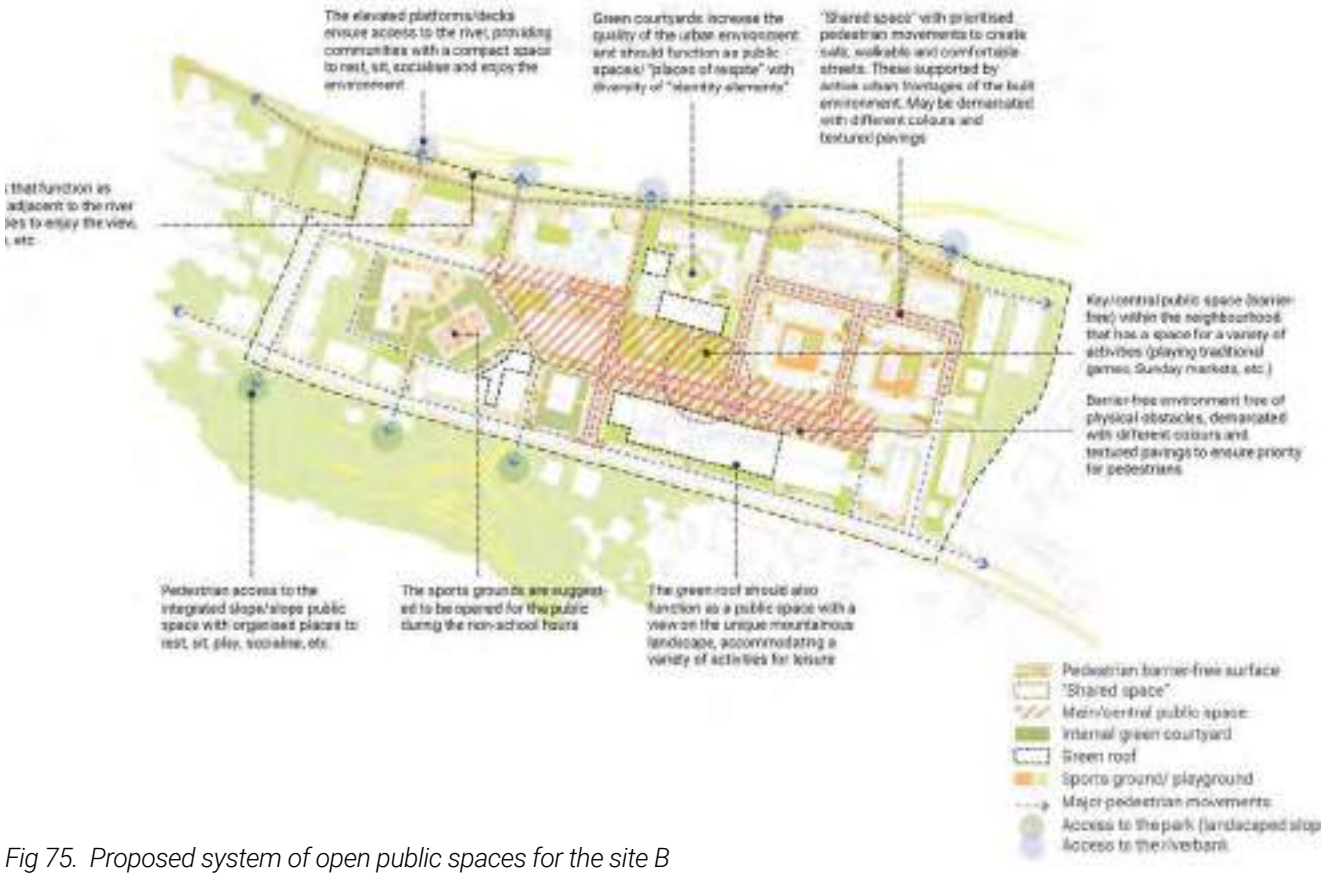


Fig 75. Proposed system of open public spaces for the site B

Density and compactness

The design proposal aims to ensure a vibrant and compact neighbourhood showcasing how well strategic densification functions. Compactness can be achieved with an average density of 300 inhabitants per hectare. Such is the case with site A. In this site the density is twice as high as the highest density indicator in the central part of the city (125 p/ha). This type of densification is achieved by medium and low-rise mixed-use development that consist of a variety of housing typologies. This type of urban fabric follows Khorog's urban design guidelines that state that the height of buildings is limited to a maximum of five stories to ensure safety, cost efficiency of construction, and maintenance.

To ensure inclusivity, the project proposal includes a variety of housing typologies targeting different social groups and thus providing increased housing opportunities for residents with low-income. The project proposes three main housing typologies:

- **Multi-family houses:** these five-story houses can accommodate from 6 to 10 families per building block. Some of the multi-family houses include small commercial spaces, or adjacent space that can be used as a shop or a restaurant. Since the multi-family houses are located along the riverbank, small commercial spaces will create a vibrant riverbank with public spaces, small cafes, kiosks, and shops.
- **Apartment buildings:** these are larger, multi-functional housing blocks that contain dozens of apartments as well as multipurpose spaces on the ground floor. The ground floor can include commercial spaces, workshops, shops for leisure and education, cafes, etc. Active street frontages of the mixed-use apartment create vibrant commercial streets within the neighbourhood. Some of the apartment units located in the mixed-use complex have either green roof, greenhouses, and terraces These areas have the flexibility to also be used as open cafes, places to sit and rest, etc.
- **Low-cost/affordable housing:** this housing is represented by mixed-use apartment units of various sizes and dimensions. Each unit has separate access through the gallery/terrace, as well as a small private plot of land for gardening. These units are designed to also allocate internal courtyards (30x30), playgrounds and places with "tandirs"(local oven to bake bread).

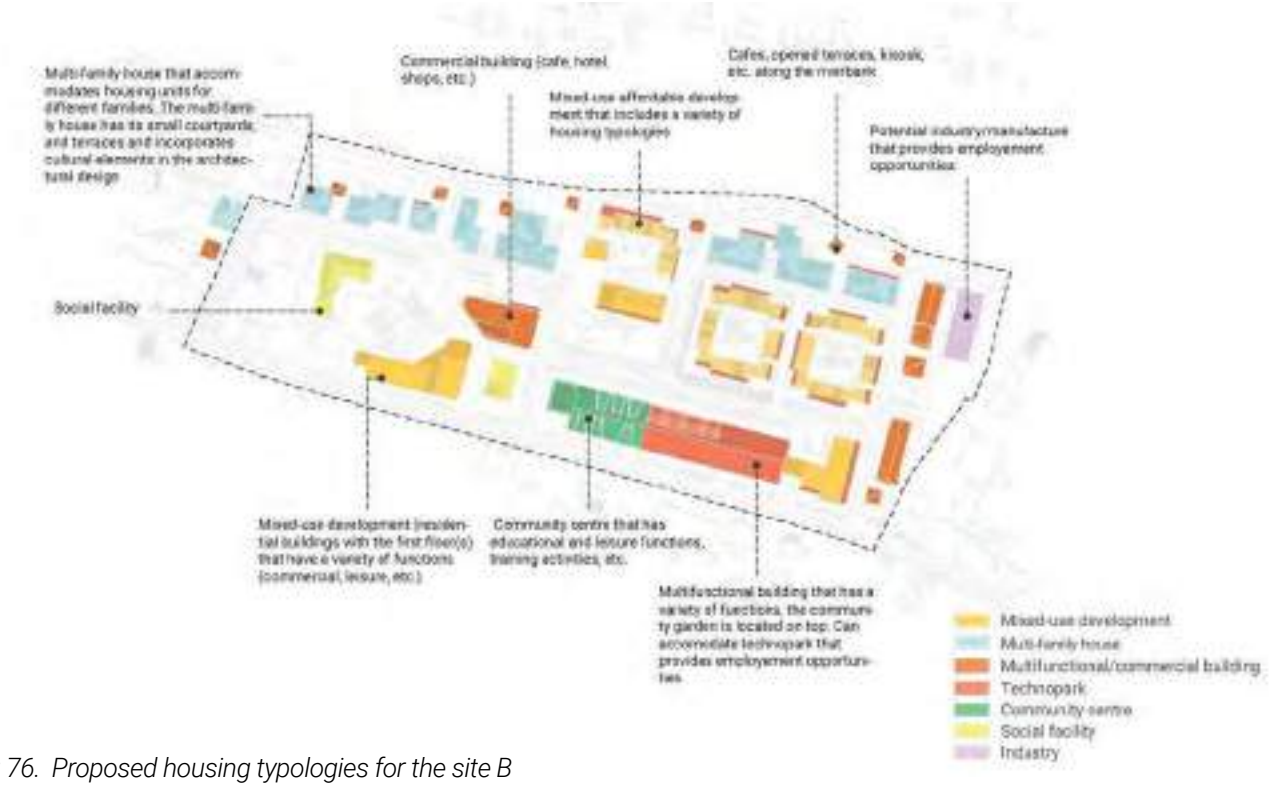


Fig 76. Proposed housing typologies for the site B

Fig 78. Example of residential block (affordable housing)

Fig 77. The existing structures of the site B, UN-Habitat, April 2023

Preserving the spirit of the site

As well as site A, site B has several post-industrial structures that may be of interest for artistic societies. The Regeneration, transformation, and integration of such structures into the urban environment will strengthen the identity of the place, showcasing how to leverage from the existing situation into the potential discovery of the project area. The project proposal for site B suggests the regeneration of the post-industrial building that is adjacent to the main multimodal loop. The building has a dimension of 122X25 meters and has a partially solid structure that can be maintained, upgraded, and then integrated into the new functionality of the building. The dimensions of the building provide opportunities to create a multifunctional space with a diversity of functions ranging from small environmentally friendly industries and laboratories to commerce, leisure, education, and sports.

The regenerated building block can become a new attraction at the city level. The spacious major public space that has dimensions of 65x40 m will contribute to be transformed into an activity cluster by providing sufficient space for outdoor activities, traditional games, outdoor markets, festivals, etc.

In addition to regeneration of the building block, it is suggested to integrate a post-industrial construction crane into the site. The crane is in the major public space adjacent to the activity cluster and can be transformed onto a staircase and an elevated bridge leading to the green roof of the regenerated building block. The green roof can be used as a public space, and open terrace, with the possibility to grow plants

Fig 80. The current state of the project site, UN-Habitat, April 2023

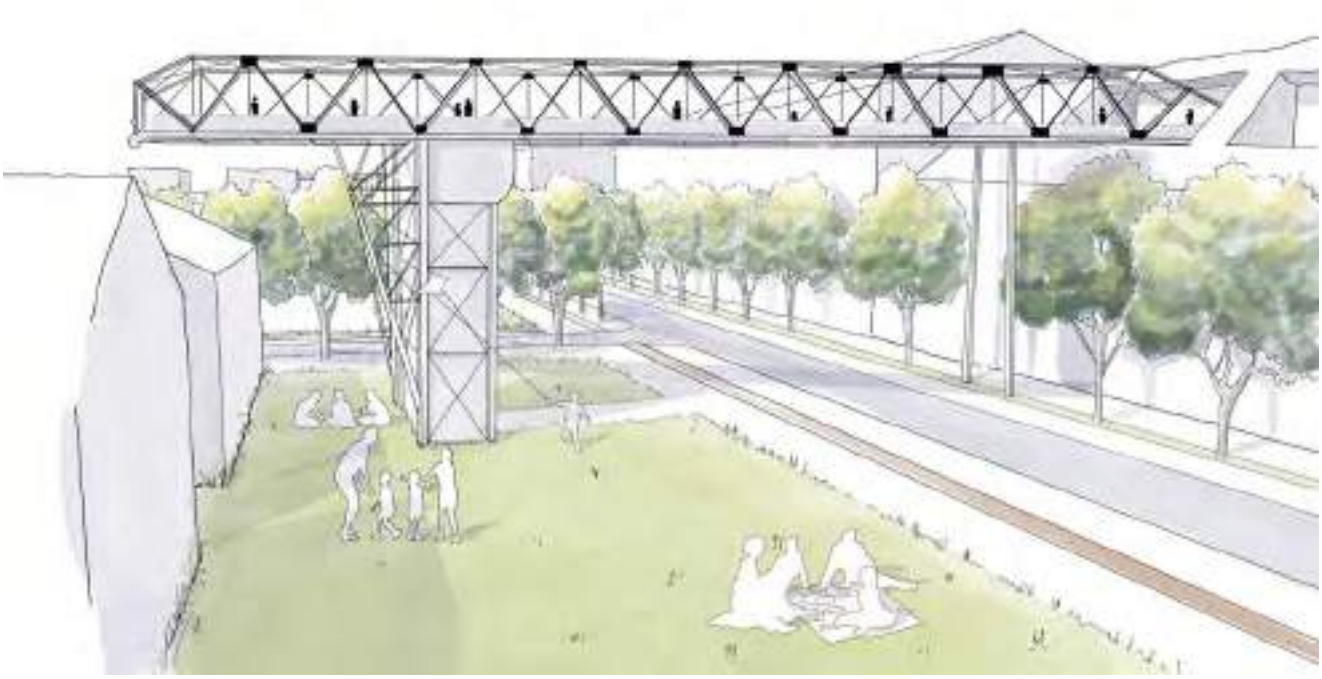


Fig 79. Integration of the existing structures (crane) in the design

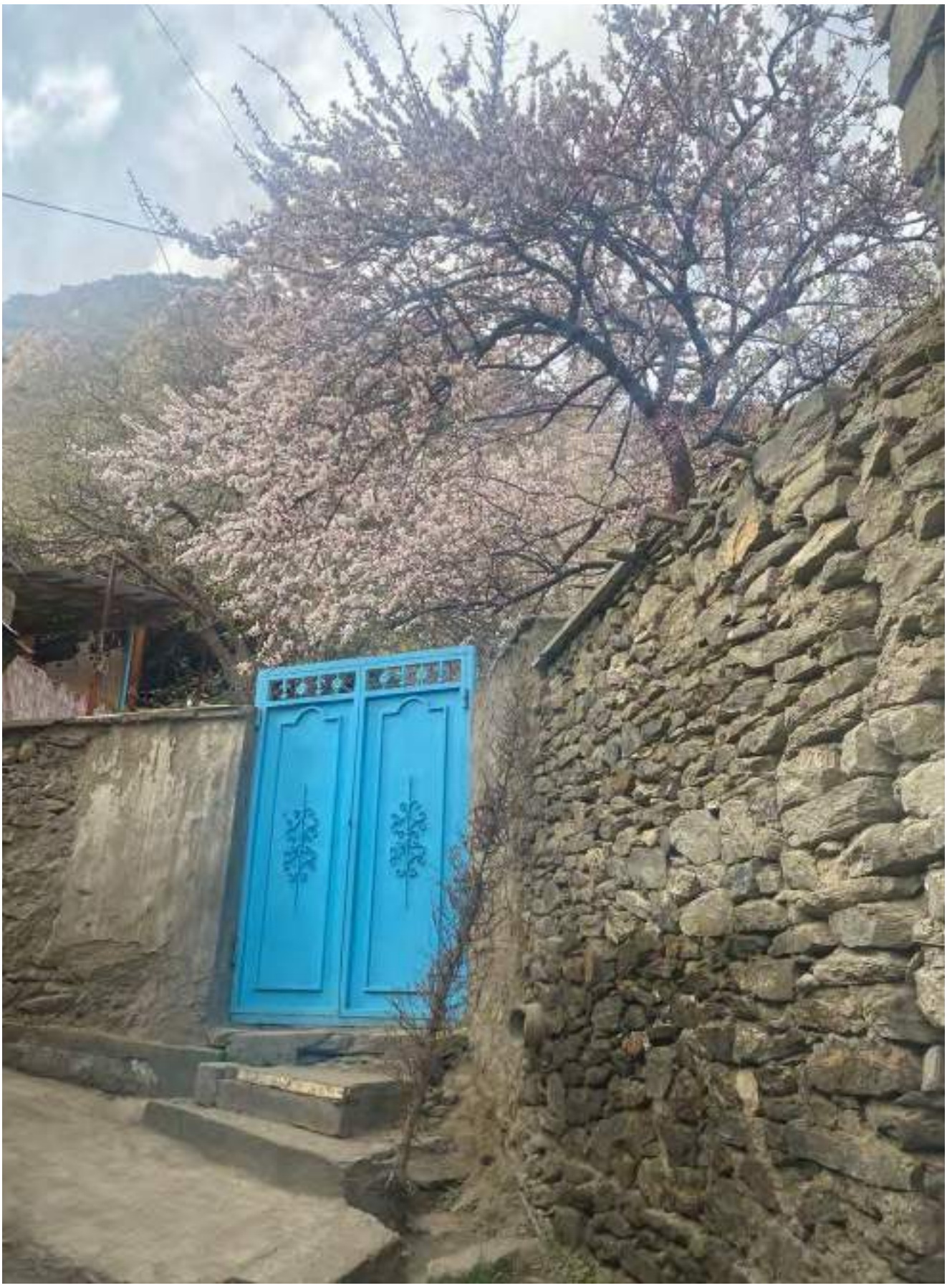


Fig 81. The entrance to the private property in Khorog, UN-Habitat, April 2023

4.5. RESILIENT STREETS

As it was defined during the first phase, the current street network of Khorog has sufficient capacity in terms of street dimensions to provide accessibility to urban services. Based on the spatial analysis and the outcomes of the participatory consultations with the stakeholders, It is suggested to establish a clear street categorisation that would help in developing consistent guidelines for street design and maintenance. Figure 83 shows the suggested actions to define street categorisation following the specific functional purpose of the street, design standards, and intended use. The suggested functional hierarchy includes the following:

- The main central street (the "loop") - an active street that prioritises safety for pedestrians and has a public transport line. The central street should be designed as a vibrant urban corridor with a variety of functions and activities.
- "Green" Boulevards - a street that combines the functionality of a multimodal street with an emphasis on incorporating greenery and natural elements. "Green boulevards" are designed to create visually appealing, environmentally friendly, and sustainable urban corridors.
- Multimodal access streets - complete streets or balanced streets should accommodate multiple modes of transportation with an emphasis on pedestrian movements and cycling. In some cases, it is suggested to promote "shared spaces".
- Pedestrian pathways - purely pedestrian routes that are designed to constitute a city-wide interconnected system of pedestrian infrastructure that links key services, natural areas, public spaces, etc.

Due to the local regulations and requirements for the current street section, the streets are wide enough to accommodate the suggested interventions without disrupting or demolishing the existing structural elements.

Figure 83 shows that the majority of actions include the street redesign and a few suggestions for the new construction of the access roads. Figure 85 demonstrates how the main street (the loop) can be redesigned following the principles of the complete street without increasing the width of the section and demolishing the existing structures.

It is important to note that every street is unique, so the redesign should consider the specific needs and characteristics of the place (proximity to facilities, public space, etc.)

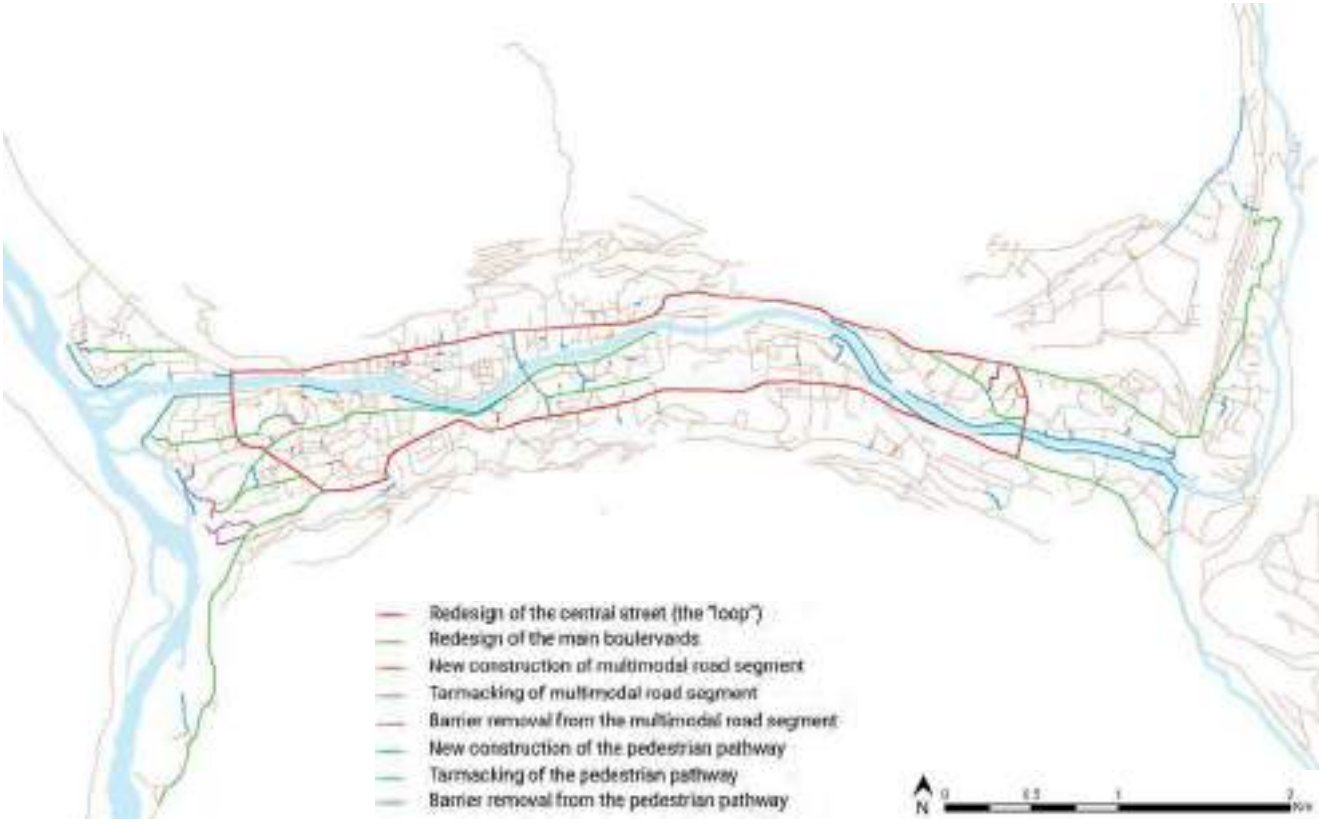


Fig 83. Pedestrian pathway along the riverbank in Khorog, April 2023

Fig 84. The cureent state of the main street, UN-Habitat, April 2023

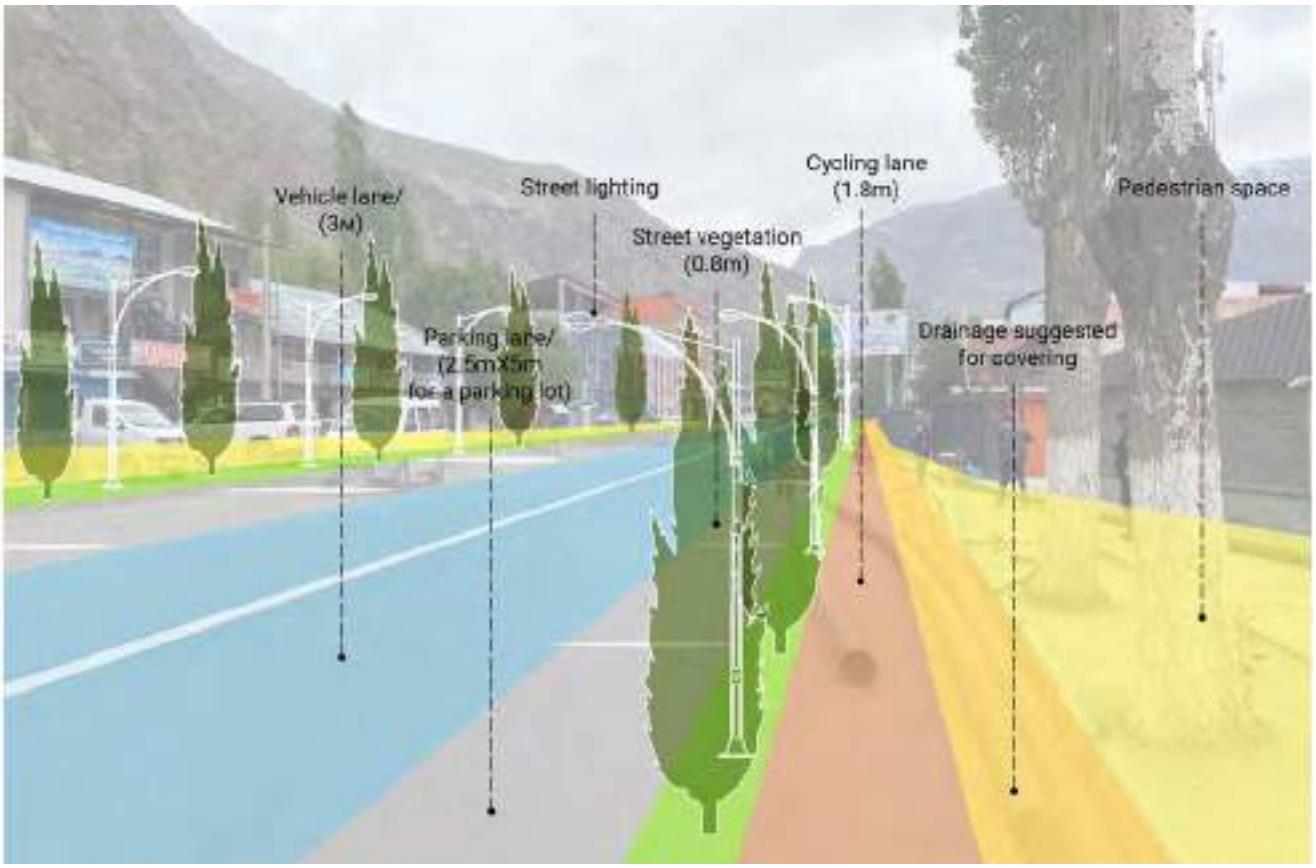
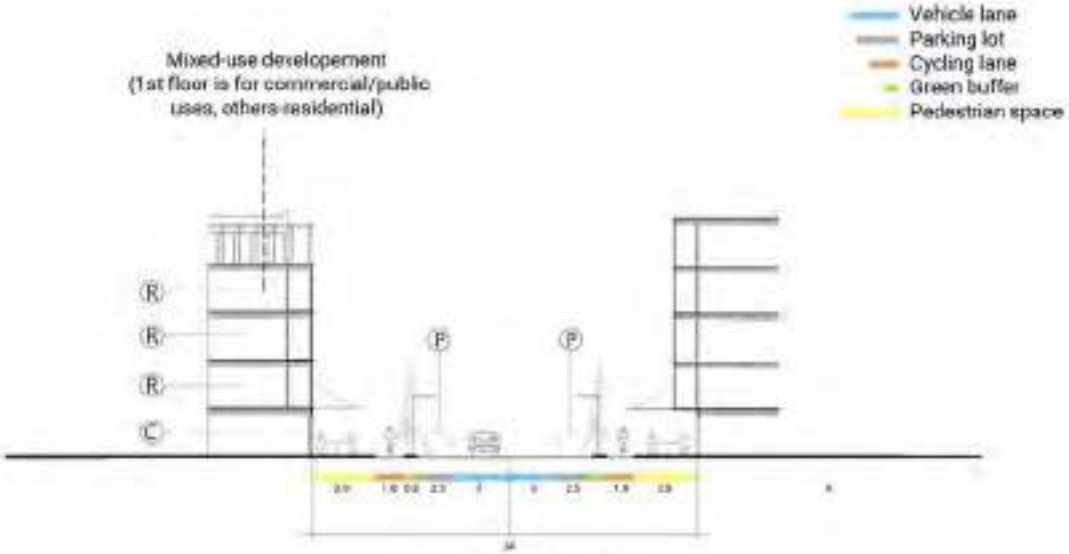


Fig 85. Proposed street redesign of the main "loop"

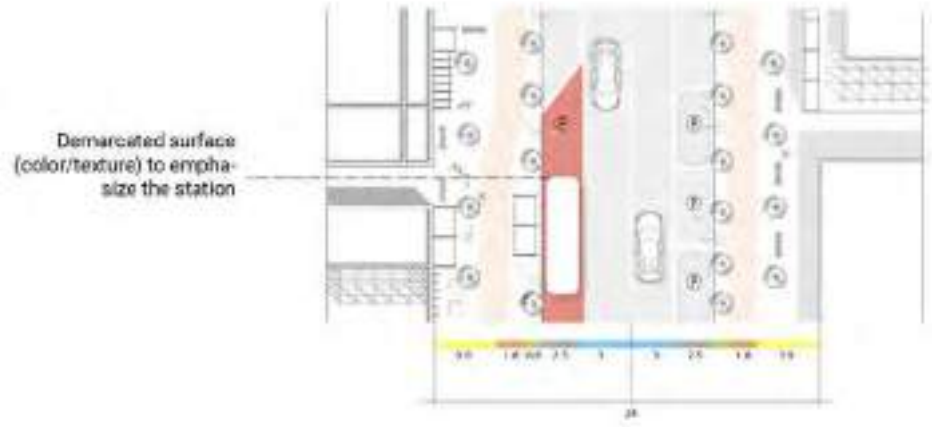
Reccomendations for the street redesign of the main loop, “green”boulevards and multimodal streets

Street section



Street plan

Street plan
(the case of public transport line)



The suggested design recommendations can be applied to multiple types of streets. The main loop, green boulevards and multimodal streets should be designed following the principles of the "complete street", an urban design approach that aims to create streets that are safe, accessible, and enjoyable for all users, including pedestrians, cyclists, motorists, and public transport users.

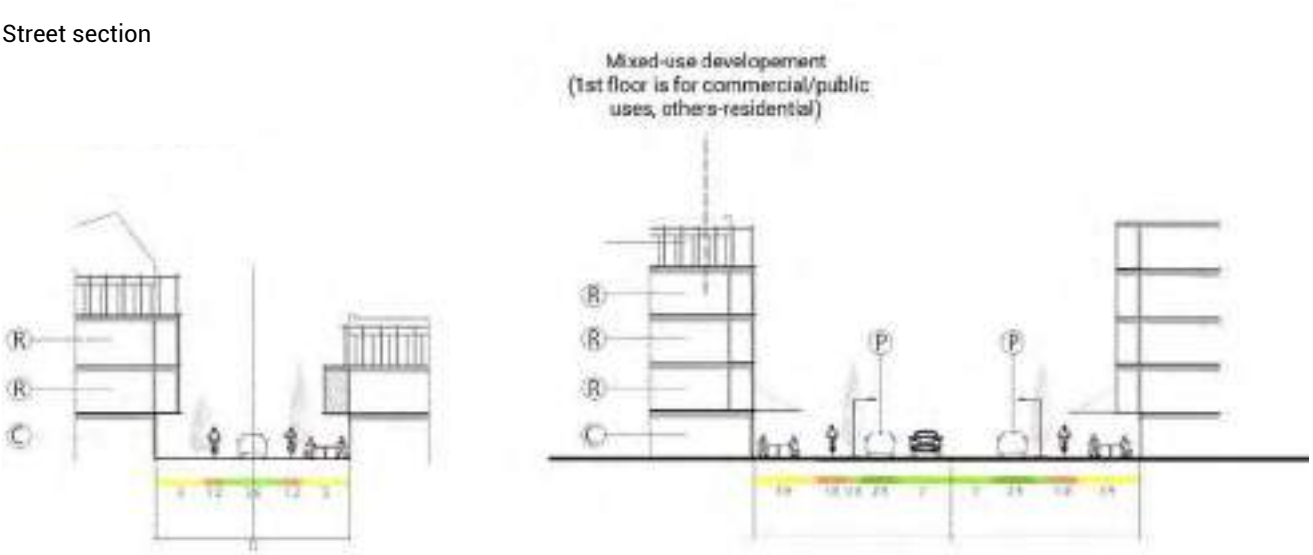
For the main loop, the well-designed pockets for public transport stops should be organised for safety reasons and to prevent congestion. The driveways and the cycling lanes should be separated by the vegetated buffer (which can incorporate a covered drainage system) and the line of regularised parking spaces (where applicable, close to major services). To avoid vast surfaces of pavement, some parking spaces should be converted into "parklets", small public spaces designed as extensions of the sidewalk, providing additional space for seating, greenery, bike parking, and community activities.

Using the adjacent underutilised spaces as public spaces will transform the current streets into vibrant corridors Depending on the surrounding context, the width of the street and its function (main loop, boulevard, access road, etc.), the application of complete street principles may vary, keeping an emphasis on prioritised movement for pedestrians, cyclists and public transport users.

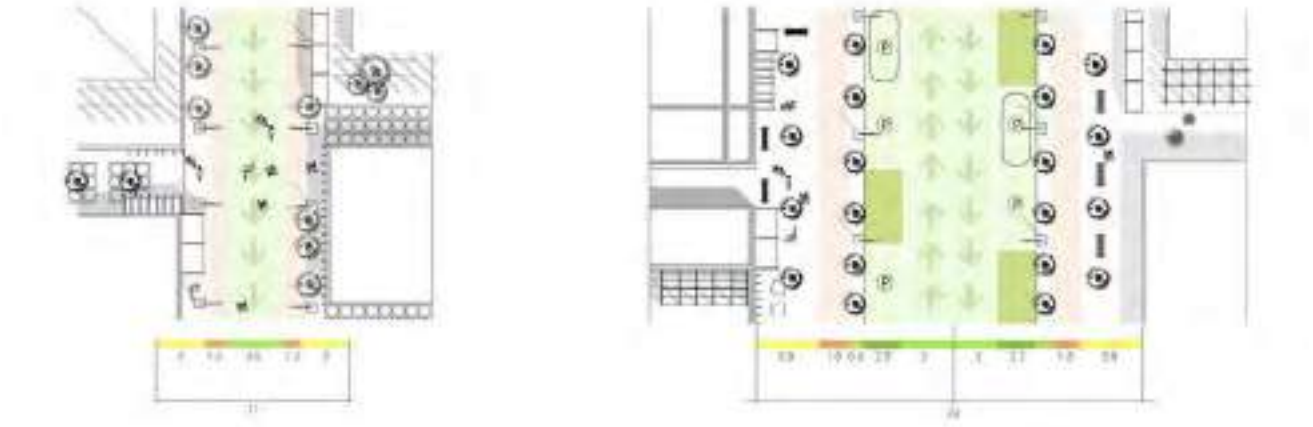
"Shared space" is another concept piloted in the demonstration projects. It is aimed to create a harmonious and safe environment by reducing the traditional segregation between pedestrians, cyclists, and motorists. It is important to ensure prioritised pedestrian needs and safety. Demarcated surfaces and similar paving materials can be used across the entire space, blurring the distinction between pedestrian and vehicular areas and emphasizing the sense of the space as "pedestrian-oriented". This and other elements aim to encourage slower speeds and make vehicles adapt to the rhythm of pedestrian movements.

Reccomendations for the "shared space"

Street section



Street plan



As it was identified during the fact-finding mission in Khrorg, multiple pedestrian streets are blocked by fences, construction materials, etc. To increase the levels of urban permeability, which is crucial for safety and resilience, it is suggested to ensure clear pedestrian pathways with eventual pocket public spaces. The citywide network of pedestrian pathways should ensure appropriate width, minimum and smooth changes in elevation (especially when designing the pathways along the slope), Adequate lighting (important to consider energy efficient lighting), clear signage and wayfinding elements, amenities for comfortable walking experience (this can include seating areas, rest stops, drinking fountains, waste bins, and public art installations).

Pedestrian streets should be integrated with the city-wide pedestrian network, a comprehensive system of interconnected pedestrian pathways, walkways, and sidewalks that span across an entire city.

Creating a city-wide pedestrian network can significantly enhance walkability, promote active transportation, reduce reliance on cars, and foster a vibrant and inclusive urban environment. In addition, pedestrian pathways that connect Khororg landmarks, public spaces and services will create an enabling environment for tourism and entrepreneurship.

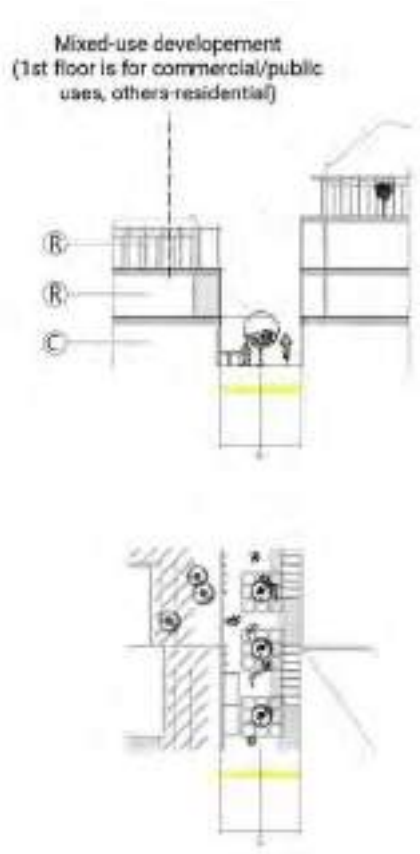


Fig 86. Street view in the central area of Khorog, UN-Habitat, September 2022

4.6. SUPPORTING SOLUTIONS TO BOOST ECONOMIC ACTIVITY

The two transformative areas include a variety of spaces that can be used for boosting employment opportunities. These spaces can be transformed into innovation and technology hubs, new industries, creative and productive clusters, etc. To do so, it is critical to develop non-spatial strategies that can bring together a variety of actors such as both the regional and the local government, NGOs, and related experts from the country and from international contexts. The Development and implementation of an employment strategy that is based on diversification of local economy should be put into place to ensure an optimal operation of the and activation of the transformed area.

Regarding the employment and economy diversification strategy, below is a summary of the suggestions and ideas that were developed in a consultative manner with technical stakeholders and the local government.

4.6.1. Innovation and technology hubs

Innovation and technology hubs (Technopark): These are the scientific, technological, and technical bases for the implementation of innovative projects. Techparks can be created not only in large cities, but also in small towns. The critical factor to establish a techno park is the technical potential and/or high demand for development. Techparks thrive particularly in science cities. Considering the location of the University of Central Asia in Khorog and the political will of attracting experts and businesses to the region, these technology/ innovation hubs will support the already existing and emerging trends, strengthening the identity of the city. The scale of the techparks should be appropriate to the size of the city and could also be relatively compact. However, their efficiency and impact can be further enhanced by allocating considerable areas that might be challenging to use.

Such complexes consist of research institutes, business centers, industrial facilities, exhibition sites, commercial spaces and sometimes some public functions (training centers, libraries, sports halls). It is crucial that such hubs have well-designed access, systems or entrances, and have sufficient capacity (both indoor and outdoor) for a variety of activities. Techparks should have enough availability for office spaces, coworking spaces, workshops equipped with diversity of tools (e.g., computers, screens, printers, etc.), spacious common areas where people can rest and socialize, laboratories, concert/presentation halls, areas for exhibitions and events, multipurpose spaces, and both internal and external common areas.

While allocating functions to the spaces of the techparks, is important to ensure compatibility of these functions and mutual benefits. Another important component to consider while planning a technopark is to ensure the concentrations of small and medium companies in a single complex rather than attracting big corporations. In this situation, synergy can be achieved through the deployment of shared equipment, certification centers, engineering, and other elements.

Another important factor is the atmosphere of the technopark and the active communication of its residents. Even if they might not have direct cooperative ties with each other, It is important that the architectural design suggests a variety of shared spaces as well spaces that are opened to the public to ensure integration of such hubs into the social and urban systems. The spatial organization and overall design of techparks can play a crucial role in attracting technopark residents.

Thus, one of the major tasks of the Technopark management company is to design a creative environment and enrich the facility with diverse service functions that are in demand from the innovative business. Analysing the demands among such businesses will be a key step to ensure that the technopark actively targets specific types of tenants.

Some Spatial determinants for the successful implementation of a Techpark are as follows:

- Spacious volumes adequate to the size of the city to accommodate small and medium industries/ businesses
- A good level of connectivity (proximity to public transportation, good provision of access streets)
- Proximity to mixed-use development to ensure vibrancy of the area and their integration into social systems
- A variety of public spaces close to the Techpark and within the space to ensure a vibrant environment for residents to interact and rest.
- Proximity to public services to make a comfortable working environment for Techpark residents.

Below is the snapshot of the two proposed Techparks with indicative planning parameters and their corresponding potential number of employment opportunities. The employment opportunities were calculated considering a high level of intensity of working spaces (from 25 pp/m2)

In addition to providing spatial conditions for these type of hubs, it is essential to ensure optimal working mechanisms to attract Techpark residents, such as grants and tax incentives. A low rental cost of the premises should also be provided. Techparks can also attract international companies to build knowledge exchange and economic linkages.

The Tachpark of the site A - 8,850m2
Can generate around 170 job opportunities

The Tachpark of the site B - 9,000 m2
Can generate around 120 – 360 job opportunities

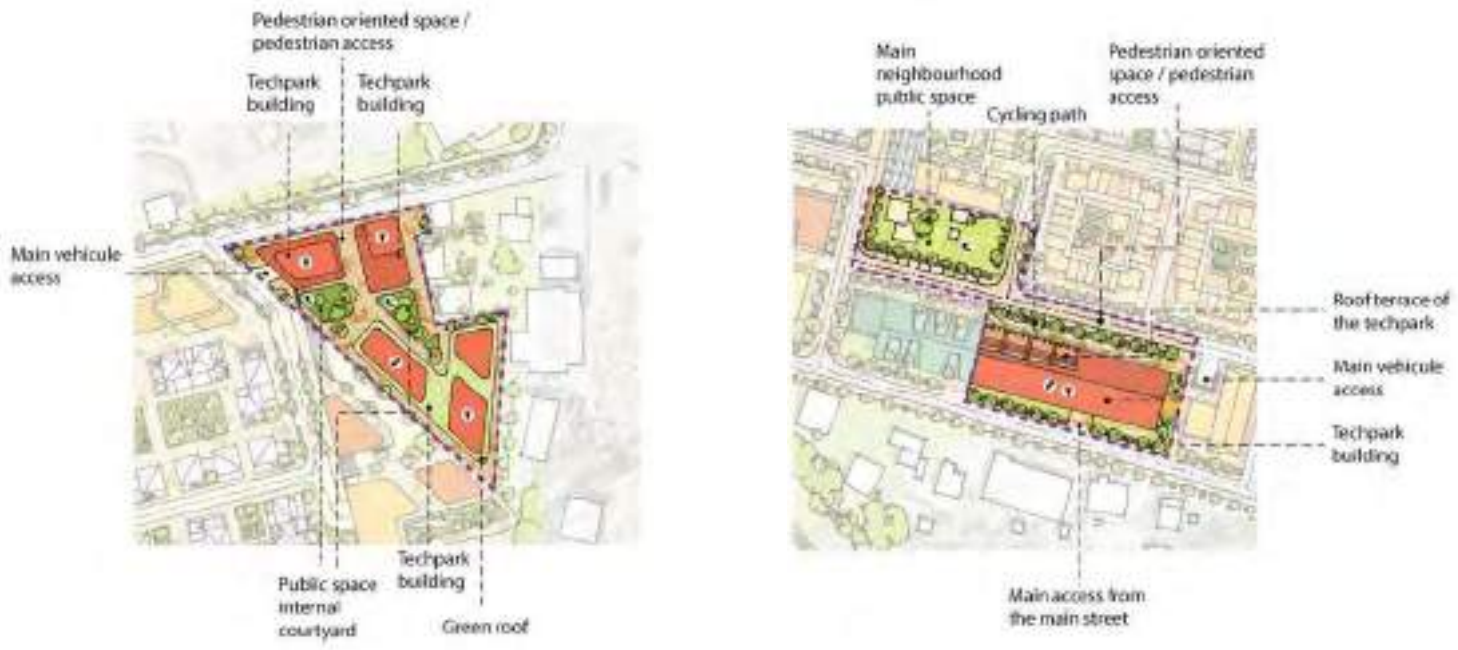


Fig 87. Spatial organisation of the techpark sites

4.6.2. Creative clusters

To support the creation of Techparks, emphasis should be put on the development of creative industries. The Creative cluster is a point of concentration of creative industries following the same rational as Techparks with an emphasis on art, education, creativity and small production practices (herbs, natural pharmaceutical products, organic food and wellbeing, handcrafts). Creative clusters often play an important role for the economic growth of a city, which is explained by their synergetic nature and influence on other sectors of the economy. For example, creative residencies are boosting the production of needed equipment and materials needed for artists and research.

However, the effect from such clusters is heavily dependent on the incentive mechanisms and the spatial organisation of creative spaces, which should ensure a high level of interaction between workers in creative industries. Both sites ensure such spaces through the regeneration of several blocks and through the integration of a variety of functions. As mentioned earlier, the abandoned industrial structures can be revitalized into art pieces, forming a unique identity of the place and attracting creative youth and talents to experiment, generate ideas, and produce artistic and creative work.

Creative clusters may attract both local and international creative industries and artists through special programs and agreements. For example, the creative residencies (or artist residences) aim to provide artists with a temporary workspace away from their usual environment and everyday life. Such residencies provide artists with the opportunity to explore new themes and materials, connect with various communities, experience life in a new location, and integrate that experience into their art.

Specific mechanisms such as research grants, research/ creative projects, and scholarships will attract both local and international artists and researchers which will significantly shape the local identity of the place, thus contributing to the local economy.

Tourism, health and wellbeing

The tourism sector provides immense opportunities for productive and inclusive jobs, grow innovative firms, finance the conservation of natural and cultural assets, and increase economic empowerment, especially for women, who comprise the majority of the tourism sector's workforce in Khorog. Khorog is already attracting tourists from all over the world, and once the airport is operational and connectivity within the region improves, the number of tourists will eventually increase. To boost the development of the tourism as an economic sector, it is crucial to follow the UN-Habitat strategic recommendation and spatial strategies which aim to preserve the unique environment of the city, leveraging from its topography and natural assets.

Fig 88. The view on the UCA, UN-Habitat, September 2022

The enhancement of the natural features is achieved through the design and amelioration of the public spaces and parks. This creates a system of interconnected open space areas and pedestrian pathways, an improved and revitalized riverbank, vibrant markets and streets, and allows for the future development of small hotels, etc. These types of initiatives will increase the attractiveness of the city, which will complement the eco-tourism sector, that is recommended as a focus area. The development of the tourism strategy should consider a variety of local activities that can be bolstered, such as hiking, fishing, gathering herbs, playing local games, and trying local food. Furthermore, Local landmarks and historic places, areas of traditional Pamiri houses should be preserved.

UN-Habitat suggests focusing on the development of tourism strategies involving a range of stakeholders to follow a participatory approach ensuring environmental, economic, and socio-cultural sustainability of tourism that aims to:

- Preserve environmental resources that constitute a key element in tourism development, maintaining essential ecological processes and helping to conserve natural heritage and biodiversity;
- Respect the socio-cultural authenticity of local communities, protect their built and living cultural heritage and traditional values, and contribute to inter-cultural understanding and tolerance;
- Ensure viable, long-term economic operations, providing socio-economic benefits to all stakeholders that are distributed, including stable employment and income-earning opportunities and social services to host communities, and contributing to poverty alleviation.

Small production

During participatory sessions with stakeholders and communities it was recommended to develop enabling conditions to boost entrepreneurship, Small and Medium Enterprises (SMEs) that can play a significant role in job creation. In Khorog there are various sectors that can be explored, such as herb and honey fabrication, elaboration of products from local berries (mulberry, sea buckthorn), textile and clothing, and a diversity of handcrafts.

Such types of small and medium enterprises will support the identity of the city by promoting the fabrication of local products. It is important to ensure environmental sustainability of production to make it possible to integrate the SMEs into the mixed-use development. Site B includes an area to locate any business that potentially has a buffer zone of 50 m from the residential area.

To develop the entrepreneurship strategy, it is suggested to conduct participatory workshops with a wide range of different stakeholders to understand the demands, skills, and resources needed to unlock sources of capital.

From the spatial perspective, the UN-Habitat recommendations suggest several elements that will create an enabling environment for business development, such as walkable neighborhoods, spaces for commercial functions and production, the network of public spaces and pedestrian pathways, etc.

5

IMPLEMENTING THE ACTIONS

The demonstration projects (Sites A and B) once implemented will facilitate the transformative process of the entire city by creating mixed-use economic nodes that will provide housing and employment opportunities. In addition, these nodes will function as new points of attraction for the city by showcasing sustainable ways of urban development that ensures human scale urban patterns, adequate high density, good connectivity, vibrancy, and integration with the blue and green networks.

The demonstration projects, being transportive by themselves, includes a variety of interlinked projects that ensure activation of these sites. For example, the mixed-use developed will create an enabling endowment for small business development, attracting more pedestrian flows, and thus, creating conditions for business development.

5.1. SITE A

Objective

The objective of the transformative area is to create a growth economic node 2 in Tabobatkhona and Barakat. Currently, this node provides several employment opportunities in public services provision, however, the private sector productivity in the area is low.

The demonstration project will encourage the emergence of private businesses and will attract investment opportunities due to its proximity to the public services, good connectivity, and strategic location near to the entrance to the city from the main road. Furthermore, the connectivity of the node will be supported by the vehicular bridge (Saifullo Abdulo to Sharifobod), which will bring traffic flow to the area and expand its service coverage to peripheral city neighborhoods. In addition, the construction of the bridge will connect the node with the airport and with the proposed economic zones, which will then create the enabling conditions for promoting more sectoral functions within the site A (food production, agricultural services, technologies, and tourism, etc.)

In addition to bringing new functions and services, the area aims to create a liveable and comfortable urban environment for communities both from the city and from its surrounding areas. By allocating a diversity of services targeting different social groups, the area will become a service hub with the goal of covering the deficit in education, healthcare, and leisure in the city and its surrounding areas. By doing so, more social cohesion through equitable service provision will be created.

Impact

Once the project is implemented it will accommodate around 800 people and provide 435 employment opportunities. This will not only be an alternative for those communities located in the areas prone to hazards but will also facilitate the efficient use of land resources within the built-up area.

The proposed IT park will create great business and employment opportunities, supporting the area as a new economic node. The suggested development area designated to hotels and apartments will attract tourism to the area, which is an important factor in popularizing local culture and production.

The demonstration project includes a school with 800 places and a kindergarten with 200 places. These, together with sports playgrounds that will be opened to the public, will cover not only the population demand of the new neighbourhood and its surroundings but will also take into consideration the potential growth of the area.

The proposals on green open spaces, vegetation in the urban centres, urban farming initiatives, and the integration of the slopes into the urban environment will create an intertwining and interconnection between Khorog and its unique nature and landscape, thus developing an attractive environment for residents and tourists.

Instead of a gated area of underutilized pocket of land, and once the demonstration project is implemented, it will act as a connection hub within the city, linking neighbourhoods to businesses, public spaces and the surrounding environment.

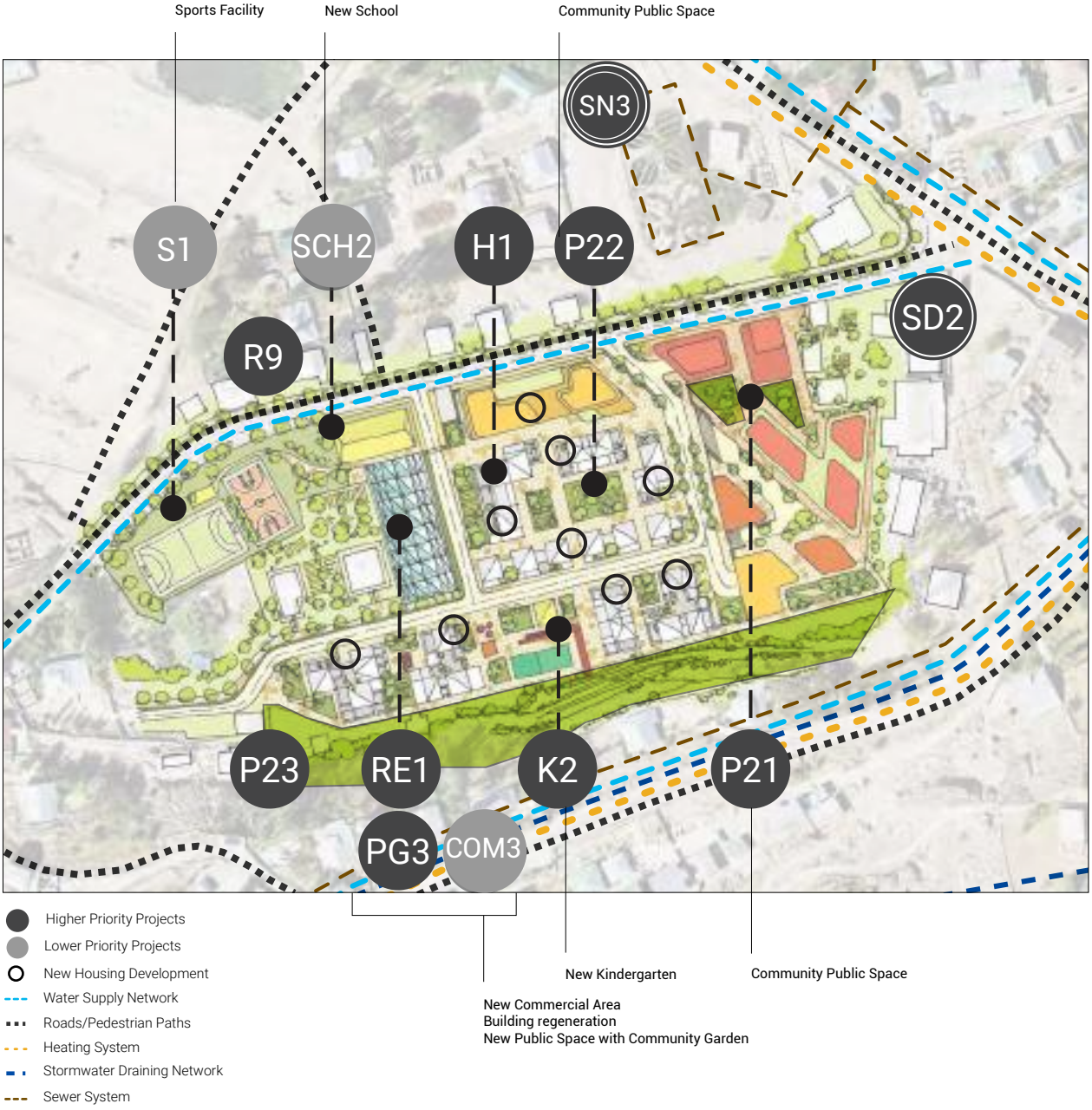
Project financials

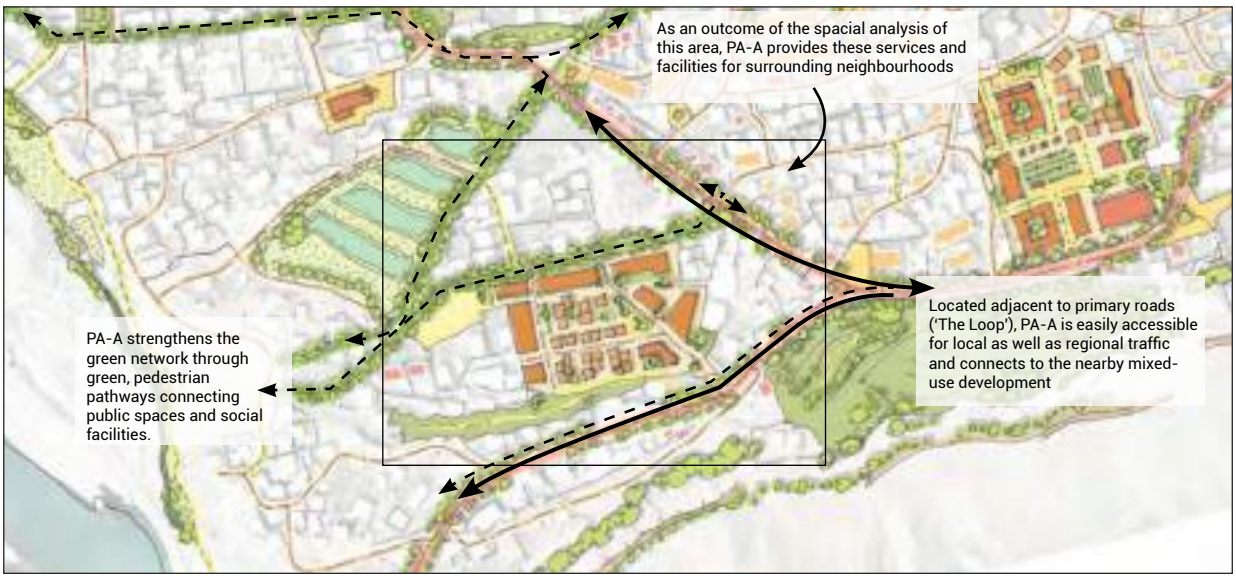
- *Total Estimated Cost: $ 47 890 000*
- *Current Investment Commitments and Type: External fund is needed*
- *Investment Needs: Feasibility Study, Concept Design and Detailed Design, Construction and Maintenance Plan*

Project partners

- *Khorog Municipality & National Government: Main responsible, owner and implementer of the projects' implementation in coordination with potential donors and external partners.*
- *Donors/ Financiers/ Private Sector: Funding entity(ies) would be requested to support the implementation of projects within Priority Area A.*
- *NGOs/CSOs: Potential external partners could be considered to support the projects' implementation throughout the overall process (e.g. capacity building/training, maintenance plan, etc.).*

Fig 89. The view on the slope of site A from the existing ramp, UN-Habitat, April 2023


Sports Facility
New School
Community Public Space
SN3
S1
SCH2
H1
P22
SD2
R9
P23
RE1
K2
P21
PG3
COM3
Higher Priority Projects
Lower Priority Projects
New Housing Development
Water Supply Network
Roads/Pedestrian Paths
Heating System
Stormwater Draining Network
Sewer System
New Kindergarten
Community Public Space
New Commercial Area
Building regeneration
New Public Space with Community Garden


As an outcome of the spacial analysis of this area, PA-A provides these services and facilities for surrounding neighbourhoods
PA-A strengthens the green network through green, pedestrian pathways connecting public spaces and social facilities.
Located adjacent to primary roads ('The Loop'), PA-A is easily accessible for local as well as regional traffic and connects to the nearby mixed-use development

	PROJECT NAME	SCORE %	ESTIMATED COST	BENEFICIARIES % of future population	TIME FRAME	DESCRIPTION
P22	Community Public Space	63,5	$ 186 000	20%	Medium-term	Community public space with vegetation, places to rest, sit and play
P21	Community Public Space	63,5	$ 123 000	19%	Medium-term	Community public space with vegetation, places to rest, sit and play
P23	Slope Public Space	61,8	$ 4 840 000	21%	Medium-term	Public space on the slope with vegetation and structures to rest (view points, terraces, etc.)
K2	New Kindergarten	60,1	$ 250 000	19%	Short-term	Construction of the kindergarten within the new development area with an adjacent space for outdoor activities
PG3	Green Public Space with Community Garden	59,8	$ 616 000	20%	Short-term	Green public space, park with community gardening (garden beds for growing vegetables, etc.)
SD2	Extending the existing Stormwater/Drainage Network	56,1	$ 5 272 000	78%	Short-Medium Term	City-wide project: cost presented is for the entire project
SN3	Renovation of the existing Sewer Network	55,2	$ 3 860 000	83%	Short-Medium Term	City-wide project: cost presented is for the entire project
H1	New Housing Development	54,3	$ 32 550 000		Short-Medium Term	Multiple typologies of housing units organised around green spaces and integrated with amenities and retail spaces on the main road
RE1	Building Regeneration	52,8	$ 2 075 000		Short-Medium Term	Multi-purpose facility, which can be used for indoor sports, a market, for events, etc. The building's structure will also be modified to support a greenhouse on the roof for intensive urban agriculture.
R9	Green Axis	53,0	$ 42 000	22%	Short-term	Redesign of the street (widening the pedestrian sidewalks, vegetation, infrastructure)
COM3	New Commercial Area	48,1	$ 1 400 000	20%	Short-Medium Term	Construction of a new commercial area, a part of mixed use development
SCH2	New School Project	47,6	$ 1 630 000	19%	Short-term	Construction of a new school with a adjacent space for sports and outdoor activities
S1	New Sports Facility	46,6	$ 306 500	20%	Short-term	Construction of a sports facility with a range of indoor classes and outdoor spaces for activities

Reminder:

- Scored above 50
- Is a city-wide project
- Scored below 50

For more information see Spatially Informed Capital Investmet Planning Report

5.2. SITE B

Objective

The objective of the transformative area is to create a growth economic node (Node 4), covering the area of Andarsitez along the river and a stretch in Gulobod. Currently, the node is composed largely of residential uses, which is an example of fragmentary, monofunctional development. A significant increase in commercial uses, suggested by the demonstration project, will address this issue, showing the diversity of functions that one block can accommodate.

The node 4 is located approximately 4 km from the city centre and close to the university of Central Asia. The demonstration project aims to transform the area and build more linkages to the university, facilitating better connectivity and development of the public space network.

The project aims to provide housing and employment opportunities, especially to the population allocated in the areas prone to hazards. Site B aims to activate the eastern part of the city by suggesting a variety of multi-purpose blocks with activities targeting different social groups.

The project aims to build linkages with the landscape, providing access to the riverfront and the surrounding green open public spaces, creating a pleasant environment for communities and tourists.

Impact

Once the projects within the demonstration site are implemented, the site will become a new centrality anda new point of attraction for the city. The area will provide housing opportunities to accommodate 1,500 people and provide 650 employment opportunities.

The suggested techno park and its multipurpose spaces will provide multisectoral options for employment (IT, wellbeing, industry, commerce), that will be accessible to both the residents of the new neighbourhood and the entire city. The public transportation stops and the location of the site near the main transportation loop make economic activities beneficial to all the residents of Khororg. Furthermore, the active street frontage created along the main transportation loop will transform the current street into a vibrant activity corridor that links with the other side of the river through a multimodal bridge.

Social facilities such as the school for and the kindergarten will benefit the surrounding communities and cover the deficit in social facilities in the area. The revitalized riverbank will connect the different parts of the city through the pedestrian promenades, creating an attractive environment and an enjoyable public space for the residents. The network of public space will promote walkability in the city and will integrate Khororg's unique topography. In Doing this part of Khorog will be transformed into an attractive environment for both residents and tourists.

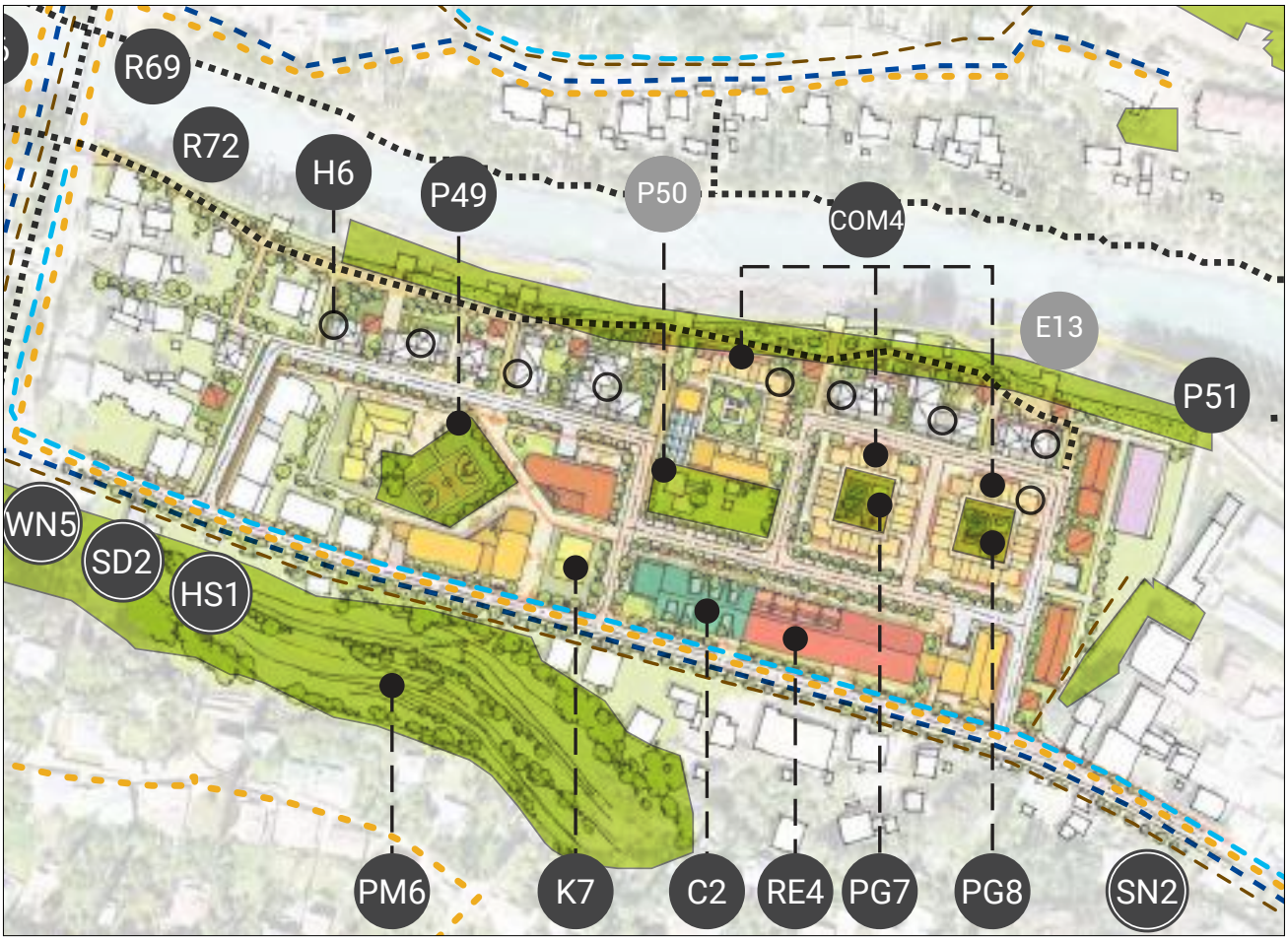
Project financials

- *Total Estimated Cost: $ 86 478 000*
- *Current Investment Commitments and Type: External fund is needed*
- *Investment Needs: Feasibility Study, Concept Design and Detailed Design, Construction and Maintenance Plan*

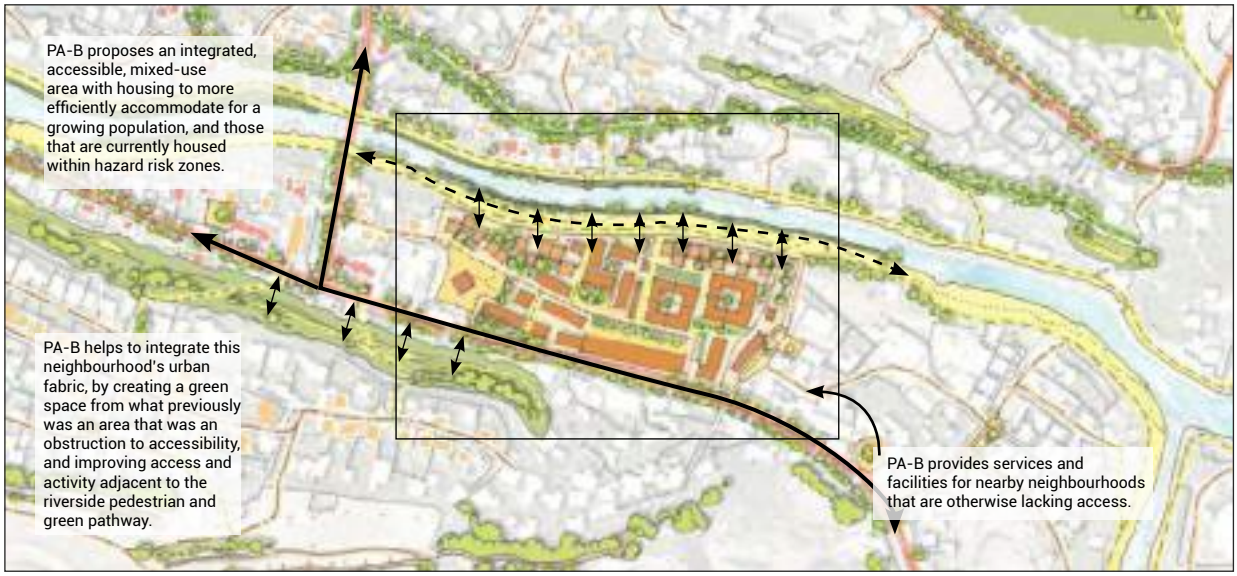
Project partners

- *Khorog Municipality & National Government: Main responsible, owner and implementer of the projects' implementation in coordination with potential donors and external partners.*
- *Donors/ Financiers/ Private Sector: Funding entity(ies) would be requested to support the implementation of projects within Priority Area B.*
- *NGOs/CSOs: External partners could be considered to support the projects' implementation throughout the overall process (e.g. capacity building/training, maintenance plan, etc.).*

Fig 90. The part of the main street (the loop) adjacent to the site B, UN-Habitat, April 2023



- Higher Priority Projects
- Lower Priority Projects
- New Housing Development
- Water Supply Network
- Roads/Pedestrian Paths
- Heating System
- Stormwater Draining Network
- Sewer System



	PROJECT NAME	SCORE %	ESTIMATED COST	BENEFICIARIES % of future population	TIME FRAME	DESCRIPTION
C2	Community Centre	65,6	$ 1 606 000	19%	Short-Medium Term	Renovation of an existing building for community gatherings and multi-purpose uses
PG7	Green Public Space with Community Garden	62,1	$ 62 000	20%	Medium-term	Green public space, park with community gardening (garden beds for growing vegetables, etc.)
PM6	Slope Public Space	58,9	$ 11 600 000	8%	Short-Medium Term	Public space on the slope with vegetation and structures to rest (view points, terraces, etc.)
HS1	New Water Heating Pipeline Grid	58,6		100%	Medium-term	City-wide project Not possible to estimate costs for heating projects
WN5	Rehabilitation of the Old Water Pipeline	57,0	$ 2 800 000	68%	Short-term	City-wide project: cost presented is for the entire project
SN2	Extension of Sewer Network	57,0	$ 5 703 000	70%	Short-Medium Term	City-wide project: cost presented is for the entire project
P49	Community Public Space	56,7	$ 465 000	21%	Short-Medium Term	Community public space with vegetation, places to rest, sit and play
R72	Pedestrian Pathway	56,4	$ 8 310	27%	Short-term	Construction of the pedestrian pathway for convenient walking and socialising.
SD2	Extending the existing Stormwater/Drainage Network	56,1	$ 5 273 000	78%	Short-Medium Term	City-wide project: cost presented is for the entire project
H6	New Housing Development	54,5	$ 54 430 000	4%	Short-Medium Term	Multiple typologies of housing units organised around green spaces and integrated with amenities and retail spaces on the main road
P51	Community Public Space	53,9	$ 793 000	12%	Short-Medium Term	Community public space with vegetation, places to rest, sit and play
COM4	New Commercial Area	53,8	$ 2 355 000	12%	Short-term	Construction of a new commercial area, a part of mixed use development
RE4	Building Regeneration	52,8	$ 2 910 000	1%	Short-Medium Term	Renovation of existing structure to accommodate a multifunctional building, technopark (job opportunities and community garden on top.
K7	New Kindergarten	52,0	$ 373 000	12%	Short-term	Construction of the kindergarten within the new development area with an adjacent space for outdoor activities
PG8	Green Public Space with Community Garden	50,8	$ 62 000	13%	Short-Medium Term	Green public space, park with community gardening (garden beds for growing vegetables, etc.)
P50	Community Public Space	48,1	$ 431 000	12%	Short-term	Community public space with vegetation, places to rest, sit and play
E13	River Bank Reinforcement	28,2	$ 1 435 000		Medium-term	Impacted beneficiaries is 0% as only direct beneficiaries were assessed. For a more accurate result, a risk assessment is required to identify indirect population impacted by the project.

Reminder:

- Scored above 50
- Is a city-wide project
- Scored below 50

For more information see Spatially Informed Capital Investmet Planning Report

5.3. ENSURING PROPER OPERATION AND MAINTENANCE

5.3.1. Maintenance planning

The project budget includes design, building, and maintenance costs. The latter can often account for most of the economic costs of the project over its lifetime. Considering maintenance costs at the beginning of the project will significantly help the corresponding implementing bodies in managing these costs and thus ensuring the viability of the investments.

For example, constructing durable structures and infrastructures, using local materials, choosing appropriate building techniques, considering environmental factors, and correlating with other planned projects at an early stage can help reduce maintenance costs. Another way to minimise the maintenance costs is through preventive maintenance, which includes regular inspections and maintenance activities aimed at identifying and addressing issues before they become more serious and costly to repair. The lifespan of the project can be extended if minor issues are addressed early on, thus avoiding the need for extensive and costly repairs down the line.

It is important to have a clear and effective maintenance plan in place. This plan should outline the responsibilities of the maintenance personnel, establish regular maintenance schedules, and provide guidelines for addressing any issues that may arise. It should also include provisions for tracking and analysing maintenance costs over time to identify opportunities to further improve the process and reduce the costs.

Furthermore, While the maintenance plan ensures that the physical aspect of the project is in a good working condition, an operational plan provides the necessary guidelines for the organization behind the project to run smoothly.

5.3.2. Governance models

The governing body is a key stakeholder of maintenance planning. The urban components can be managed publicly, privately or through PPPs (public-private-partnerships).

Public governance

The public governance of the projects should be effective, transparent and participatory. Participation must be defined at an early stage of the project development and should be included in all the stages of the project's life. From conception through design, budgeting, implementation, and into operation. Particularly, during the project's operation, communities and other interested actors can provide ideas and solutions on how to reduce maintenance costs,

Fig 91. The view on Khorog, UN-Habitat, September 2022

improve their environment and give their feedback on the budget readjustment. Doing so will create common project ownership and create an enabling environment for fruitful communication between the government and the stakeholders.

It is recommended that the local government engages with stakeholders at all stages of the project using participatory approaches such as citizen consultations, brainstorming activities including topics such as placemaking, and overall deliberative processes to ensure that stakeholders have a saying in the decision-making process.

Private governance

If the urban structure is privately owned, it is important to adopt corporate social responsibility, practices and principles, such as environmental sustainability, social inclusion, and ethical business practices to build trust and credibility, while also demonstrate a commitment to sustainable development. Similarly, to the model of public governance, a participatory communication approach with the communities and stakeholders needs to be ensured.

Public-Private Partnerships (PPPs)

Public-private partnerships are a form of multistakeholder partnership that can mobilize the expertise and resources of the private sector, fulfilling the sustainable development objectives, thus addressing the financing gap for achieving strategic goals and specific objectives. When promoting such a type of partnership, it is important to ensure the alignment of the goals and objectives among the parties involved and allow for jointly developed risk management and monitoring mechanisms for the partners to ensure their commitment.

Regardless of the governance model, the participating bodies should ensure a clear maintenance and operational strategy (or a plan) with a defined set of objectives and monitoring indicators. A Maintenance plan is crucial to sustain proper condition of the components (building, infrastructures, etc.) and maximize its returns on investment.

The general steps of the maintenance and operational plan are summarized as following:

Establish Objectives

- Define specific project goals and objectives
- Set Targets and Desired outcomes

Identify Requirements

- Define the governance / management model
- Determine resources (human, financial, etc.) to involve in a process

Define and list tasks

- Determine tasks and activities

Develop timeline

- Create a realistic timeline for each activity
- Define the interim deadlines

Assign responsibilities

- Define roles and responsibilities for each individual or team

Understand and mitigate risks

- Identify risks
- Develop a contingency plan

Build transparency

- Develop a comunication plan
- Determine how the information will be shared with stakeholders
- Dissiminate/share informatioon

Maintain

- Develop a maintenance plan
- Include maintenance cost in the the project lifecycle

Monitor and evaluate

- Measure the progress towards the objectives
- Develop metrics for success

Establish Objectives

Establishing clear objectives is a critical first step in project management. To ensure that all stakeholders are aligned and working towards the same goals, the objectives should be specific, measurable, and approved by all parties involved. When defining objectives, it's important to consider the project's purpose, target audience, and desired outcomes. Objectives should also be aligned with the city's spatial strategies and the sustainable development goals to ensure that the project is contributing to the community priorities.

Depending on the context of the project the objectives can be further specified over time to extend the lifetime of the project, reduce energy costs, etc. Taking the time to establish clear objectives in a project can help minimize confusion and conflict down the line and ensure that everyone is working towards a shared vision of success.

The following questions served for the Step-guiding part of the process:

- *What is the strategic objective of the project for the city?*
- *What is the objective of the project for the neighbourhood? Area? Community?*
- *How will the project achieve those objectives?*
- *Who are the main beneficiaries of the project?*

Tools for the step: stakeholder workshop to define priorities, dashboards to classify and document the list of objectives per stakeholder group. The workshop should be managed by the body responsible for project operation.

Identify requirements

It is important to define governance of the project, roles and responsibilities and resources necessary. Establishment of a well-defined governance and management structure will ensure proper implementation and distribution of responsibilities. This includes identifying all stakeholders, agencies, and partners involved in the project and clearly defining their roles and responsibilities. It is also important to determine the leading stakeholders, the project owner, and who will manage the project once completed.

To achieve project objectives, collaboration is key. Foster effective project coordination and implementation through coalition-building with diverse actors and using participatory approaches. This will help ensure that all stakeholders are engaged and have a say in the project, leading to a more successful outcome. (UNDP, 2015)

Step guiding questions:

- *What are the key stakeholders of the project?*
- *Which stakeholders will govern the project?*
- *Which stakeholders will be responsible for operation? Maintenance?*
- *Does the stakeholder have enough resources, capacity to maintain the project?*
- *What are the gaps and how address them?*
- *What resources will be needed to maintain the project? (Additional budget? staff? etc.)*

Tools for the step: stakeholder mapping sheet with highlighting the ones responsible, SWOT (strengths, weaknesses, opportunities, threats) analysis of the stakeholder capacity.

List tasks

To ensure clarity between all the parties involved, it is critical to conduct a list of precise tasks that should specify actions that are needed to achieve the priorities When appropriate, tasks can be broken down.

Step guiding questions:

- *What are the specific actions that are needed to achieve the priorities? – to each responsible stakeholder?*
- *If applicable, please breakdown the actions into tasks.*
- *Assign tasks to the responsible party*

Tools for the step: stakeholder mapping sheet with tasks and timeframes, schedules and related contacts.

Develop Timelines.

It is important to establish clear timelines for the project to ensure that it stays on track and meets its objectives. This includes identifying major milestones and deadlines that need to be met. The timeline should be realistic and consider potential delays or unforeseen circumstances that may impact the project's progress.

Step guiding questions:

- *What is the timeline for the project maintenance?*
- *What are the major milestones?*
- *What will be the deadlines and how to organize them?*

Tools for the step: spreadsheets and tables to document the timeline, and indicate the milestones and deadlines.

Build transparency

To ensure a thorough collaboration the decision-making processes need to be transparent, this includes possibilities to have access to project information and stakeholder engagement opportunities. An effective communication strategy should be established to ensure clear communication channels are established between all stakeholders.

Step guiding questions:

- *How will the stakeholders communicate?*
- *How can the information be shared? (information on the project, timelines, deadlines, etc.)*
- *How can the stakeholders access the information?*
- *Who will be responsible for information sharing?*

Tools for the step: online folder/archive to store the information, contact list of all the stakeholders with whom the information should be shared.

Develop a risk management plan

Once the objectives, resources, tasks and responsible actors are identified, it is important to conduct risk passement and develop risk mitigation strategies where applicable. Risk mitigation strategy may include a variety of maintenance scenarios, budget readjustment, etc. Conducting the risk passement ensures a controlled maintenance process. Transparency on risks and awareness about mitigation solutions should be ensured among all the actors involved.

Step guiding questions:

- *What are the project's risks?*
- *Which risks are low? Moderate? High?*
- *How can the risks be mitigated?*

Tools for the step: Spreadsheet and tables with risks and mitigation strategies.

Develop a project budget

Defining financial resources requires a clear understanding of the funding sources and available budget. It is important to identify the sources of funding for the project, whether they come from the government or from private institutions, and if any limitations or conditions could come with it. The budget should also consider any potential risks and uncertainties that could impact on the project's financial sustainability.

Step guiding questions:

- *What are the resources needed to maintain a project? What is their cost?*
- *For how long is the maintenance stage planned for?*
- *Is there or should there be some budget allocated for any risks?*

Tools for the step: Spreadsheets and tables with the budget plan.

Monitor and evaluate

This step consists of 3 sub-steps which are as follows:

- Establishing an accountability mechanism for the project' outcomes. This can be achieved through astrategy that specifies how to measure the maintenance progress. This can include measurable performance indicators, and a system for monitoring, evaluating and reporting.
- Defining an indicator track system. That includes a system that allows to document the process and observe the trends to measure the progress. It is important to collect the indicators regularly to evaluate the maintenance plan and identify where it could be improved.
- Collecting the feedback from the stakeholders and communities to assess the effectiveness of the plan. At this step the process of maintenance and evaluation results should be shared to discuss how to improve and/or adjust the maintenance strategy.

Step guiding questions:

- *•What is considered as a successful project?*
- *•Which indicators can evaluate the conditions and the impact of a project?*
- *•How to measure these indicators?*
- *•How to collect these indicators?*
- *•How to document and evaluate these indicators? Who will be responsible?*
- *•Where and how can the data be organized and stored?*

Tools for the step: the database of collected indicators managed by the assigned stakeholders or responsible bodies.

Recommendations for indicators

1. Think SMART: Indicators need to be Specific, Measurable, Accurate, Relevant, and Time bound. […]

2. Identify suitable indicators: Look for indicators that give as detailed, accurate and comprehensive a picture of progress as possible. […]

3. Disaggregating indicators and collecting information on different groups. […]

4. Use a mix of qualitative and quantitative indicators to measure the results of an intervention. […]

5. Consult stakeholders when formulating and choosing indicators.

(UNEG, 2014)

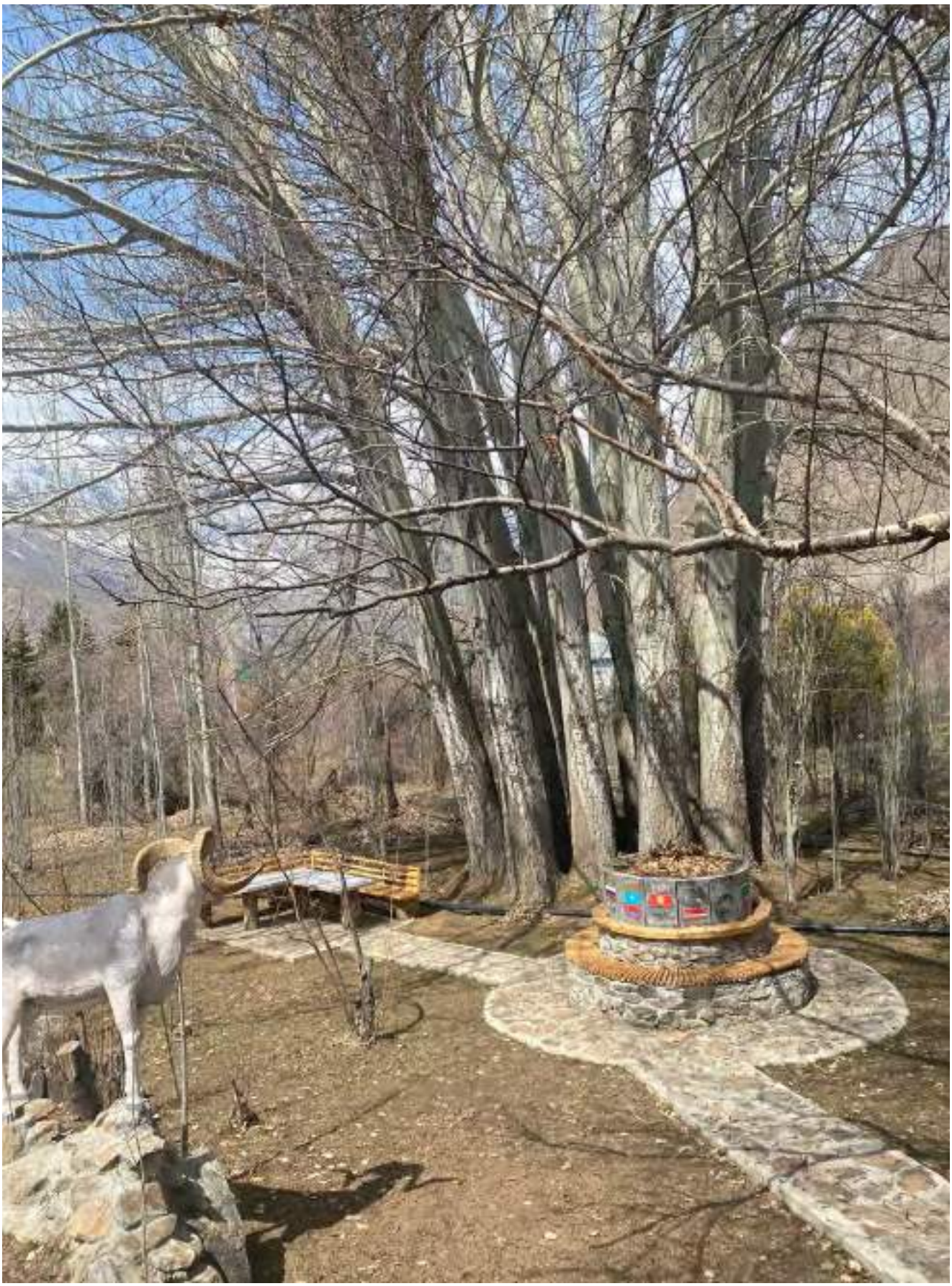


Fig 92. The public space of 15 republics close to Botanical Garden in Khororg, UN-Habitat, September 2022

5.3.3. Example of an operational framework for a public Urban Garden

Component description

Urban gardening is, in a general sense, the practice of growing plants in the urban or suburban environment. It can take many forms, from backyard gardening to private agriculture ventures, to community gardens. Urban gardening can produce a green space withing the city that is both productive and enjoyable. It can be integrated within a park, in vacant underutilized land, or as supporting green infrastructures of other projects within a city.

A community garden consists of a relatively big area that is subdivided into plots of land that are then distributed to the urban garden members for them to plant freely. In the case of Khorog, urban gardening is already common practice in the form of backyard gardens, the proposed urban gardens aim to promote this practice as part of the creation of green public spaces.

This new urban garden in Barakat will be part of a community centre, it may include the following uses and spaces:

- Vegetable raised beds
- Aromatic plants
- Greenhouses
- Tool sheds
- Insect hotel
- Beekeeping area
- Compost area
- Playground
- Resting / socialization area

Objectives

Several examples of objectives that might be achieved by an urban garden project.

- Comply with strategic recommendations to ensure green public spaces with possibilities to communit y gardening in the areas of the "yellow zone" (prohibited for residential uses due to hazards)
- Create a lively green space that serves for production and enjoyment of the general population.
- Integrate existing food production practices in the city's structure to improve food security, eco-friendly practices, and to create spaces for food production and social interaction for the community.
- Promote physical activity, reduce environmental toxins, and contribute to the development of sustainable cities by promoting the use of vacant and underutilized land, reducing food transport and waste, improving the urban food system resilience. SDG 3 (Good health and well-being) and 11 (Sustainable cities and communities)
- Mitigate the effects of climate change by supporting biodiversity, reducing the use of harmful pesticide and fertilizers, reducing carbon emissions, and allowing carbon sequestration in urban soils. SDG 13 (Climate action).
- Integrate waste management through waste separation and composting.

Urban gardening can function in a variety of ways depending on the goals and resources of the community. The space can be multifunctional, including other uses such as playgrounds, and spaces for gathering and for events.

Fig 93. Medium rise housing from the Soviet times and adjacent community garden, UN-Habitat, May 2021

Governance and management structure

The organizational structure is defined, including roles and responsibilities of volunteers, staff members, decision making processes, and policies for managing the garden infrastructures.

- Municipality-managed model. The Local government is responsible for managing the garden and renting out the plots to citizens. Land, water, and basic infrastructures such as fencing, tool sheds and composting areas are provided. Gardeners pay a nominal fee to rent the plot. This fee also covers the maintenance of the infrastructure and provides services such as trash collection and pest control. It works as a service provided by the municipality and may include educational programs and workshops.
- Association-managed model. A community association, a non-profit or an informal group manages the garden on a voluntary basis or, in some cases, with grant money. People choose how they organize themselves and how to manage the garden. (Barcelona, 2022). They are responsible for securing the land and building infrastructure and recruiting and managing gardeners. There is usually a core team that is more permanent in time, and more sporadic participants that meets regularly to discuss issues that may arise and manage the waiting list if there is any. They may also charge a fee to cover the managing costs. This model allows for greater community involvement but requires more volunteer time and resources to be successful.

These options could be combined to create a municipal association model: the local government could build the necessary infrastructure, and through participation processes engage the community to form a group that takes over the administration tasks and reports back whenever issues occur. By encouraging the formation of a community group, the project can become more sustainable and resilient. This approach promotes social cohesion and stewardship

.

Tasks, responsibilities, timelines and resources

Site management. The land could be a single plot where everything is communal or be subdivided into smaller plots and allocated to individuals, families, or collective spaces. The first option is suitable for smaller plots and smaller groups as with more available land the system grows in complexity.

The priorities of the site are collected and transformed into objectives. Tasks are then listed, and each one of them has a corresponding responsible party that will follow the objectives on a given timeline and with the appropriate resources. This process should be done before the project, further developed during the early stages, and updated regularly.

Objective	Task	Responsibility	Timeline	Resources
Garden Maintenance	Weed control	Garden members	Weekly	Gardening gloves, hand tools
	Irrigation	Garden members	Every other day	Hoses, watering cans, irrigation system
	Pruning and trimming	Garden members	Monthly	Pruning shears, loppers
	Soil testing Water testing	Garden team	Annually	Testing kit
	Soil amendment	Garden members	As needed	Compost, natural or organic fertilizers
	Pest management	Garden members	As / if needed	Environmentally friendly pest control , insect traps

	Tool maintenance	Garden members	Monthly	Lubricants, sharpening tools
Harvesting and Distribution	Harvesting	Garden members	As needed	Harvest baskets
	Distribution • Local distribution to markets. • Weekly vegetable basket through food groups, etc.	Garden team	As needed	Distribution schedule, transportation
Community Engagement	Outreach events With the goal of bringing people to the project space generating revenue • Volunteer days • Farmers market • Community lunches • Art exhibits • Movie nights • Garden tours	Garden team	Quarterly	Event materials, volunteers
	Trainings, and classes • Composting • Seed Saving • Garden Design • Herb workshops • Foraging • Irrigation workshop	Garden team	Monthly	Workshop materials, instructors
Finances and Administration	Budget management	Garden treasurer	Annually	Budget spreadsheet
	Membership management	Garden team	As needed	Membership roster
	Communication	Garden team	Ongoing	Email, social media
	Partnership and collaborations	Garden team	Ongoing	

Responsible parties

Garden team: a project owner, NGO, and/ or a managing team is in charge of the success and maintenance of the project. Within the garden team different roles will be distributed according to the desired structure. The responsible bodies oversee the day-to-day operations, securing a budget and new garden member, and managing the wait list if there is any. Furthermore, the parties responsible need to be in contact with the municipality for general maintenance needs that may arise within the project.

Garden members: People from the community who regularly visit the community garden and lease a plot and are responsible for their care. The garden members are also responsible for any collective task within the garden.

Monitor and evaluate

Garden team: a project owner, NGO, and/ or a managing team is in charge of the success and maintenance of the project. Within the garden team different roles will be distributed according to the desired structure. The responsible bodies oversee the day-to-day operations, securing a budget and new garden member, and managing the wait list if there is any. Furthermore, the parties responsible need to be in contact with the municipality for general maintenance needs that may arise within the project.

To establish a monitoring process the monitoring group (community members, local authorities, responsible bodies) should ask for questions such as:

- How is the success of the project determined?
- How is it performing?
- What are the impacts the project has for the community?
  - Positive or negative?
  - Direct or indirect?
  - Intended or unintended
- Who is accountable to perform the monitoring / assessment?

Some indicators to measure the impact of the project in the community might be:

- Increase access to healthy food.
  - How much food is produced.
  - The amount of compost produced.
- Community engagement and participation
  - The amount of people regularly involved.
  - The number of volunteers.
  - The number of events they organize.
  - The number of participants to these events.
- Environmental impact
  - Increase in pollinators in the area.
  - Reduction in stormwater runoff
  - Improvement in soil quality
- Economic impact
  - The number of jobs it creates.
  - The income it generates.
  - Reduction of food cost for the community
- Educational impact
  - Educational material generated.
  - The number of workshops created.
  - The level of interest of local schools.

Data collection

To assess these indicators, it is necessary to collect data on each one of them. It is recommended that the community be involved in all stages of the monitoring process.

- Who is responsible for this collection?
  - It may be someone in the municipality or in the garden core team. (Decolonialize data collection)
  - It may be internal or externalized.
- How is it collected?
  - It may be digital surveys, interviews, etc. Data should be disaggregated including categories such as gender, occupation, and age to be able to draw relevant conclusions.

Note that this is just an example and some basic guidelines. The stakeholders should develop a specific operation and maintenance plan as well as a monitoring framework according to their own needs and interests.

5.3.4. Example of an operational framework for a mixed-use block

Component description

A mixed-use block/building as a type of urban development that includes multiple uses such as residential, commercial, cultural, institutional, leisure, and many others. These functions are ideally connected, compatible, and complementary with each other. A mixed-use development may be a new construction, the reuse of an existing building or brownfield site, or a combination of both.

Mixed-use development brings multiple social, economic, and environmental benefits. This type of initiative is highly suggested to be integrated in Khorog and within the UN-Habitat recommendations. A mixed-use development generates both housing and employment opportunities, promotes walkability, and creates a vibrant urban environment while supporting adequate density levels. When developing the plots within the underutilised land, and repurposing it to mixed-use development, the land and property values will increase, which can help in addressing several challenges at the city level.

In Khorog the mixed-use development may include several functions, such as:

- Residential uses
- Commercial uses
- Co-working and office space
- Healthcare and well-being infrastructure
- Sport facilities
- Leisure (cinema, child amusement park, etc.)
- Community centre

Objectives

Mixed-use development facilitated the achievement of multiple objectives at the city and neighbourhood levels, such as:

- Compliance with strategic recommendations and spatial strategies to ensure a balanced development and provision of housing in the safe areas of Khorog
- Demonstration of appropriate ways to achieve high density that does not exceeds 6 storeys
- Ensuring employment opportunities and productive built environment
- Creating a vibrant built environment, avoiding monofunctional clusters of development amd maximising the efficient use of land
- Creating new points of attraction to rebalance the city
- Accelerate the transformative processes in Khororg, creating and enabling environment for implementation of other projects (small markets, public spaces, etc.)

The objectives can be further broken down and include specific objectives depending on the context and location of a particular block.

Governance and management structure

A possible governance model is the creation building committee integrated with all the stakeholders that manage the different uses, including the building owner(s) or management, the tenants, community centre staff, etc.

This team is responsible for the development of the maintenance plan, creating a budget and securing funds, hiring and supervising maintenance staff, addressing tenant complaints and concerns communicating with all stakeholders about the status of maintenance and operations and any issues that may arise.

Tasks, responsibilities, timelines and resources

An operational plan for a mixed-use building should outline the specific needs and responsibilities for each use within the building, as well as establish a framework for collaboration and communication between the different parties.

Each and every project within the building will have its own operational plan.

an outline of a possible operational plan is as follows:

Private uses

Objective	Task	Responsibility	Timeline	Resources
Commercial spaces	Develop leasing agreement and rental process	Property manager	One time as the lease expires	Legal assistance, lease agreements
Coordinate coworking space	Develop lease agreement or access system	Property manager	One time / Ongoing	Personnel, lease agreement, marketing, events
Manage Residential Units	Ensure each type of housing is leased / sold to eligible tenants	Property manager	One time / Ongoing	Personnel for eligibility check, rent collection, maintenance
Maintain financial sustainability of building	Ensure rent collection	Property manager	Ongoing	n/a
Communication and collaboration	Establish communication channel with tenants (meetings, group chat, etc.). Organize social events with tenants and neighbourhood community	Property manager / tenants	Ongoing	n/a
Emergency Procedures	Develop an emergency plan. Define and signal emergency routes.	Property manager / tenants	Ongoing	n/a
Security and access control	Define hours of access to coworking space.	Property manager / Coworking personnel	Ongoing	n/a
Budget and resources	Develop and update a budget for the building including regular and occasional costs	Property manager	Ongoing	n/a

Public uses

Objective	Task	Responsibility	Timeline	Resources
Community centre	Manage community centre: Designate a local team or NGO to run the project. They should dispose of a budget that may come from the municipality, the state funds or international grants	Municipality / NGO / Management team	One time	Legal assistance, lease agreements, requirements, evaluation funding grants.
	Define community centres vision and mission	Community centre management team	One time	Local community, participatory project, surveys, focus groups
	Define organizational structure: Roles,responsibilities, staff members, volunteers	Management team	One time/as needed	Management team, participatory process
	Define day-to-day operations: Opening hours, safety protocol, usage guidelines	Management team	As needed	n/a
	Develop programming and activities for community centre	Community centre managing team	Yearly	Participatory process
	Define needed infrastructure	Management team	As needed	n/a
	Define budget and resources. Should include staff salaries, maintenance costs and program expenses.	Management team	Yearly	n/a

General maintenance plan of the built environment

Objective	Task	Responsibility	Timeline	Resources
General Building maintenance	Regular inspections to identify needs	Building Maintenance Staff	Monthly - Quarterly	Inspection checklist, tools, materials
	Repair and replace broken elements: • Repair any damage to the building exterior. • Repair any damage to residential units and commercial spaces.	Building Maintenance Staff	As needed	Tools, materials, contractors if needed
	Regularly clean common areas	Building Maintenance Staff / Cleaning staff	Daily / Weekly	Cleaning supplies and equipment, contract of cleaning company
	Maintenance of electrical, plumbing, and HVAC systems. (Inspect and maintain)	Building manager	Electricity: <5 years Plumbing: Every two years HVAC= Yearly	Maintenance contract with licensed contractors, tools, parts and materials.
	Maintain landscaping and outdoor spaces	Building Maintenance Staff		
Ensure safety and functionality	Perform Emergency Alert System test (EAS)	Building manager	Min once a year	EAS equipment
	Conduct elevator maintenance	Building Manager	Yearly or twice a year	Contractor / elevator maintenance company
Ensure compliance with building codes and regulations	Regularly review local building codes and regulations	Building Manager	Annually	Legal resources, legal consultant

Creating bridges between different projects is an important aspect of an integrated community development. In the case of the urban garden managed by a community centre, there are many opportunities to strengthen its viability and integration within the community.

One effective approach to community centres and urban gardens is to focus on sustainability and nature-based solutions. Such community centres can play a vital role in promoting environmental consciousness among the community, especially for young people. These spaces can serve for various activities in topics such as recycling, composting, and waste management, thus, helping to reduce waste and promote sustainable practices.

In addition to the urban garden, a community centre can also be a place for learning about climate change and its impact on the planet. Interactive exhibits, particularly those aimed at children and teenagers, can help to raise awareness on the importance of sustainability and environmental protection.

Community centers can also work in close collaboration with local schools, kindergartens, and other educational institutions. Workshops and day trips to the urban garden can be organized, allowing children to learn about biodiversity, food production, and the importance of healthy eating habits.

A community centre can also function as a meeting space for different NGOs, local hospitals, and the municipality. For example, it can serve as a place where the community hospital holds its community meetings or open consultations. Additionally, it could be a location for the municipality to organize some participation processes for the improvement of the neighbourhood.

By creating bridges and interlinkages between different projects and institutions, communities can benefit from the collective resources and expertise of all parties involved. This approach can help to strengthen the viability of individual projects and foster integration within the community.

Fig 94. The view on Khororg from Botanical Garden, UN-Habitat, September 2022

6

ANNEX

6.1. LIST OF FIGURES

6.2. LIST OF TABLES

Integrated Spatial Plan for Environmental and Socio-Economic Resilience

KHOROG
Tajikistan

Community Participation & Stakeholder Engagement

May 2023

UN-HABITAT

Habitat Planning

A Programme of the Aga Khan Agency for Habitat

Aga Khan Agency for Habitat

RESILIENT KHOROG 2035

Integrated Spatial Plan for Environmental
and Socio-Economic Resilience
Khorog, Tajikistan

**Community Participation &
Stakeholder Engagement Report**

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Habitat Planning

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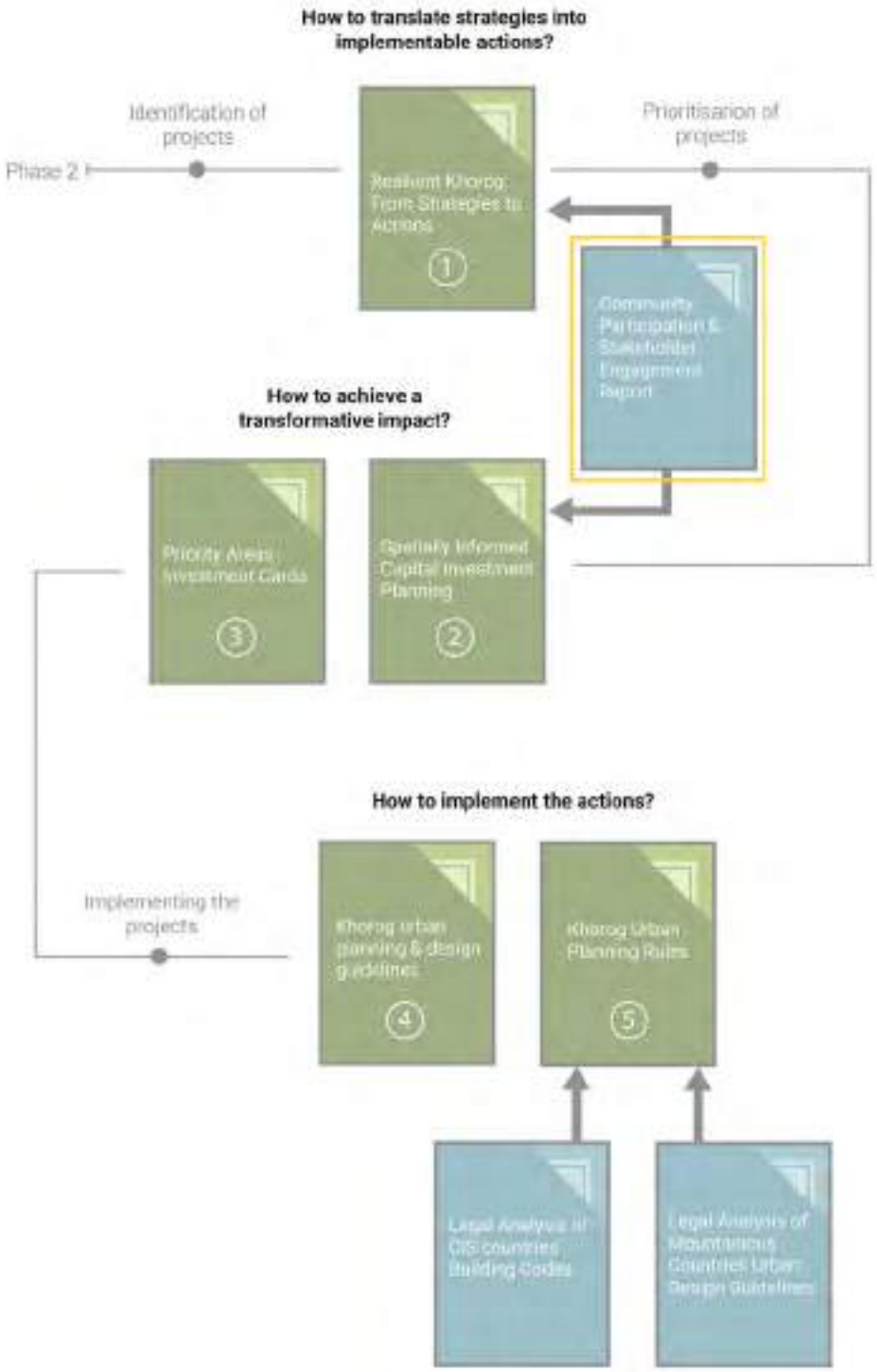
Mumtaz Ali (Senior Urban Planner)

And for all who participated in the meetings, field trips, working sessions and trainings from the government, service providers, AKAH, AKDN, UCA, and inhabitants of Khorog.

Integrated Spatial Plan for Environmental
and Socio-Economic Resilience

Community Participation & Stakeholder Engagement Report



CONTENTS

KHOROG

COMMUNITY PARTICIPATION & STAKEHOLDER ENGAGEMENT

Fig 1. A woman is collecting apples in her garden, Khorog, UN-Habitat, September 2023

1

INTRODUCTION

1.1. PROJECT BACKGROUND

This work forms a component of the collaborative project "Promoting Spatial, Environmental and Socio-Economic Resilience" between UN-Habitat, the Aga Khan Agency for Habitat, and the government of Tajikistan. The project has been developed within the framework of the Khorog Urban Resilience Programme (KURP), with funding from SECO, the Economic Cooperation and Development division of the Swiss State Secretariat for Economic Affairs. The KURP is a five-year initiative designed to establish the structures, systems, and capacity to transform Khorog into a resilient city model that promotes sustainable economic growth and investment.

The United Nations Human Settlements Programme (UN-Habitat) and the Aga Khan Agency for Habitat (AKAH) signed a strategic Memorandum of Understanding (MoU), to further enhance AKAH's planning activities in Tajikistan and thus improve quality of life. UN-Habitat has partnered with AKAH and other agencies of the Aga Khan Development Network (AKDN) in urban policy and capacity building to enhance the Global Network of Labs through collaborative work on planning and design projects, joint engagement in resource mobilisation, and joint development of normative planning and design products as a means to further inclusivity of human settlements in accordance with the Sustainable Development Goals (SDGs) and New Urban Agenda (NUA). The partnership will bring together UN-Habitat's global technical expertise and AKAH's experience in habitat planning, leveraging on best practices in a collaborative and integrated way to guide Khorog's inclusive and resilient future growth.

The project is designed to improve the communities' resilience and ensure that Khorog's projected population growth incan be sustainably accommodated. More specifically, the project aims to provide environmental, legal, economic, spatial, and infrastructural projections and policy recommendations, resilient infrastructural plans, guidance for the implementation of transformative projects, and capacity-building for stakeholders in planning and technical fields. Thus, the role of UN-Habitat's Urban Lab is to provide planning expertise, drawing on existing methodologies, toolkits and best practices in a collaborative and integrated way.

The project is divided into two phases, as shown in Table 1. During both phases the project has included participatory events such as technical working sessions, workshops and community engagement exercises. Participatory activities were tailored to the specific themes of each phase. While the first phase included activities aimed to ensure fact finding and data collection, the participatory activities of the second phase aimed to validate the design proposals and ensure accurate prioritization of actions, projects.

During the second phase the project team organised multiple working sessions, mapping exercises, and brainstorming activities with the local authorities, technical experts and communities, with a special focus on women, youth and children.

1.2. PARTICIPATORY APROACH AND METHODOLOGY

Participation is an essential component of sustainable urban development, promoted by both the 2030 Agenda and the New Urban Agenda. The project team proposed various techniques to define an inclusive participation strategy that involves all stakeholders and the community in the planning process.

Resilience and safety are the core directives of the programme, but social inclusion is recognised as an important cross-cutting issue of urban planning and was incorporated into the scope of the project with the implementation of the participatory strategy. Social inclusion encompasses human rights, gender equality, youth, children, elderly people, people with disabilities, as well as people of all races and religious beliefs. The project team established guidelines to ensure the diversity of the participants , including gender balance and representation of different age groups.

The UN-Habitat project team used a methodology based on the Our City Plans (OCP) approach, which was developed by the Urban Lab as a step-by-step guide for urban planning in small to medium sized cities. The OCP provides a flexible methodology that can be adapted to various contexts according to identified needs and focus areas.

The OCP ensures that stakeholders are engaged both in the planning process, and in the outcomes in a meaningful way, safeguarding the ownership of completed projects and opening the potential for ongoing, multi-stakeholder collaboration. Continuous engagement with communities and other stakeholders throughout the planning process was carried out through workshops, design charettes, expert group meetings, and updates at each of the various planning stages.

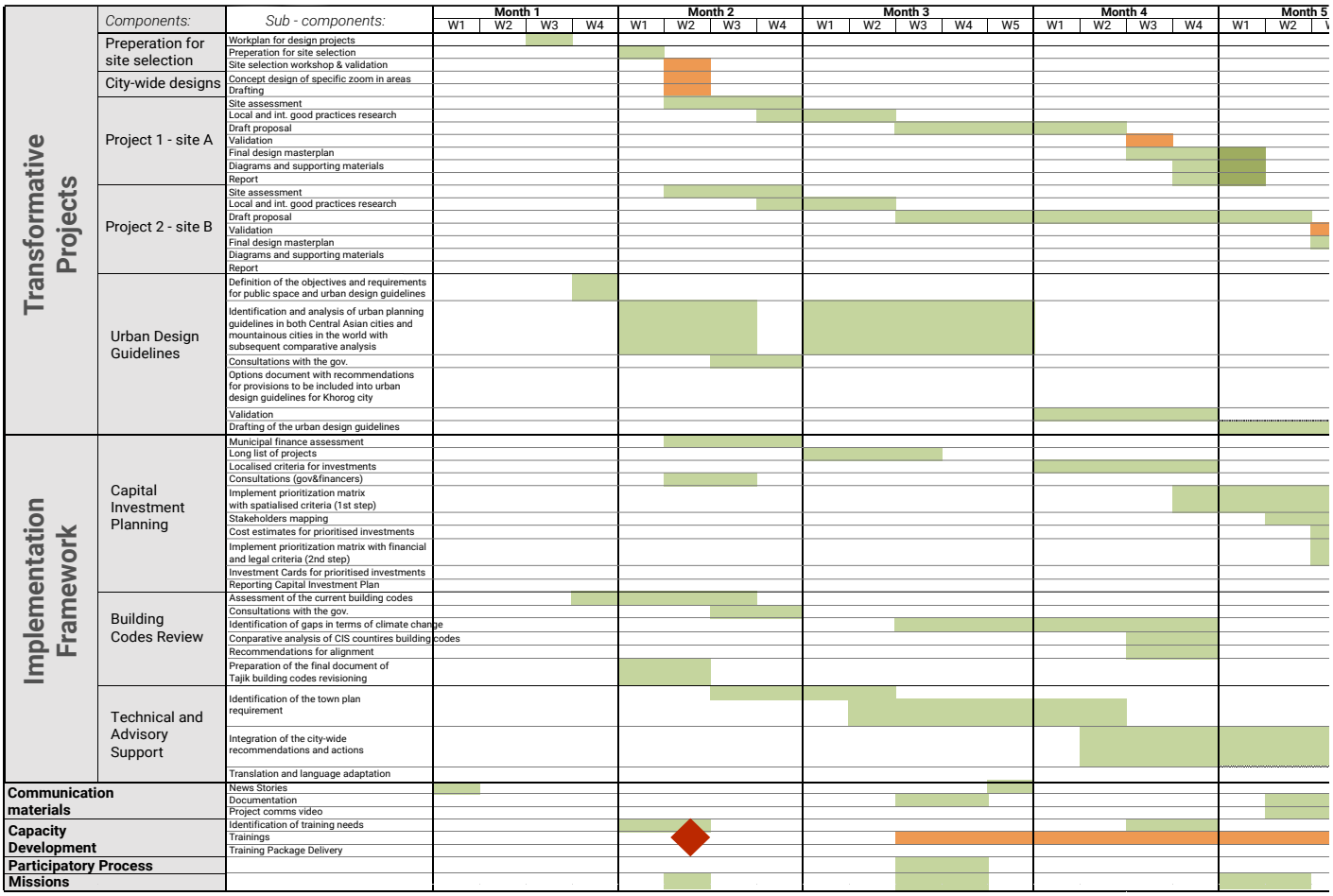
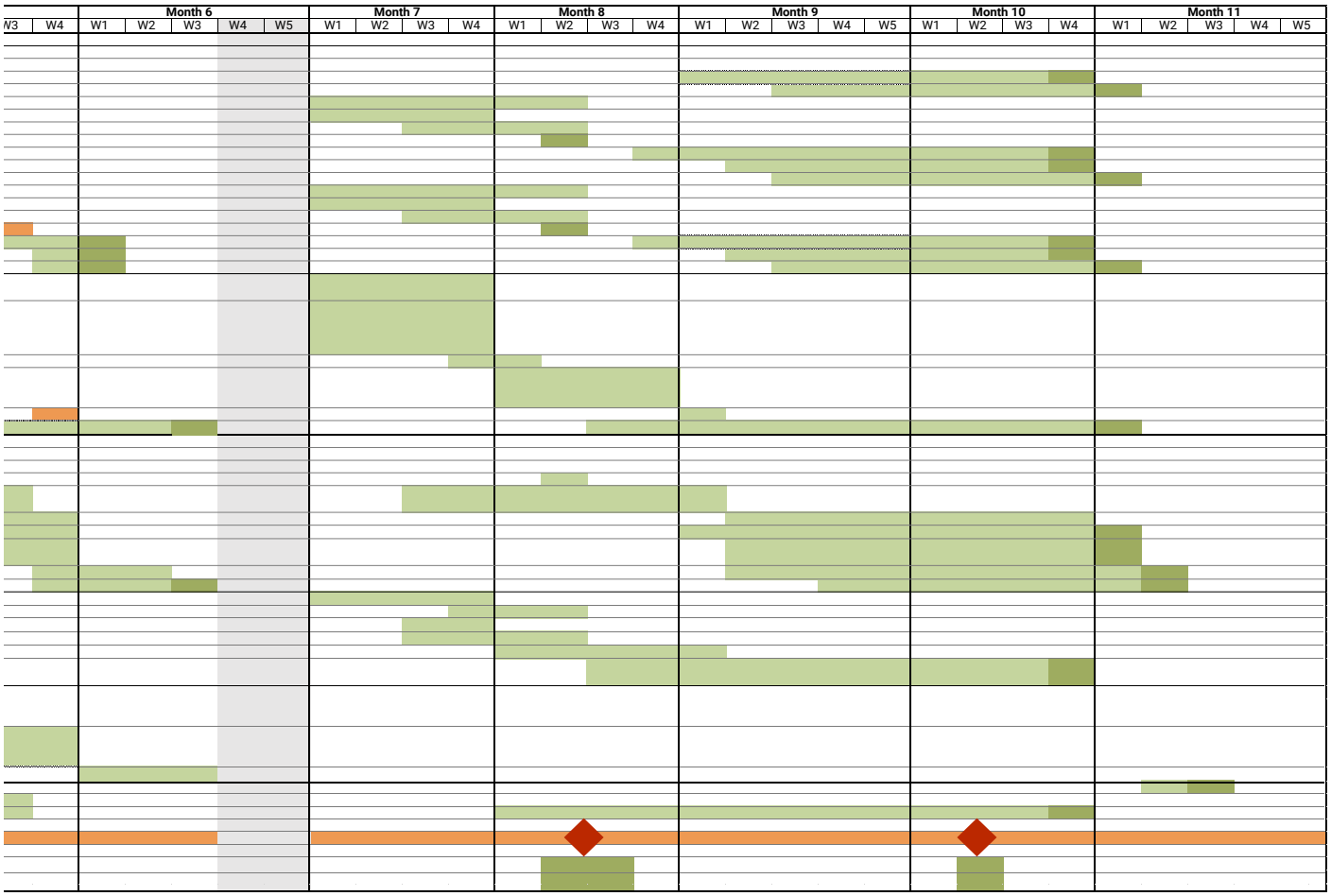


Fig 2. Positioning of the major participatory events within the project framework

UN-Habitat also referred to the Habitat Planning Framework developed by AKAH, the mission of which is to establish "a safe and sustainable habitat in which communities, families and individuals can thrive". This framework contributes to a holistic planning approach, ensuring alignment with common strategic priorities. The framework consists of three phases and nine steps (each phase includes 3 steps). This structure includes guidelines on community-centred participatory design, government engagement, socio-economic and land use analysis based on a strong GIS component, for the purposes of planning, design, construction, and monitoring and evaluation. To apply the framework, UN-Habitat utilised the database established by AKAH's planning team and incorporated this data with field-based discoveries.

The structure of this report is chronological; it includes a summary of the meeting with the Committee of Architecture, the Shahrofar Project Design Institute on the second phase expectations, a summary of the working sessions with AKAH technical teams and with the local authorities. Furthermore, it encompasses a summary of the ideation activities with women, youth and children, as well as a summary of the validation workshops with AKAH technical teams from Tajikistan and the Global offices on the project design proposal and capital investment planning.



The report highlights the key takeaways from the technical session and provides an overview on the organization of the ideation activities. The concrete design ideas were directly incorporated in the urban design proposals (See "Resilient Khorog: From Strategies To Actions Report"). These were thendocumented and framed within the comprehensive project list as a project for further prioritization (See Spatially Informed Capital Investment Planning).

The overall activities of the second phase can be divided into 3 major thematic groups:

- Sectoral thematic working sessions with technical experts
- Comprehensive prioritisation activities to inform the scoring criteria for capital investment planning
- Ideation activities tailored to the specific community group

Specific tools were applied during the activities' sessions and in each thematic group. For the sectoral thematic sessions, the team used the basemaps' hard copies which included key data sets such asroad network, built up area, and hazard zones. The collaborate mapping was done using two types of scales:

- 1) The citywide level and a
- 2) zoom in into the pre-selected areas for the transformative projects.

For the Comprehensive prioritisation activities, the project team ran a flag exercise that consisted of allocating a priority action (flag) of the specific theme to the area requiring urgent actions. As an outcome of such activity conducted with different stakeholders, the team developed a heatmap of area-based priorities that further informed the scoring criteria.

The ideation activities included the materials for collaborative mapping exercises such as basemaps, sticky notes, prepared local practices of urban design concepts such as complete streets, active frontage, etc.

During the participatory activities, the project team was actively collaborating with local planning actors, transmitting knowledge and sharing participatory planning techniques, and thus, increasing the local capacity byfollowing a "learning by doing" approach.

Fig 3. Traditional tapchan, UN-Habitat, September 2023

	Scoping, Analysis, Diagnosis and Spatial Strategy			Deliverables
PHASE 1	Project Scope and Inception Report	What is the scope of the project and what can we achieve?	This involves a desktop review of existing reports and studies to generate an understanding of the city. This formalised the scope of the projectand the steps to be taken, and identified information gaps. In response, requests for specific and updated data sets (GIS and other) were made, and key stakeholders were identified for interviews.	• Inception Report • Data requests
	Discovery and Understanding	What is the context of the work? How should the framework be defined?	At this early stage, discovery interviews were conducted with stakeholders. As resilience was the focus of the project, findings were organised into four key areas: Environmental, Socio-Economic, Infrastructure and Basic Services, and Institutional Resilience. This first step informed the team of the challenges the city faced and directed the next stage of assessments.	• Discovery Workshop • City Profile Part 1: Discovery Report
	Diagnostic and Community Engagement	What are the key challenges and why are they happening?	This stage of work involved a process of data collection, data cleaning and a series of assessments based on the spatial themes of resilience; environmental, socio-economic and infrastructure and basic services. The final theme of institutional resilience was assessed by the urban legislation team and the assessment is included as an individual chapter alongside the data assessments. This step provided the team with a basis of understanding from which to design focused community engagement activities, and on-site validation exercises.	• Diagnosis Workshop • City Profile Part 2: Diagnosis Report • Capacity Assessment Report
	Spatial Strategy	How and where to approach these challenges?	This stage of work involved consolidating the challenges faced by the city and identifying key spatial and non-spatial strategies in order to address them. Not only can this set of plans and strategies support the sustainable development of the city, but their inclusion as part of the process provides local government and stakeholders with a greater understanding of evidence-based, participatory, and collaborative planning approaches that can be applied to future work.	• Validation Workshop • City Profile Part 3: Recommendations Report • Participation & Community Engagement Report • Legal Assessment Report
	Transformative Projects	How to actualise the plan?	This stage of the project illustrates how the strategic recommendations are translated into targeted actions. This involves identifying key pilot project sites to showcase the practical implementation of the plan. These projects will demonstrate how the SDGs can be localised, setting reference models for future development. In addition, the projects will show how principles for sustainable neighbourhood planning and design can be applied in the local context.	• Fact-finding workshop • Ideation activities with women, youth and children • Validation design workshop • Design proposals • From "strategies to actions" Report
	Capital Investment Plan	How and when to implement?	This mechanism prioritises identified projects with an accompanying finance and investment strategies to support their implementation. At this stage, the scoring criteria for the projects is defined as well as the comprehensive project list. Such scoring mechanism will highlight the priority actions to be taken in the city to ensure transformative impact. In addition, the mechanism defines priority areas for future investments.	• Prioritisation workshop • Validation workshop • Capital Investment Planning Report • Priority project and areas for investments • Comprehensive list of projects
	Analysis of Mountainous Countries Urban Design Guidelines	What and how the actions are taken in other contexts?	This stage of the project explores how Urban Design Guidelines are implemented in the contexts of mountainous cities, exploring best practices and solution for urban resilience.	• •Report on analysis of Urban Design Guidelines in Mountainous Countries
	Urban planning and design guidelines	How to guide the future development in Khorog?	This stage of the project defines targeted recommendations for Khorog context across thematic areas to guide the transformative processes in the city. Urban planning and design guidelines set specific indicators to meet (density, permeability, etc.) as well as provide recommendations at the neighbourhood level	• Validation workshop • Urban Planning and design guidelines report
	Analysis of CIS countries Building Codes	How are actions implemented in other contexts similar to Tajikistan in terms of legislation and institutional framework?	At this stage of the project, the analysis of building codes in the CIS countries is conducted to understand the gaps and alignment with international standards. Such analysis provides a comprehensive overview of the building codes in the region, informing the analysis of Khorog regulatory frameworks	• Report on the analysis of CIS countries Building Codes
	Khorog Urban Planning Rules	How to implement action in Khorog?	This stage provides clear recommendations based on the comprehensive revision of the Khorog planning rules, including recommendation on law's amendments according to international standards.	• Khorog Urban Planning Rules Report

Table 1. Project phasing and participatory events conducted

Fig 4. People walking back home from the market, Khorog, UN-Habitat, September 2023

2

PRIORITISATION WORKSHOP WITH AKAH TEAM

In September 2022 the UN-Habitat project team conducted a prioritisation workshop that informed the scoring criteria for the defined projects. Prior to the actual prioritisation exercise, the project team exchanged ideas and aspirations regarding the outcomes of the second phase as well as the potential challenges.

The AKAH technical expert were asked to prioritise the eight spatial strategies according to level of urgency. The eight spatial strategies are:

- Growth Management Strategy (GMS)
- Adequate Housing & Relocation Strategy (HRS)
- Urban Regeneration Strategy (URS)
- Hazard Mitigation Strategy (HMS)
- Natural & Cultural Conservation Strategy (NCCS)
- Agricultural & Food Supply Strategy (AFS)
- Basic Service Provision Strategy (BSPS)
- Resilient Streets Strategy (RSS)

Apart from helping in the prioritisation process, the activity opened the discussion on the potential project that can be defined according to the specific strategy, feasibility of implementation, and timelines. Moreover, the activity aimed to:

- Discuss the details of each strategy and how it can be translated into projects;
- Discuss the sensitivities and potential challenges for particular projects and strategies;
- Collect the feedback on the relevance of the spatial strategy;
- Discuss the potential amendments of regulatory mechanisms to ensure those strategies can be integrated into the planning processes;
- Prioritise the spatial strategies and define the most urgent scope of actions

The AKAH technical experts were given a set of eight stickers corresponding with the icons for each strategy and asked to prioritise using a specific format. The results were collected and summarized.

The activity revealed that the Hazard Mitigation Strategy (HMS), the Growth Management Strategy (GMS), and the Basic Service Provision Strategy (BSPS) were within the top priority strategies that would have an immediate impact on the population in terms of service provision and protection from hazards. The Growth Management Strategy (GMS) was also seen as one of the key priorities, however it was stated that the strategy has an overarching nature and may include same actions as for Hazard Mitigation Strategy (HMS), Adequate Housing & Relocation Strategy (HRS) and Urban Regeneration Strategy (URS).

The Adequate Housing & Relocation Strategy (HRS) and the Agricultural & Food Supply Strategy (AFS) were highlighted as critical, while the Natural & Cultural Conservation Strategy (NCCS) and the Resilient Streets Strategy (RSS) were defined as concluding strategies

that should be addressed after the most urgent actions related to service provision, housing and safety are taken.

Priority	Strategy
1	Growth Management Strategy (GMS)
2	Adequate Housing & Relocation Strategy (HRS)
3	Urban Regeneration Strategy (URS)
4	Hazard Mitigation Strategy (HMS)
5	Natural & Cultural Conservation Strategy (NCCS)
6	Agricultural & Food Supply Strategy (AFS)
7	Basic Service Provision Strategy (BSPS)
8	Resilient Streets Strategy (RSS)

Table 2. Prioritised spatial strategies

As an outcome of the activity, the UN-Habitat project team extracted the following priority list that informed the scoring criteria for the defined projects:

In addition to the prioritised strategies, it was suggested to consider a complex relation between the strategies that would inform the projects. The Natural & Cultural Conservation Strategy (NCCS) as well as the Urban Regeneration Strategy (URS) might be considered as cross-cutting strategies integrated into the majority of the spatial recommendations.

Fig 6. Prioritisation list done by the participant

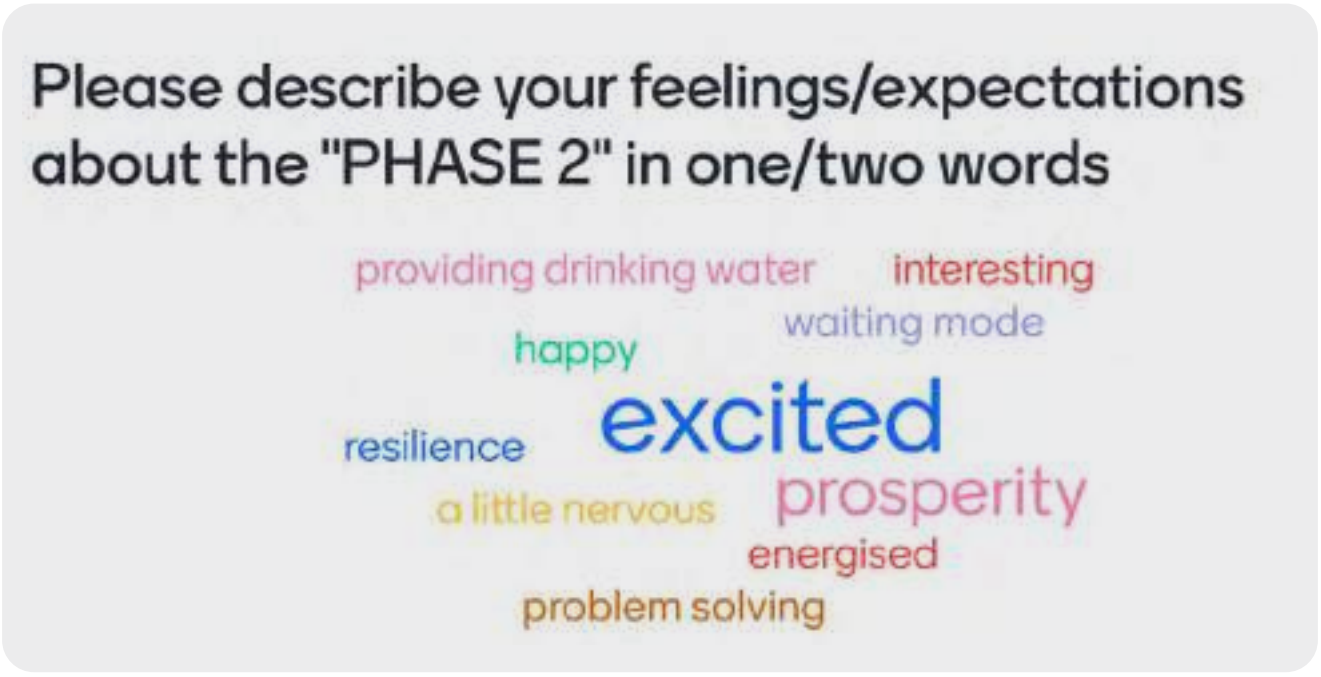


Fig 5. . Ice-breaking activity with AKAH technical team

Fig 7. Presentation of the prioritised spatial strategies and technical discussion, UN-Habitat, September 2023

Fig 8. Colloborative mapping of the updated projects/ initiatives, UN-Habitat, September 2023

Fig 9. Presentation of the prioritised spatial strategies, UN-Habitat, September 2023

Fig 10. The idea of a public space design. A drawing by the participant of the ideation activity with children, UN-Habitat, September 2023

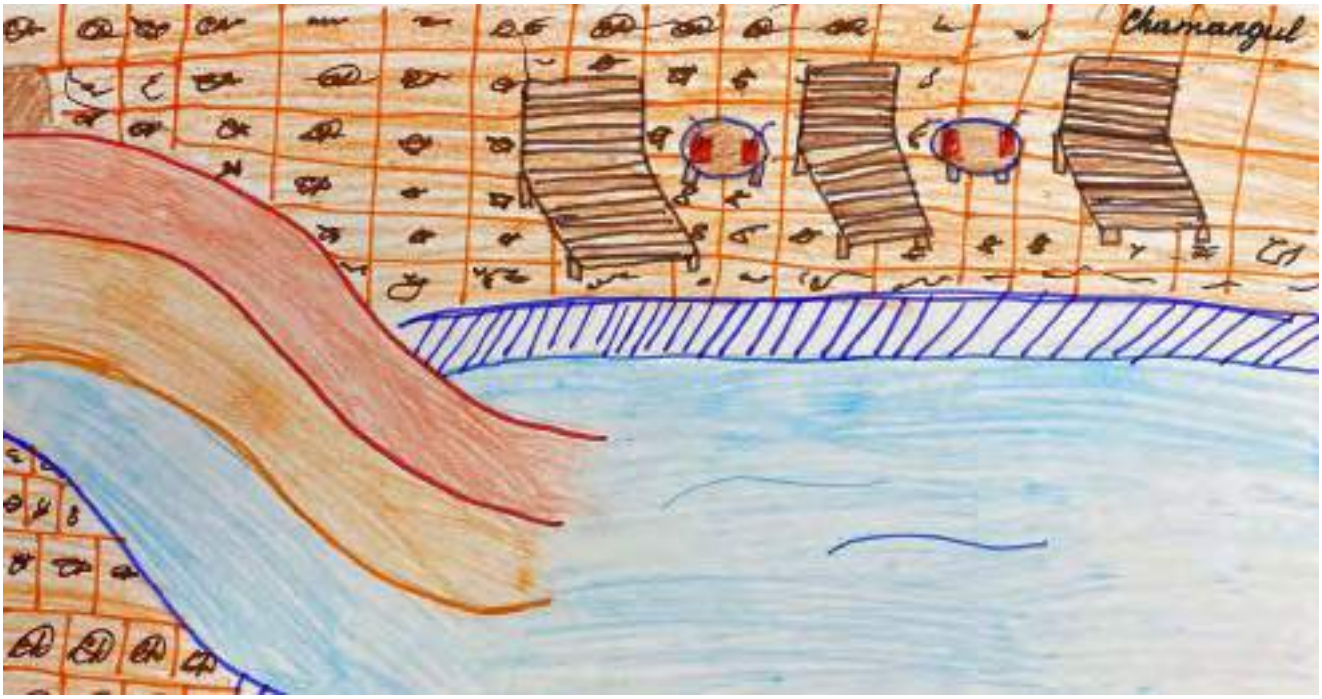


Fig 11. The idea of a public space design. A drawing by the participant of the ideation activity with children, UN-Habitat, September 2023

3

WORKING SESSION WITH THE NATIONAL PLANNING INSTITUTE "SHAKHROFAR"

During the mission in September 2022, the UN-Habitat project team conducted a visit to the national planning institute "Shakhrofar" to run a mapping activity and explain the goals of the second phase. The team explained the strategic recommendations, the eight strategies that resulted from the priority list, as well as vehicle/ path that could serve to translate these strategies into projects. The team presented the pre-selected sites chosen as the demonstration projects to be validated by thelocal planning officers.

Due to organizational political shifts, it was challenging to ensure a meaningful participatory process however the team managed to conduct a rapid mapping exercise to collect some feedback and tips from theGeneral plan. In addition, the team consulted the planning officers on the pre-selected sites of the transformative projects. It was agreed that under-utilized lands within the pre-selected sites might be considered for the mixed-use development space. All this of course following adequate density benchmarks which includes a limit of 6 floors.

The key discussion points from the working session were as follows:

- The New development should not exceed 6 floors;
- The current development adjacent to the river can become a pleasant riverfront once some elements such as elevated housing, hazard mitigation, etc, are considered,redesigned, and integrated into the design.The amendment to the current legislation are critical to make sure recommendations of UN-Habitat are feasible

Below is the table of the key recommendations as well as the next steps for the second phase' planning process. These recommendations werea result of participatory workshop where Shakhrofar was an active participant (p.21 of the Participation and Community Engagement Report).

These recommendations were addressed during the second phase and are highlighted in green rows.

Enhancing engagement with the civil society
During the workshop, the importance of public participation was emphasised. Civil Society engagement is a cornerstone of the UN-Habitat approach, and civil participation will be ensured throughout the planning process.
During the second phase the project team included numerous activities with the community groups, ensuring parallel discussions with target groups. This was done to ensure a transparent dialogue on the city' challenges, its safety concerns, etc. The project team conducted a wide range of activities with women, youth, and children, collecting ideas and actual suggestions on how to improve the built environment. In addition, the outcome of "My Vision" campaign conducted by AKAH was integrated into the design proposals.
Including previous studies in the analysis
During the workshop, it was noted that critical pieces of analysis undertaken before the establishment of the programme were not considered. These included the mapping of the lake which was conducted from 2015 to 2020 and done by AKAH in collaboration with the planning and design institution in Moscow. Another piece of the analysis not included was the AKAH study on the geological conditions of Tajikistan, conducted in 2019. The project team should be provided with these documents to be able to include them in further analysis.
The study was shared by the AKAH technical team, and it was then analysed by the project team. The proposed recommendations and findings are aligned with the overall vision and understanding of the urban and environmental resilience.
Considering the Mahalla in the analysis
During the workshop, participants were discussing the challenges and opportunities at the neighbourhood scale. It is important to ensure that the analysis included the Mahala scale, especially regarding the risk analysis. Sample recommendations at this scale could also be provided (e.g., developing the riverfront, creating a system of public spaces, etc.). This Sample recommendations at the neighbourhood scale should respond to the concerns of the citizens , and provide clear explanations of the development strategy.
The scope of the second phase included the detailed plans and the design snapshots at the neighborhood scale. These detailed design proposals include solutions for the riverfront, housing, public spaces, etc. The Design proposals demonstrate how the recommendations and strategies discussed are applied at the neighbourhood, street, public space and the block level.
Identifying safe areas suitable for development
It is critical to identify the areas suitable for development, as it was noted that the city lacks housing options. The Identification of the safe areas within the city should also be included in the recommendations on relocation This will form part of the comprehensive disaster response strategy. To facilitate the study, it is critical to first conduct a vacant land mapping in the city of Khorog.
During the second phase of the project, the areas that are considered safe for living were identified. The findings were based on the evidence that resulted fromthe first phase. Detailed design projects were developed for the selected sites, showcasing housing typologies that are specific to the local context and the culture and can ensure contextually appropriate density indicators. By promoting such spatial organization, twice as much as the population in need could be relocated to the safe areas.
Updating The General Plan
The General Plan of Khorog was developed according to all necessary norms and standards, however, it no longer responds to the current socio-economic and spatial needs. Moreover, some norms and regulations have been changed requiring an update on the Plan. It is critical to allow for a smooth process in the updating of the General Plan.
During the second phase, the project team developed context specific urban planning and design guidelines for the mountainous cities. This was aimed to assist "Shakhrofar" in integrating the UN-Habitat recommendations into the General Plan. In addition, a mechanism for feedback' exchange was developed to push forward collaborative work.

Table 3. Key recommendations and the next steps for the second phase' planning process.

Fig 12. Technical consultation with the planning authority "Shakhrofar", UN-Habitat, September 2023

Fig 13. Presentation of the intermodiate project outcomes to the planning authority "Shakhrofar", UN-Habitat, September 2023

Fig 14. Tools for prioritisation activity (stickers, flags, markers, basemap), UN-Habitat, September 2023

4

COMPREHENSIVE PRIORITISATION ACTIVITY WITH STAKEHOLDERS AND PLANNING ACTORS

In September 2023, during the mission to Khrorog, the team conducted a comprehensive prioritisation activity with a wide range ofstakeholders . Some of the stakeholders, among others, were theAKAH technical team, representatives from the local government and line ministries such as CoES, Main Architect of Khorog, and the Deputee Mayour of Khorog. For this activity, a set of materials were included such as the a basemap with the key data layers (built-up are, road network, hazard zone), and printed flags of different colors each color corresponding a specific thematic area of potential projects.

The list of thematic areas for the proposed projects are as follows:

- Restriction and limitation
- Relocation
- New construction
- Hazard mitigation
- Public space development and design
- Connectivity improvement
- Utility improvement and regularization
- Agricultural restoration

Each participant was given a set of 6 flags (2 per thematic area). Each flag symbolised a priority action orproject that should have been placed in a particular area. By doing so, each participant could identify the most urgent action that needed to be established. Due to the participants' wide range of background and expertise, the outcome of the activity (the consolidated map of prioritised actions) was in-depth and comprehensive and was based on the experience of the people working and living in Khorog.

Due to the vast number of participants, and the limited number of flags given to them, some actions were repeated and overlayed with each other. This allowed the team to conduct an intensity analysis, defining the hotspots of priority actions.

The ease of the activity and the available materials, allowed the team to conduct itmultiple times and with different actors such as experts from AKG and UCA. This ensured that, every stakeholder could engage in the activity whether by leaving a message, apriority action, or a flag.

Fig 15. Prioritisation activity with technocal experts, UN-Habitat, September 2023

Fig 16. Prioritisation activity with technocal experts, UN-Habitat, September 2023

The team summarized all the findings and mapped the priority actions according to the outcomes of the activity. All the proposals were then digitalised and georeferenced. This exercise informed the scoring criteria for the Capital Investment Planning.

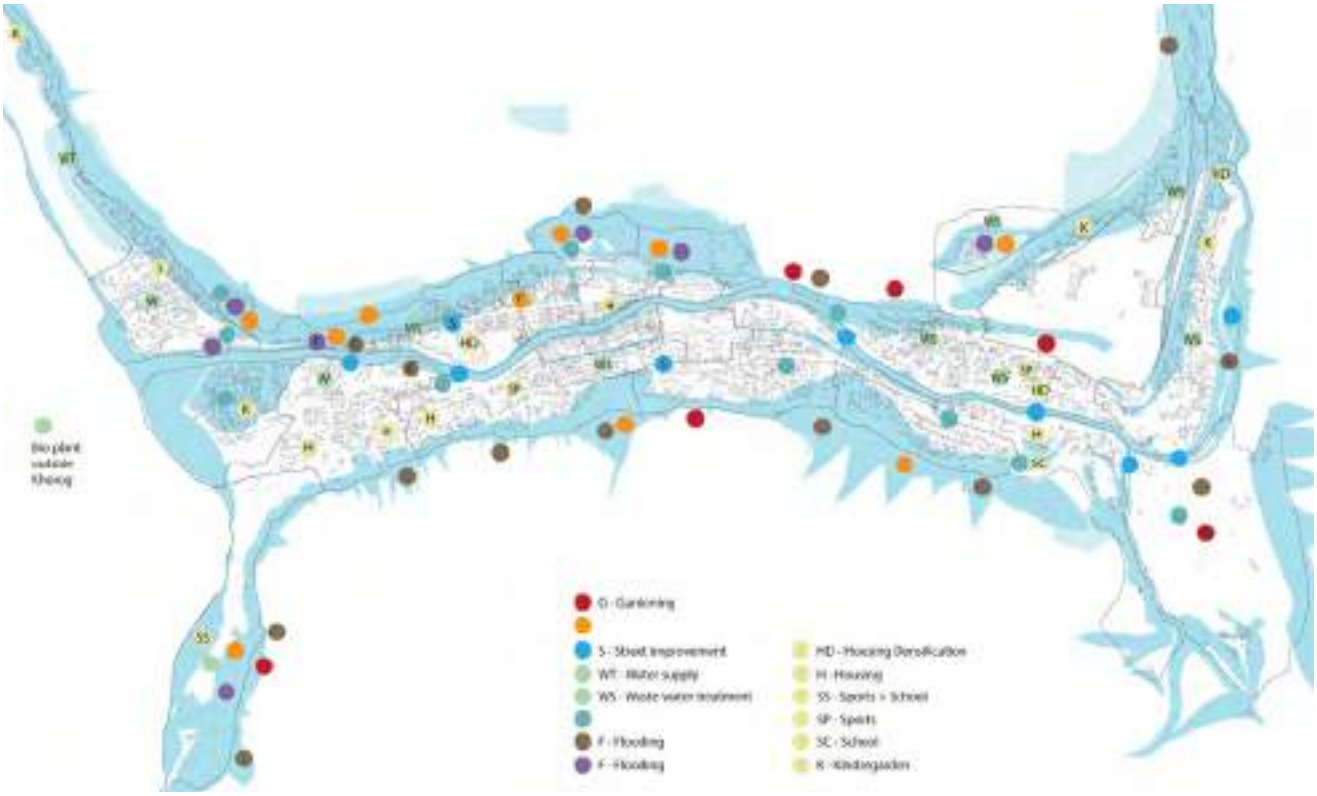


Fig 17. Mapped outcomes of the priotisation activity

Fig 18. Outcomes of the priotisation activity (thematic areas), UN-Habitat, September 2023

Fig 19. Improvised exibition in the central park of Khoroga as an outcome of the ideation activity, UN-Habitat, September 2023

5

IDEATION ACTIVITIES WITH COMMUNITIES

The ideation activities with the communities included a variety of techniques to ensure accurate feedback collection. collaborative mapping helped in mapping the most significant places for the communities. Furthermore, it helped in identifying a specific part of the city associated with the challenges in the built environment. The exercise provided opportunities to map and validate the design solutions together with the communities. For the collaborative mapping in Khorog, the project team used 2 scales of basemaps: 1) The entire city of Khorog and, 2) the zooms into the 2 pre-selected areas for demonstration projects.

Another technique was the technique based on "My neighborhood" aimed to collect specific ideas and best practices from Khorog. Thiswas crucial to understand which local design elements/activities were the most appreciated and which were lacking and thus needed. The "My neighborhood" tool helped in facilitating thecollection of ideas, feedback, and best practices, while raising awareness on planning and design concepts, principles, and how those can be applied in the specific contexts.

The drawing exercise is a technique particularly successful among youth and children. It provides an opportunity to both graphically present ideas, as well as totransform any space into a temporary exhibition space, attracting attention to urban planning and design issues and sparkling discussions around design solutions.

5.1. COLLABORATIVE MAPPING WITH WOMEN

To ensure a transparent dialogue on the existing/ current urban challenges and opportunities, the project team conducted a paralell women's group activity. By doing so, the team could discuss specific topics on accessibility, safety concerns and perceptions, and how to improve the built environment by specifically targeting women and girls.

During the mission, and in the beginning of the second phase, the project team conducted a collaborative mapping activity with women. During this mapping activity the the following thematic areas were discussed: challenges and opportunities of the buildt environment, , safety, mobility patterns, and housing typologies.

The list of participants was discussed in advance to ensure not only significant representation from the different mahallas, but to be able to also acknowledge thedifferent issues of the communities. Prior to this exercise, the project team developed a list of questions for the participants. The questions were as follows:

List of questions addressed to the women's group:

- What place in Khorog do you appreciate the most and why?
- What place in Khorog don't you appreciate and why?
- What are the top 3 challenges and opportunities in Khorog?
- What is your perception of safety?
- Which place in Khorog can you identify as "unsafe"?
- Is it easy for you to walk around with children? Why?
- Is it easy for you to drive in Khorog?
- How do you organise a space in the house?
- Do you have any sharing spaces? And if so, how would you see sharing some spaces? (e.g., community garden)
- Would you prefer to live in an apartment or in a house?
- What is your perception about the high-rise buildings in Khorog?

After the discussion, participants had an opportunity to share their ideas and identify the critical places on a map. All the comments and ideas were documented and georeferenced. The findings were then integrated in the design or/and addressed by the design proposals during the second phase. These findings arehighlighted in geen rows.

Fig 20. The colloborative mapping with women, UN-Habitat, September 2023

Fig 21. The colloborative mapping with women, UN-Habitat, September 2023

Lack of accessibility
Some areas of the city are lacking accessibility not only due to the lack access roads and bridges, but also due to poor urban design. Open drainages, lack of ramps, non-tarmacked parts of the roads, and lack of pedestrian pathways are the critical challenges for a comfortable mobility. Due to these challenges, people with disabilities, elderly people, and families with small children, cannot or need huge efforts to be able to access some parts of the city. This creates an impression that some parts of the city are not for everyone.
The demonstration projects of the second phase will showcase how the space can be pedestrian-oriented with minimum physical barriers by following the principles of universal design. In addition, the projects will demonstrate the recommendations for the street redesign. The recommended street section is developed with indications on appropriate sidewalks' widths, vegetation buffers, cycling lanes, etc. All the recommendations are synthesised in the urban planning and design guidelines for Khorog, which is one of the outputs of the second phase.
Safety concerns in some areas of Khorog
Khorog is generally perceived as a safe city, where there are no risks/threats towards women. It is possible to walk late hours in different areas of Khorog, however lack of lighting along the street and the existing physical road conditions (open drainages, lack of tarmacs, ditches, lack of sidewalks) makes it dangerous to walk. Despite the general perception, some areas of the city are unsafe due to very poor road design, sharp road curves, and a lack of traffic lights as well as traffic calming measures. Many car accidents have happened in these areas, and they have therefore becomechallenging parts of the city to drive through and cross.
The unsafe areas were identified and georeferenced for further diagnostic. The road curves were addressed by the design proposals and city-wide vision of projects. The recommendation on street infrastructure and street redesign will help address the challenges that cause the aforementioned safety concerns.
Fear of high-rise buildings
As it was identified during the participatory session, communities were concerned about the possibility of being resettled into the high-rise buildings. That is caused by the concerns regarding the safety of the construction in an earthquake prone area. Generally, single housing units are more appreciated than apartment units as communities are used to have a plot of land for gardening and for the any outdoor social activities.
The second phase of the project included detailed neighbourhood designs to demonstrate the modern type of spatial organisation that includes the culture and the local way of living. The design proposals include the preliminary solutions for housing, community gardens, as well as a variety of social and public facilities.
Poor service provision
The women's group shared concerns regarding the accessibility to basic services (water, sewage). In some mahallas it is very challenging to collect drinking water and water for gardening. Access to sewage was also highlighted as an urgent need.
The project team documented the feedback and concerns regarding the basic service provision. In addition, the team synthesised the information into the mapped deficit areas (the major component for the capital investment planning) and provided Feedback on the priority actions to be implemented such as water, sewage, and street accessibility. The outcomes of the consultation informed the scoring criteria for the capital investment planning. This allowed to give higher score to the projects related to urgent community needs.

Table 4. Key ideas and feedback from the ideation activity with women

Fig 22. The colloborative mapping with women, UN-Habitat, September 2023

Fig 23. The colloborative mapping with stakeholders, UN-Habitat, September 2023

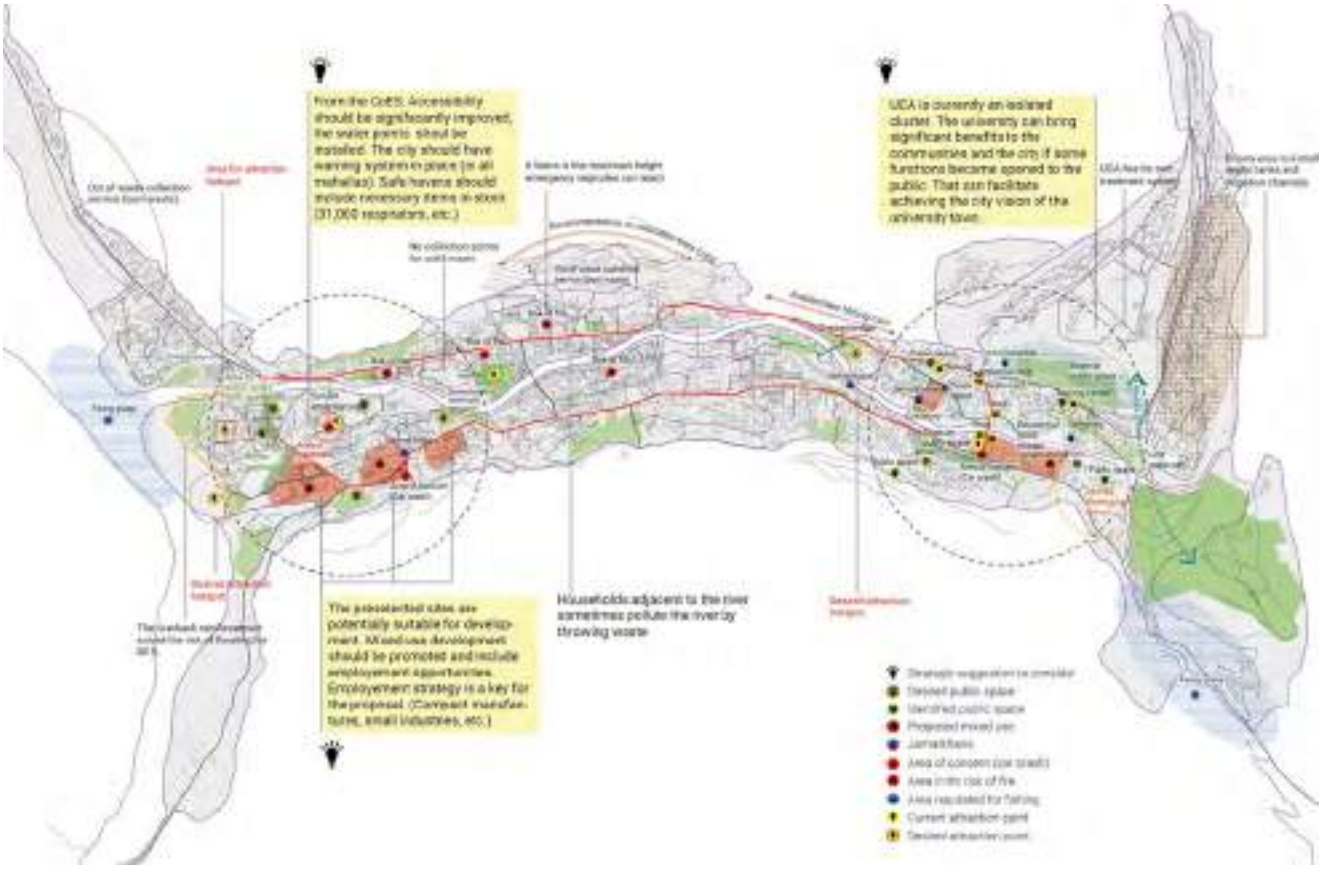


Fig 25. Georeferenced outcomes of the collaborative mapping activities

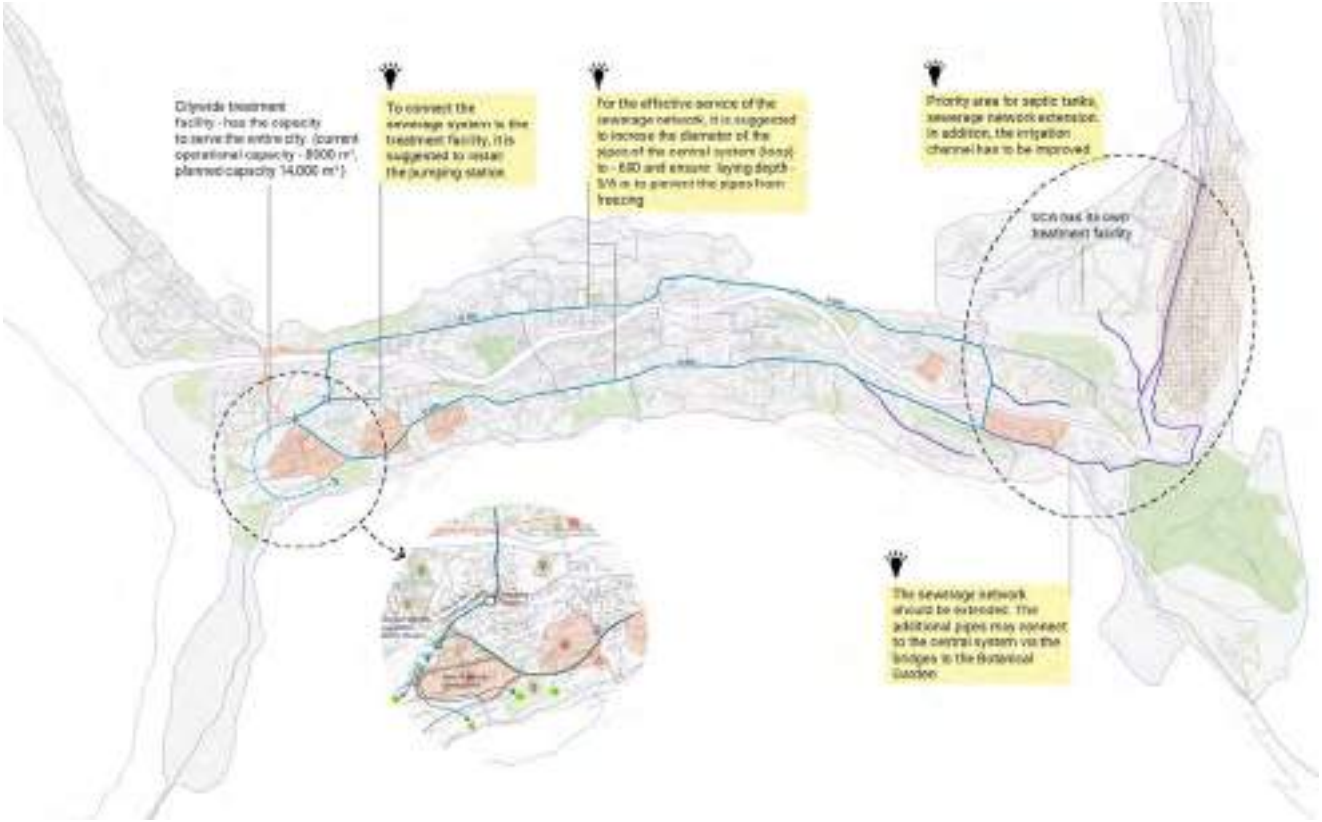


Fig 24. Georeferenced outcomes of the collaborative mapping activities with deputy mayor and representatives from sectoral departments on infrastructure

5.2. "MY NEIGHBOURHOOD" WITH YOUTH

The "MY Neighbourhood" activity was conducted during the second phase of the mission. Developed in 2022 UN-Habitat's "My Neighborhood" offers a practical guide to achieve sustainable urban space while contributing in localizing the Sustainable Development Goals (SDGs) as well as implementing the New Urban Agenda. UN-Habitat's 'Five Principles of Sustainable Neighbourhood Planning', created in 2014, was used as a starting point for the MY Neighbourhood activity. It summarized five key urban planning theories and provided indicators for sustainable neighbourhood design.

In Khorog the "MY Neighbourhood" was used as an independent product for collecting ideas. A matrix format was developed and represented on a wall, serving as a mural and idea collection board.

For such activity the project team targeted the Khorog youth to raise awareness about urban planning issues and collect ideas how to make the future development of Khorog attractive for young people. For this activity the team selected five photos of Khorog that illustrated the components of the city's five objectives. Prior to this activity, the key planning and design concepts were explained to the participants.

Apart from thisactive participatory process, the matrix provided actual design recommendations from the youth and according to the 4 levels of interventions which were: neighbourhood, streets , public open space, and a building. These recommendations were considered inthe detailed design proposals.

Key workshop/discussion findings. The findings were integrated in the design or/and addressed by the design proposals during the second phase. These are highlighted in green rows.

Fig 26. "MY Neighbourhood"activity, UN-Habitat, September 2023

Fig 27. A snapshot of ideas/messages left, UN-Habitat, September 2023

Fig 28. The improvised matrix with five city objectives (compact, connected, vibrant, inclusive, resilient), UN-Habitat, September 2023

Fig 29. The ideation activity and brainstoeming with youth, UN-Habitat, September 2023

Lack of fun places to spend time
The Khorog youth is mission urban places where they can spend time such as cafes, modern daily stores, wi-fi spots, well-designed public spaces where people can sit rest and play, places for indoor and outdoor sport activities, etc. The city of Dushanbe was mentioned as an example of city in Tajikistan, where the youth like to spend their time.
The second phase of the project addresses the concerns of the youth in the detailed design proposals by demonstrating the design of active public spaces, calm areas to rest, a variety of public facilities and new functions. The projects include a wide variety of public spaces to cover entire population of Khorog, regeneration and construction of libraries, commercial areas, public gardens, sport facilities, etc. The design proposal for the green network will create a vibrant system of streets and public spaces significantly improving accessibility for pedestrians.
Poor accessibility and lack of street lighting
The youth raised serious concerns regarding accessibility. specifically regarding the challenges in traveling to the central part of the city, the time it takes to reach to certain areas, and the system of public transpiration is non-convenient with a lack of public transport stops. Lack of lighting is also a serious issue which makes it challenging to meet friends or travel home in the late hours.
The design proposals include the detailed street sections that help in addressingthe concerns of youth. UN-Habitat recommends creating a network of pedestrian and cycling paths, constructing new pedestrian bridges and upgrading existing bridges to increase accessibility both for pedestrians and for cyclists. The detailed street section demonstrates how to plan the street network following the principles of the “complete street” to ensure safe and comfortable movements for all street users. Design proposals include recommendations on street lighting and sidewalks. In addition, the identified project includes the comprehensive system of public transportation with public transport stops every 400 meters.
No infrastructure for cycling and comfortable walking
The lack of cycling was highlighted as a critical issue. Most of the young people stated that they would cycle every day to their destinations if there were a safe and comfortable infrastructure for cycling. Because of the road conditions and safety concerns many young people are forbidden by their parents to cycle.
As mentioned above, the detailed street section demonstrates how to plan the street network following the principles of the “complete street” to ensure safe and comfortable movements for all street users, including cyclists. The recommendations by UN-Habitat on mobility and cycling infrastructure are highlighted in the urban planning and design guidelines developed by UN-Habitat and specifically for Khorog.
No volunteering opportunities
Young people of Khorog shared the concern that there are no opportunities for “soft activities” such as upgrading something, restoring, and/or volunteering. Khorog youth stated that they are willing to contribute to the development of their city with their skills and ideas, there are however no opportunities to do so.
The identified issue highlights the opportunity to facilitate the creation of urban development activism that would assist the local government and the key actors in maintaining and upgrading the public spaces including the community gardens, etc. The Khorog youth can play a vital role in designing and improving and enhancing the public spaces using their skills and ideas. The second phase addresses such issues by defining a variety of public space projects and providing insights and recommendations on the possible maintenance mechanisms of these spaces, where the youth can be actively involved.

Table 5. Key ideas and feedback from the ideation activity with youth

Fig 30. The idea of a public space design. A drawing by the participant of the ideation activity with children, UN-Habitat, September 2023

Fig 31. The ideation activity with children, UN-Habitat, September 2023

5.3. DRAWING ACTIVITY WITH CHILDREN

Children's ideas together with their feedbackare critical inputs to consider in the planning and design phase to ensure the city or a neighborhood is inclusive for all. The drawing as well as the modeling exercises are a techniques that can be used for avariety of ages and contexts. The project team was in the city of Khorog on mission in September. During the missiona drawing activity was conducted outdoors, in the main park of Khorog, and thanks to the good weather, the participants had the possibility to enjoy the public space.

Children of different ages took part in this activity. The age range was from 5 to 14 years old. To ensure everyone could participate and that the task was easy to understand the attendees were divided into two groups: A group consisted of toddlers and another group consisted of the older children. For the younger group the task was to draw what they would like to see in front of their houses, while the group with the older children were asked to draw what was missed in the city.

The drawings were then analysed and the key findings were extracted and included in the design proposals of public spaces, housing, activities, etc.

Below are the key ideas and messages shared by children:

- It is important to have more trees and flowers in the city
- Many children want to have a trampoline
- There is a need to have more playgrounds with a variety of structures for children
- It can be nice to enjoy the view of the mountains from the city
- A swimming pool is very desired by the children
- More shops and markets will be appreciated
- The city needs more colors as now Khorog seems to be gray

Fig 32. A child expressing his ideas on how to improve the urban environment of Khorog, UN-Habitat, September 2023

Fig 34. Children expressing their ideas on how to improve the urban environment of Khorog, UN-Habitat, September 2023

Fig 33. Children expressing their ideas on how to improve the urban environment of Khorog, UN-Habitat, September 2023

Fig 35. The labyrinth as an idea of a public space design. A drawing by the participant of the ideation activity with children, UN-Habitat, September 2023

6

VALIDATION WORKSHOP WITH AKAH TECHNICAL EXPERTS ON CAPITAL INVESTMENT PLANNING AND PROJECT PRIORITISATION

In February 2023 the project team conducted a second mission to Dushanbe to conduct the comprehensive workshop with the AKAH technical experts on capital investment planning, project identification, prioritisation, and methodology for the scoring criteria.

Key points of discussion:

- Capital investment planning is an important mechanism to increase the intergovernmental coordination and alignment, facilitate the sectoral integration, and assist in the actual process of localizing the SDGs.
- The most common challenge in cities is the lack of focus on maintenance of projects and understanding the capacity of the city/country to maintain the projects they get investments for.
- Capital investment planning can assist in understanding and developing mechanisms to increase own-source revenues for the city, build a better taxation system and improve revenues for maintenance of projects.
- Capital investment planning ensures a balance between bankable and other projects by considering a variety of criteria for project scoring (e.g., community voices).
- Spatial plans have to be strategic, integrated, and dynamic so they can be easily translated into the project list. Once the strategies can be translated into the projects it becomes easier to implement them, thus achieving the overall vision of the project.
- There are 5 critical steps of spatially informed investments:
  - Assessing the city
  - Identifying the needs
  - Developing strategic responses
  - Identification of projects
  - Prioritizing projects
- Identifying the deficit areas is a critical component for capital investment planning. The deficit is defined according to the nature of the project (accessibility, capacity, etc.). Understanding the right methodology is crucial.
- Enabling components for implementation such as the legislative framework(assessing) and financial sustainability are important to consider in the project scoring.
- It is important to conduct comparative studies among the mountainous cities, however, the compilation of different codes should be avoided. Currently the building codes in Khorog are a copy-paste from the Duschanbe codes. It is therefore crucial to develop specific building codes tailored to the context of Khorog.
- There is no need for road expansion. Improving public transportation and pedestrian infrastructure is however strongly recommended. Rather than extending the widths of roads, the focus should be made on increasing the street permeability of the urban

fabric (Diversity of routes from point A to point B). In addition, a block should not exceed 200m to ensure convenient pedestrian movements that will bring economic benefits to the city (smaller plots are more attractive for small businesses due to better walkability, human-scale, etc.).

- Budget fitting includes several steps: carry out priority scoring, inclusion of committed projects, fit priority projects, project moderation, and test and repeat.
- For the projects related to water network amnesty of informal connections may be considered. It will be crucial to look for ways to legally connect all households (including those that have illegally connected) to the water network.
- The AKAH technical team provided assistance in collecting data on the projects (especially projects on infrastructure) to complete the project list for scoring. Data should be collected according to the template developed by the UN-Habitat project team. All the identified projects are synthesised in the project list.
- The approach of capital investment planning can bring a significant impact in Khorog, it is therefore important to ensure sustainability of the approach by having a good understanding of the process in both AKAH and in the local government.
- Some specific data on municipal finance and financial mechanisms is not available, hence some data is difficult to get in digital format. UN-Habitat should find a way to proceed with the approach if these data challenges will remain.

The validation workshop on the capital investment planning was a crucial step that informed the following technical sessions with AKAH team on the mapping and validation part of the project. After the comprehensive workshop, the UN-Habitat project team allocated a full workday for the project's validation.

GIS experts, field officers, and urban planning and design experts gathered together to go through the entire project, discussing the location and the nature of each one of the projects. The amendments were directly made to the comprehensive project list and the geodatabase.

Fig 36. The snapshot of prioritisation excercise, UN-Habitat, September 2023

Fig 37. Technical consultation with stakeholders, UN-Habitat, September 2023

Fig 38. Technical consultation with stakeholders, UN-Habitat, September 2023

Fig 39. Technical consultation with AKAH experts in Dushanbe, UN-Habitat, September 2023

Fig 40. Technical consultation with AKAH experts in Khorog, UN-Habitat, September 2023

7

VALIDATION DESIGN WORKSHOP WITH AKAH TECHNICAL EXPERTS

The project team conducted a design validation workshop to discuss the initial design proposals based on the outcomes of the previous participatory activities, the local planning parameters, and the UN-Habitat urban planning and design principles for sustainable neighborhood planning.

The project team prepared a presentation that contained several thematic areas: the overall vision for the proposed interventions, context specific density considerations, and UN-Habitat recommended benchmarks. Moreover, the presentation also includedthe rationale for site selection, preliminary design proposals, preliminary suggestions for housing typologies, the work on urban planning, and the design guidelines.

The presentation sparked discussions on how to enhance local culture and traditions in urban design, as well as on housing typologies to be developed at the later stages.

Key discussions points:

- By doing urban design demonstration projects, UN-Habitat showcases how high density can be applied in the context of Khorog taking into consideration the traditional ways of living. It is important to consider density not as a planning indicator but as a socio-cultural phenomenon that can be "well-planned".
- The under-utilized land that is considered within the project scope is currently privately owned. Once the detailed designs are developed and approved (which implies technical development of plans by Shakhrofar), the participatory sessions with the landowners could be arranged.
- The deign proposals should consider different seasons to ensure the use of the public spaces throughout the year.
- It may be helpful to elaborate on the incentives for the building owners to introduce mixed-use functions.
- The mechanisms to reduce maintenance costs should be considered in the design proposals.
- Prior to the development of the detailed housing proposals, it might be helpful to conduct a survey among the residents of Khorog to have a sense of how communities prefer their houses to be. It is important to know if people want to live close to each other, share a garden/kitchen, etc.
- It can be helpful to transform the guidelines into the concise and sharp "do's and don'ts " that can guide the Shakhrofar's work on the General Plan.
- It would be very helpful to detail the design proposals to include explanatory graphics, sections, etc. to ensure the AKAH project team can further carry out the technical design process with the involvement of the different sectors.

As an outcome of the session, the UN-Habitat project team received feedback on the feasibility of the design proposals, updates from the field, and practical ideas on how to strengthen the design proposals. This feedback was considered in the design proposals as well as in the city-wide vision.

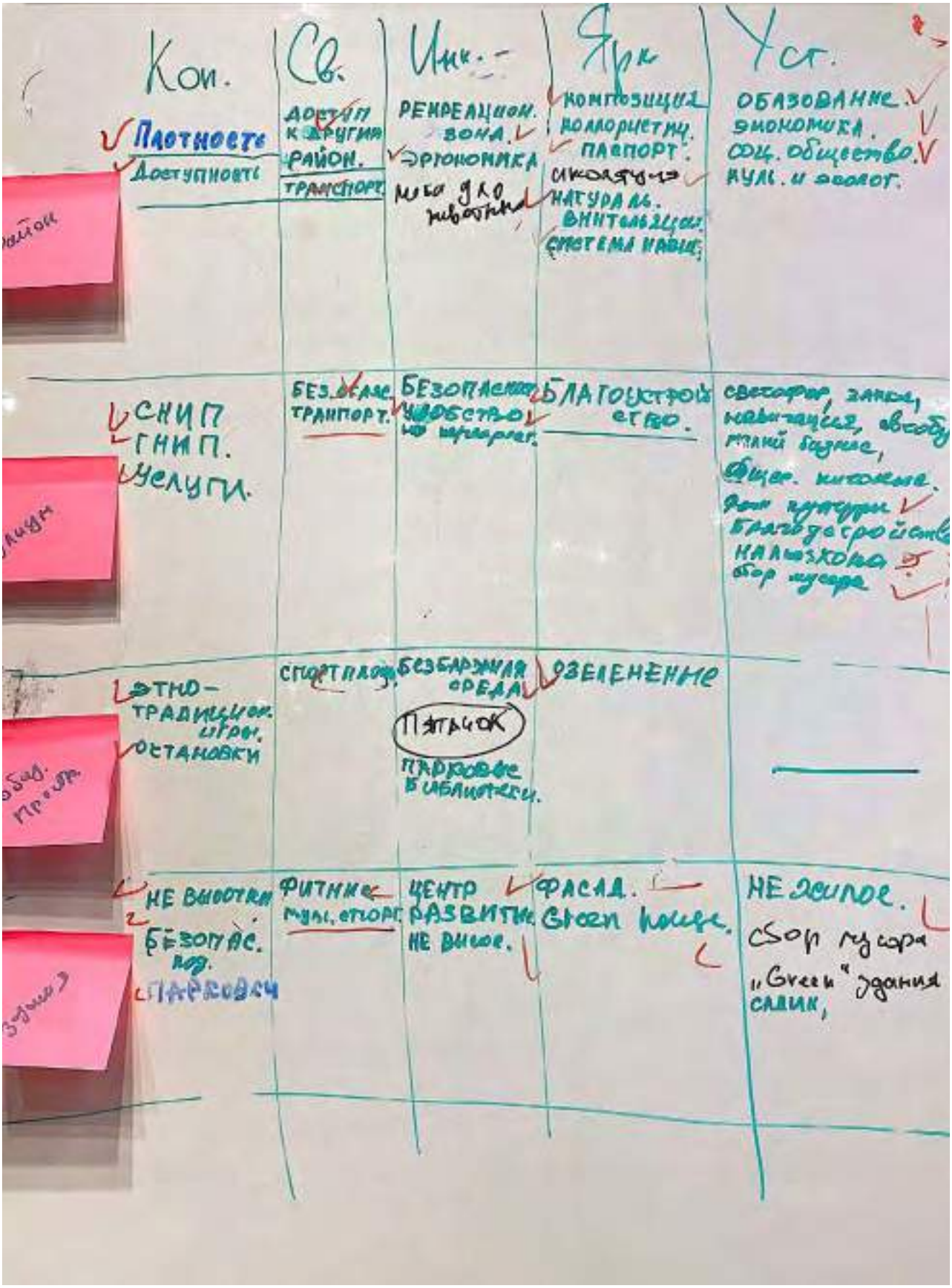


Fig 41. The outcome of the "MY Neighbourhood"excercise with AKAH Design Unit, UN-Habitat, May 2023

8

THEMATIC TRAINING SESSION WITH AKAH DESIGN UNIT

1st training day

In the end of April 2023, the UN-Habitat Urban Lab conducted a thematic two-day training with the AKAH design unit. The attendees were Azratqul Soibqulov, Farhod Safarmamadov, Nekruz Alibakhshov and Surush Zikrilobekov. The training was carried out by Anastasia Ignatova, who is a Design Expert for the UN-Habitat Urban planning section. The training was divided into 2 thematic parts:

- The Strategic planning of Khorog and the translation of strategies into actions (day 1)
- The Urban Planning and Design principles and practical exercise (day 2)

During the first day the training presentation and discussions were focused on the process of collecting data, methodology of data synthesis, diagnosis, formulation of spatial strategies, and their translation into georeferenced list of projects. The mechanism of project identification was precisely explained using the classification tables that position a project according to a specific strategy and the scale of intervention.

The attendees drew a step-by-step process following the explanation of the planning process approach of the Urban Lab.

The presentation was based on the case of Khororg with snapshots of the different stages of analysis conducted in phase 1 and 2. During the training the teams exchanged ideas regarding the best practices in the region and brainstormed on the solutions to be further developed in Khorog.

Key discussion point from brainstorming:

- In Khorog,the education sector is currently growing faster than what the system can accommodate. This leads to the emigration of qualified people, also called brain drain. To manage it, it is crucial to create an enabling environment for employment opportunities. The Sustainable Markets Initiative (SMI) could be a feasible strategy tobe implemented in Khorog.
- There are different ways to diversify Khorog'seconomy. This could be done in the economic fields of wool, honey, and herbs production. Economic diversification could also include the small dairy and meat factories, and spa and well-being sector, etc.
- It is crucial to preserve the Pamiri cultural heritage by building Pamiri houses or by integrating the traditional architectural elements in the design. For example, for the proposal of the Pamiri houses that are in proximity to the mountains, backyards and gardens were recommended and included in the design for mitigation purposes. Traditional elements can be also integrated in the interior design of the houses (skylight, big living rooms, etc.)

- Permaculture can be promoted for better food security. In remote areas like Khorog, and especially during wintertime, roads are closed, and food is delivered from other parts of the country. For this reason, conscious design and proper maintenance of diverse, stable, and resilient agriculturally productive ecosystems are essential to sustain the population.
- Planting fruit trees can be beneficial for Khorog's economy and environment. Traditionally, fruit trees were growing in different parts of the city and such practice can be revitalised.
- Incorporating the perspective of the community into the design is important to ensure that housing typologies are planned according to people's needs. Many people coming to Dushanbe from Khorog try to integrate the specific design elements in their apartment design.
- Stone production can be developed as an economicsector in Khorog. Iis howeverimportant to ensure the environmental sustainability of the stone extraction and production' process.
- While working on any design proposal, it is important to integrate the possibility for entrepreneurship to boost employment on each sector. A good example of this is how the AKAH design unitshowcased that the waste collection point can be merged with an office space.

Experts exchanged experiences on planning and design issues. UN-Habitat gave an overview on the ongoing normative work on design principles, which included the demonstration projects in Saudi Arabia, Guinea Conakry, etc.

The AKAH design unit presented their recent projects (e.g., the waste collection point merged with the office spaces) and gave feedback on the design proposals for Khorog. The 1st day of training included the components of the validation workshop. As a result, the UN-Habitat design proposals were discussed in detail.

2nd training day

During the second day of the workshop, UN-Habitat experts presented the urban planning and design principles followed by the ideation activity based on "MY Neighbourhood". The AKAH team was asked to identify the most crucial design recommendations for Khorog that would also align with the five city objectives (compact, connected, vibrant, inclusive, resilient). These recommendations were then classified by the character of the interventions (neighbourhood, open public spaces, streets, block).

The exercise raised discussions on inclusivity strategies for Khorog, the comfort of urban environment for women and children, and on recommendations to create "visual attractiveness" of Khororg. In addition, and using the "MY Neighborhood" matrix, the AKAH design unit provided design recommendations that could complement the UN-Habitat's output. The "MY Neighborhood" matrix is designed to be a "living document", aiming to collect feedback and ideas on how to design the built environment across diverse contexts.

Key discussion points from the "MY Neighborhood" activity:

- The public space design should include sufficient areas for traditional Pamiri team games. It is important to prioritise team games as they can strengthen the identity of the place and thus the overall well-being of the community.
- The public space should include special places with different activities catering for both the youth and the elderly. It is important to ensure the youth are not disturbing the elderly people, who might prefer calmer activities.
- Small workshops shoulde be also considered to support women's activities (sewing workshops, handcrafts, etc.)
- It is important to start thinking on the passports of color appearance for Khorog to ensure color balance in the city, vibrancy, and visual attractiveness.
- Folllowing the local design guidelines and regulations can also be implemented as a "principle" which will help in achieving a more compact urban form
- Insolation is an important principle that is particularly applicable in the case of Khorog. The principle can be potentially unpacked and updated to include new technologies and suggest housing typologies that ensure better insolation.
- No high-rise development should be allowed. Appropriate high density can be achieved through a human-scale based development.

Fig 42. Practical excercise with AKAH Design Unit in Dushanbe, UN-Habitat, May 2023

Fig 43. "MY Neighbourhood" excercise with AKAH Design Unit in Dushanbe, UN-Habitat, May 2023

Practical exercise

During the second day, experts conducted a practical exercise. The aim of the exercise was to develop a draft proposal of the spatial organization for the underutilized land in Tabobatkhona (former meat factory). The site was selected based on consultation with the Mayor of Khorog who suggested considering this area for the design proposal since the state owns the plot.

The experts studied the surrounding areas and identified existing parameters that could influence the design proposal. Among these parameters are:

- •The radius curve of the road prone of causing car accidents.
- •The proximity to the major route of the public transportation
- •The surrounding built environment, the demand in well-organized public space and services
- •The compatibility of the new mixed-use development and surrounding urban pattern
- •The current street network and safety considerations (creating internal pedestrian-oriented spaces)

As a result, the AKAH design unit developed a draft design proposal that suggested the modification of the central street to ensure safety, and the allocation of a mixed-use development that would include public spaces and urban services. The draft proposal will be further detailed by the AKAH design unit.

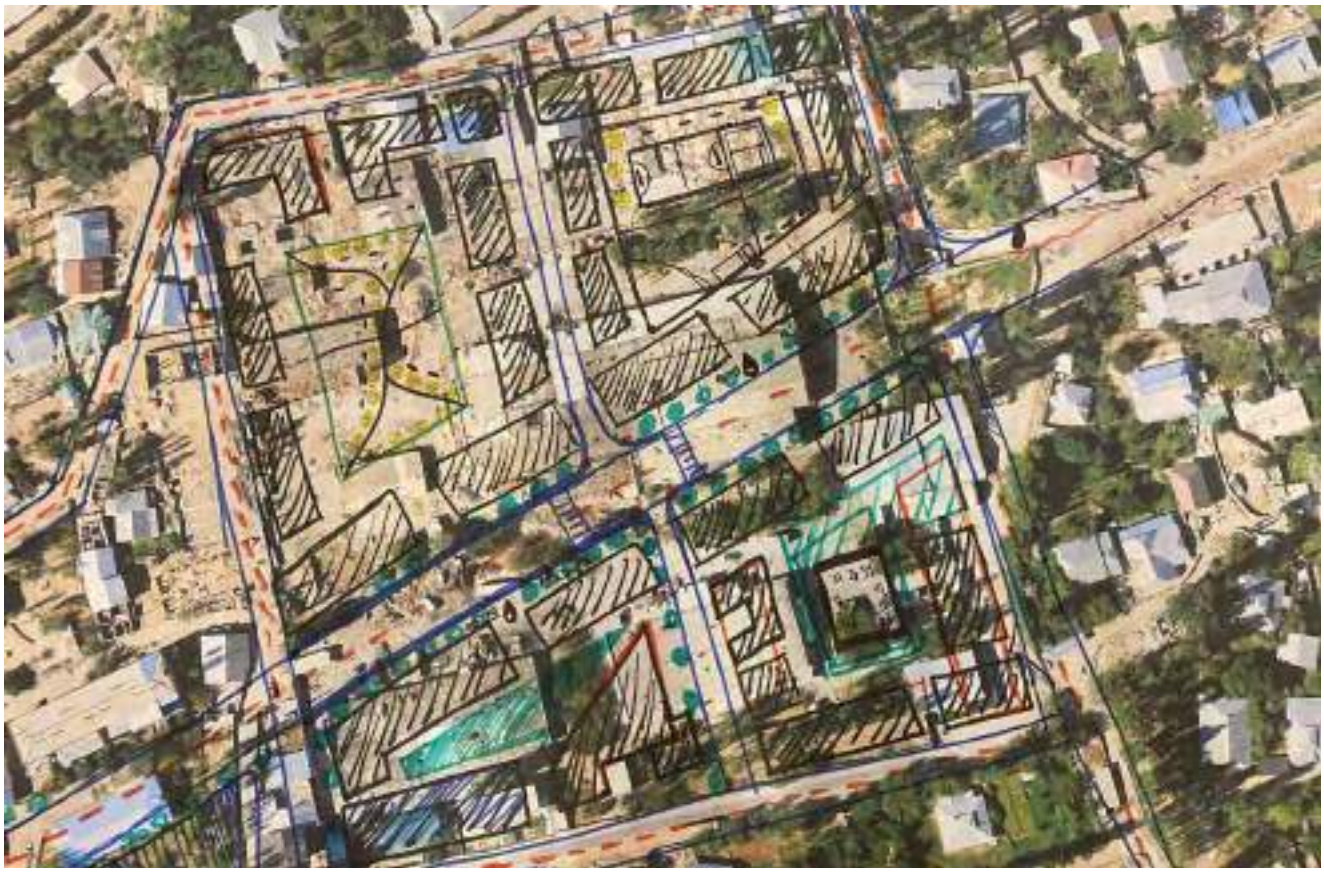


Fig 44. The outcome of the practical excercise with AKAH Design Unit. A first draft for the uder-utilised land (meat factory), UN-Habitat, May 2023

9

TECHNICAL CONSULTATIONS WITH STAKEHOLDERS

1st training day

Technical consultations with national planning authorities were taking place upon demand. The UN-Habitat Urban Lab expert was present in the country to ensure on-site assistance and clarifications on the UN-Habitat recommendations and their integration into the General Plan. The Three conducted technical consultations and their respective content were as follows:

- 1st technical consultation: to discuss the hierarchy of plans and regulations applied at the different scale levels (regional, city, neighbourhood)
- 2nd technical consultation: to revise and validate the intermediate draft of the General plan developed by the national planning authority "Shakhrofar"
- 3rd technical consultation: to provide clarification on the areas of transformative impact and potential allocation of employment opportunities (definition of the techno parks, ideas on howto boost employment and SMIs, etc.). To revise and validate the intermediate draft of the General Plan

During the 2nd and the 3rd technical consultations, the experts from "Shakhrofar" presented their progress on the actualization process of the General Plan that consisted of draft maps of functional zoning. As it was observed, the plan drafts of the General Plan were aligned with the UN-Habitat strategic recommendations, and more precisely regarding:

- The Location of mixed-use development areas with opportunities for employment
- The Major transportation routes and location of bridges (multimodal and pedestrian)
- The Urban Growth Boundary that prohibits development beyond itself

Fig 45. The technical consultation with planning authority "Shakhrofar", AKAH, April 2023

Fig 46. The technical consultation with planning authority "Shakhrofar", AKAH, April 2023

Fig 47. The technical consultation with AKAH technical experts, UN-Habitat, September 2023

10

BILATERAL CONSULTATIONS

During the second phase of the project, the UN-Habitat Urban Lab met the representatives of the local government to discuss strategic recommendations and preliminary design proposals. The deputy Mayor of Khorog and the designated main project architect were always present at the technical workshop to provide their input and ideas.

In April 2023 the UN-Habitat Urban Lab team visited the mayor's office to present the spatial strategies, the preliminary design proposals, and to give a brief overview about the capital investment planning process of project identification and prioritization. During the discussion, the areas for transformative impact were identified as the ones with highest potential. Thesewere suggested for the detailed design proposals. In addition, the area in Tabobatkhona (the former meat factory) was also suggested for consideration.

It was pointed out that the investment forum to be held in August 2023 would be a good opportunity to use UN-Habitat's work on Capital Investment Planning. The investment cards with their respective priority areas developed by UN-Habitat Urban Lab, will indicate the impact of the projects and their potential costs. This will thus, significantly benefit the attendees of the forum. It was stated that understanding the investments mechanisms and having the list of potential development projects are crucial for the event and for the development of the city.

Fig 48. Meeting and consultation with the Mayor of Khrorog, AKAH, April 2023

11

CONCLUSION

The second phase of the project included a variety of participatory activities which undoubtedly positively influenced the phase's final outcomes. The Urban Lab team used multiple techniques to collect ideas and feedback from a wide range of stakeholders, which ranged from children to local government representatives. The critical inputs were documented and further spatialised. These were then incorporated in the design proposals of the transformative and priority areas.

Having a diversity of activities demonstrated the will of all the stakeholders in contributing to the development of Khorog. The main cross-cutting topic among all the participants were:

- The Selection of safe areas for human-scale low and medium-rise housing;
- The Allocation of services in the deficit areas and public space development;
- Extension and upgrade of sewage and water networks;
- Strategies to ensure attractiveness of the built environment, as well as opportunities for employment.

These themes are included in Un-Habitat second phase' outputs, and more specifically in the design recommendations, urban planning and design guidelines, and the work on capital investment planning.

Fig 49. The outcome of the prioritisation excercise with diverce stakeholders, UN-Habitat, September 2023

12
THE ANNEX

12.1. LIST OF TABLES

12.2. LIST OF FIGURES

Fig 50. A woman is baking bread in Khorog, UN-Habitat, September 2023

Integrated Spatial Plan for Environmental and Socio-Economic Resilience

KHOROG
Tajikistan

Spatially Informed Capital Investment Planning

May 2023

UN-HABITAT

Habitat Planning

A Programme of the Aga Khan Agency for Habitat

Aga Khan Agency for Habitat

RESILIENT KHOROG 2035

Integrated Spatial Plan for Environmental
and Socio-Economic Resilience
Khorog, Tajikistan

Spatially Informed Capital Investment Planning

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And for all who participated in the meetings, field trips, working sessions and trainings from the government, service providers, AKAH, AKDN, UCA, and inhabitants of Khorog.

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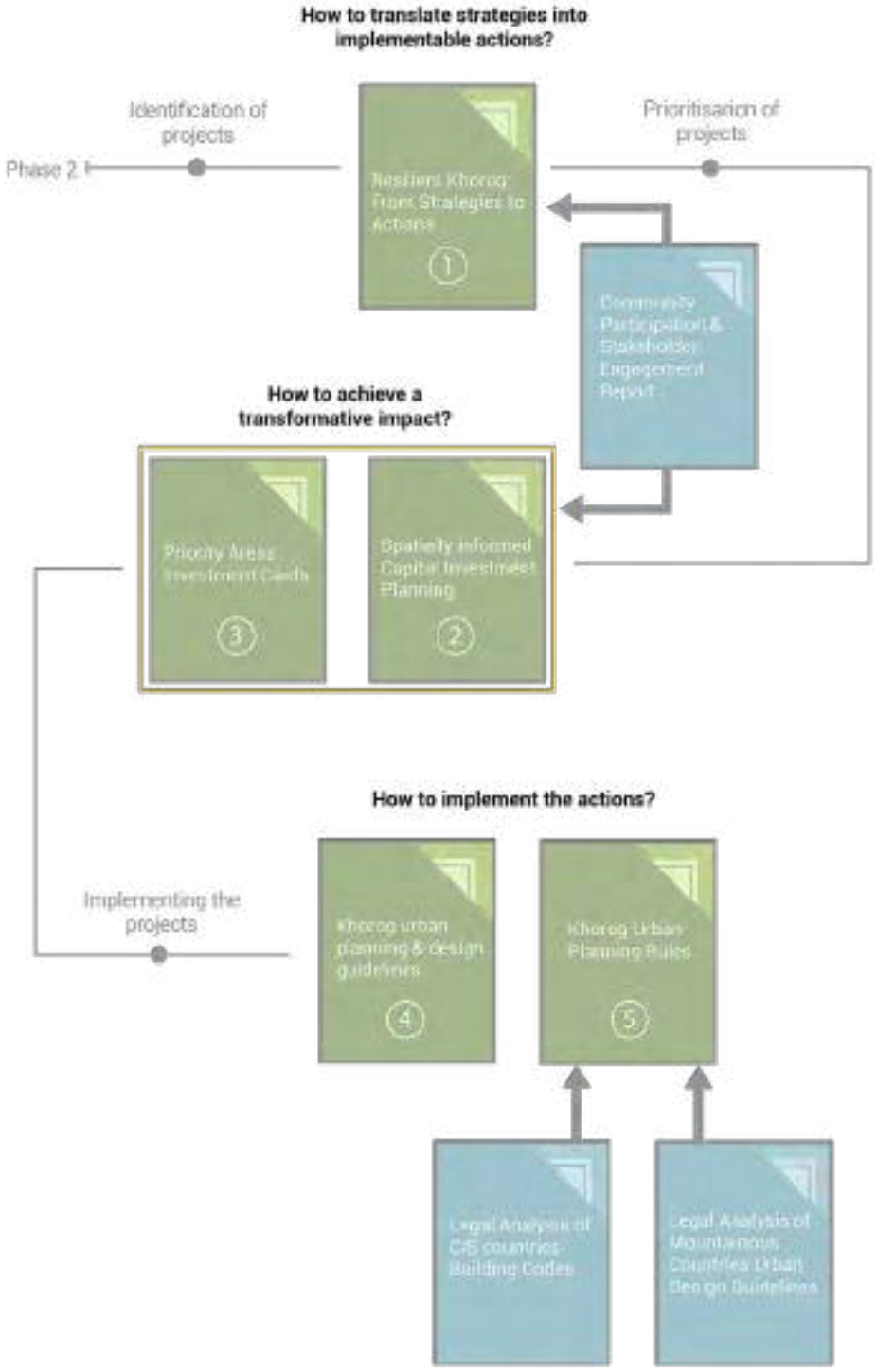
RESILIENT KHOROG 2035

Habitat Planning

Integrated Spatial Plan for Environmental
and Socio-Economic Resilience

KHOROG
Spatially Informed Capital Investment Planning



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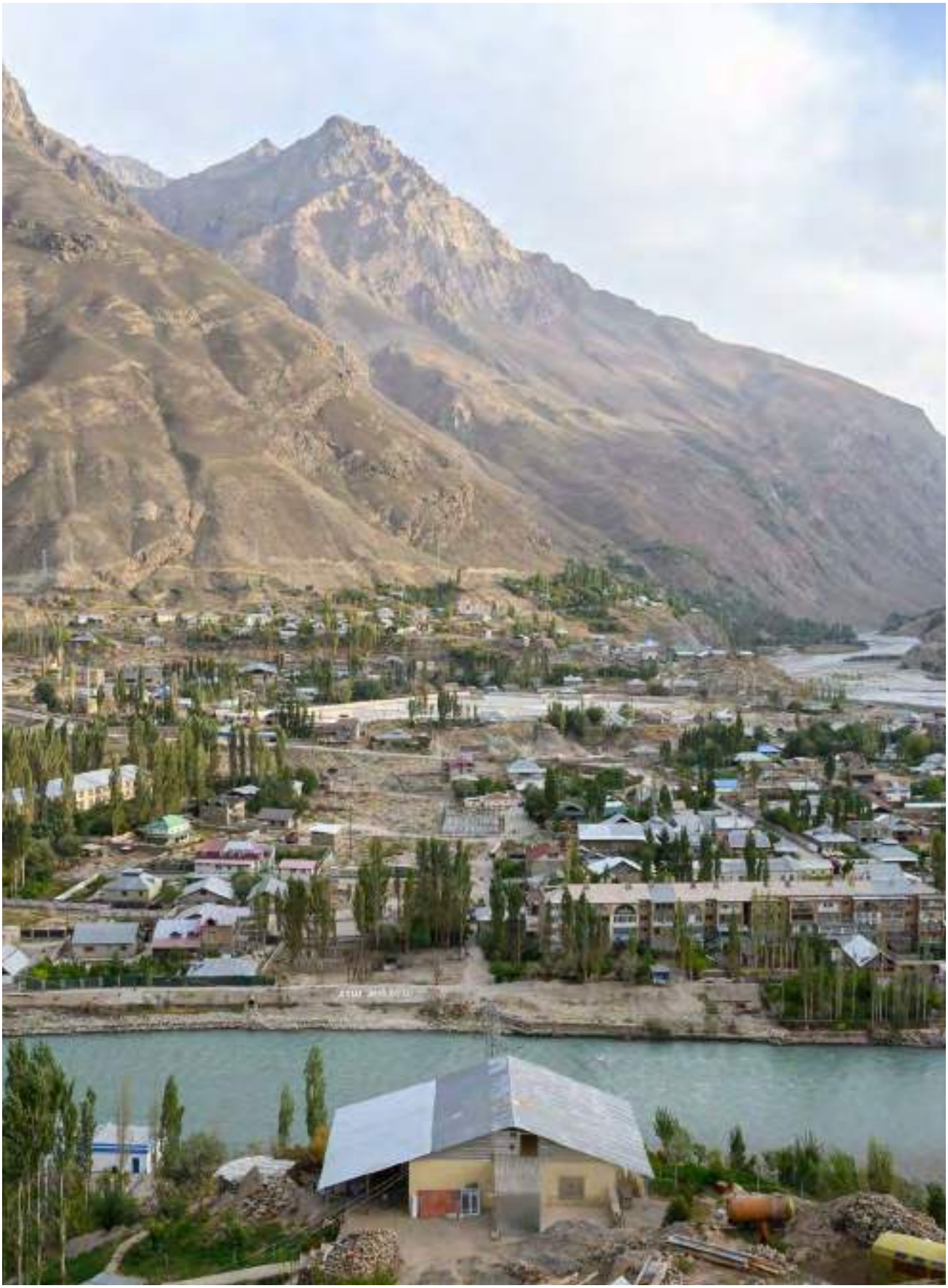

Fig 1. View of Sharifobod and Nivodak Mahallas, UN-Habitat, September 2022

1

INTRODUCTION

1.1. INTEGRATED SPATIAL PLAN FOR ENVIRONMENTAL AND SOCIO-ECONOMIC RESILIENCE

UN-Habitat has partnered with the Aga Khan Agency for Habitat (AKAH) and the government of Tajikistan, through the Aga Khan Development Network (AKDN), to undertake the 'Integrated Spatial Plan for Environmental and Socio-Economic Resilience' in Khorog Tajikistan. UN-Habitat's Urban Planning and Design Lab (Urban Lab), in a collaborative process with other units and branches within the UN-Habitat Planning Finance and Economy Section and the Urban Practices Branch and with AKAH's Habitat Planning teams in Geneva and Tajikistan, aims to provide planning direction to improve resilience and social stability for existing communities and accommodate the increasing populations in Khorog in a sustainable way through:

1) developing strategies, masterplans, interventions, and regulations.
2) knowledge creation, capacity building, and guidelines.

More specifically, the project aims to provide environmental, legal, economic, spatial and infrastructure policies and projections, governance and management, recommendations for transformative projects, and planning and technical capacity building for stakeholders. The UN-Habitat, in concert with AKAH's Planning methods and advanced data collection and analysis, provide planning expertise, drawing on existing methodologies, toolkits, and best practices in a collaborative and integrated way to guide the growth of Khorog.

This project is one of several outcomes from an assessment of resiliency that was undertaken for Khorog in 2017 and 2018 by the Swiss State Secretariat for Economic Affairs (SECO) and Holinger, with partnerships from the international community that include the European Union for resilient infrastructure, the Government of Japan, the IFC and World Bank.

The work of UN-Habitat in collaboration with AKAH is part of The Khorog Urban Resilience Planning and Proof of Concept Initiative, supported by SECO to drive resilient infrastructure investment and access to basic public services, intended to reducing risk, ensure more reliable infrastructure and a safer environment. This will, in turn, improve economic growth and wellbeing. This project has been undertaken in parallel with other initiatives for Khorog, such as the EBRD and SECO funded phase 1 and 2 water infrastructure projects.

AKAH looks to UN-Habitat to support the Revised Town Planning process in a way that can ensure alignment of the town plan to UNDRR resilience principles and best practices. The integrated plan for environmental and socio-economic resilience in Khorog will integrate the disaster risk reduction approaches within the planning processes of identified projects.

1.2. REPORT ROLE & CONTEXT

This report outlines the Spatially Informed Capital Investment Planning process applied in Khorog as part of Phase II of the project. It outlines a set of simplified step-by-step instructions and lessons learned during the implementations on detailing methods and processes. The document is structured in three chapters:

- Chapter One, **INTRODUCTION**: provides an overview of the project and introduces the concept of capital investment planning while highlighting the critical role of strategic spatial planning in the capital investment process. It also describes the main purpose of the report, and the key stakeholders involved in the process.

- Chapter Two, **SPATIALLY INFORMED CAPITAL INVESTMENT PLANNING**: provides an overview of the steps and outcomes of the UN-Habitat's integrated planning approach and its importance in feeding information into the Capital Investment Planning process. The chapter utilises the methodology followed in Khorog. Furthermore, it outlines the key components and processes related to Capital Investment Planning, including the creation of spatial databases. It sets up a system of prioritization with clear criteria, and it establishes an iterative process that fits the capital projects into the available budget.

- Chapter Three, **PRIORITISED AREAS FOR FUTURE DEVELOPMENT**: this section provides the results of the CIP prioritisation process by identifying the priority project areas and translating them into investment cards with key information to promote resource mobilization. The investment cards link the prioritised infrastructure investments to potential partners for financing the implementation.

This report is the one of the series of 7 reports that make up Phase 2 of the Integrated Spatial Plan for Environmental and Socio-Economic Resilience Project. Additional outcomes of this project have included participatory workshops, technical consultations, presentations and a wide range of ideation activities. The key deliverables are listed in Figure 2, alongside an explanation of the key steps in phases 1 and 2.

Table 1. Project phasing and participatory events conducted

	Scoping, Analysis, Diagnosis and Spatial Strategy			Deliverables
PHASE 1	Project Scope and Inception Report	What is project scope and what can we achieve?	This involves a desktop review of existing reports and studies to generate an understanding of the city. This formalised the project scope and next steps and identified information gaps. In response, requests for specific and updated data sets (GIS and other) were made, and key stakeholders were identified for interviews.	• **Inception Report** • **Data request**
	Discovery and Understanding	What is the context of the work?	At this early stage, discovery interviews were conducted with stakeholders. As resilience was the focus of the project, findings were organised into four key areas: Environmental, Socio-Economic, Infrastructure and Basic Services, and Institutional Resilience. This first step informed the team of the challenges the city faced and directed the next stage of assessments.	• **Discovery Workshop** • **City Profile Part 1: Discovery Report**
	Diagnostic and Community Engagement	What are the key challenges and what are the causes?	This stage of work involved a process of data collection, data cleaning and a series of assessments based on the spatial themes of resilience; environmental, socio-economic and infrastructure and basic services. The final theme of institutional resilience was assessed by the urban legislation team and the assessment is included as an individual chapter alongside the data assessments. This step provided the team with a basis of understanding from which to design focused community engagement activities, and on-site validation exercises.	• **Diagnosis Workshop** • **City Profile Part 2: Diagnosis Report**
	Spatial Strategy	How & where to approach these challenges?	This stage of work involved consolidating the challenges faced by the city and identifying key spatial and non-spatial strategies by which to approach them. Not only can this set of plans and strategies support sustainable development in the city, but involvement in the process provides local government and stakeholders with further understanding on evidence-based, participatory and collaborative approaches to planning that can be applied to future work.	• **Validation Workshop** • **City Profile Part 3: Recommendations Report** • **Participation & Community Engagement Report** • **Legal Assessment Report**
PHASE 2	**Transformative Projects, Implementation Tools**			
	Transformative Projects	How to actualise the plan?	This stage in the project demonstrates how the strategic recommendations are translated into targeted actions. That involves identifying key pilot project sites, to showcase practical implementation of the plan. These projects will demonstrate how the SDGs can be localised, setting reference models for future development. In addition, the projects will demonstrate how principles for sustainable neighbourhood planning and design can be applied in the local context.	• **Fact-finding workshop** • **Ideation activities with women, youth and children** • **Validation design workshop** • **Design proposals** • **From "strategies to actions" Report**
	Capital Investment Plan	How & when to implement?	This mechanism prioritises identified projects with an accompanying finance and investment strategies to support their implementation. At this stage the scoring criteria for the projects is defined as well as the comprehensive project list. Such scoring mechanism will demonstrate the priority actions to be taken in the city to ensure transformative impact. In addition, the mechanism defines priority areas for future investments.	• **Prioritisation workshop** • **Validation workshop** • **Comprehensive list of projects** • **Capital Investment Planning Report** • **Priority project areas Investment Cards**
	Analysis of Mountainous Countries Urban Design Guidelines	What & how the actions are taken in other contexts?	This stage of the project explores how Urban Design Guidelines are implemented in the contexts of mountainous cities, exploring best practices and solution for urban resilience.	• **Report on analysis of Urban Design Guidelines in Mountainous Countries**
	Urban planning and design guidelines	How to guide the future development in Khorog?	This stage of the project defines targeted recommendations for Khorog context across thematic areas to guide the transformative processes in the city. Urban planning and design guidelines set specific indicators to meet (density, permeability, etc.) as well as provide recommendations at the neighbourhood level.	• **Validation workshop** • **Urban Planning & design guidelines report**
	Analysis of CIS countries Building Codes	How actions are implemented in other contexts similar to Tajikistan in terms of legislation & institutional frameworks?	At this stage of the project, the analysis of building codes in the CIS countries is conducted to understand the gaps and alignment with international standards. Such analysis provides a comprehensive overview of the building codes in the region, informing the analysis of Khorog regulatory frameworks.	• **Report on the analysis of CIS countries Building Codes**
	Khorog Urban Planning Rules	How to implement action in Khorog?	This stage provides clear recommendations based on the comprehensive revision of the Khorog planning rules, including recommendation on law's amendments according international standards.	• **Khorog Urban Planning Rules Report**

1.3. INTRODUCING CAPITAL INVESTMENT PLANNING

Capital investment, in the context of cities and governments, refers to financial allocation for the development of new public assets (such as infrastructure, vehicles or buildings) or for major repair and maintenance of existing ones (World Bank, 2011). Such investments are characterised by being irreversible in nature, and by having a minimum financial threshold and a useful life of more than one year. Capital expenses are different from operating expenses, which refer to the expenditures necessary for the everyday operation of the municipality. The capital budget together with the operating budget, becomes a part of the approved city budget for that year.

Infrastructure investment determines the efficiency and functionality of the urban landscape and directly impacts the sustainability and resilience of urban areas over the longer term. Decisions on what, where, how, and when projects get financed and implemented have a critical long-lasting impact on the liveability of cities and should therefore be targeted to achieve the SDGs.

Therefore, a Capital Investment Plan (CIP) is a multi-year plan that follows a formal approval process to identify, prioritise, and estimate a city's investment needs over a medium-term horizon, given existing infrastructure and services gaps and projected growth. It integrates the strategies of different departments and helps guide an integrated municipal strategy; prioritising projects based on the established criteria. Considering the limited resources that cities usually have for capital investment, the CIP helps to improve the efficiency of municipal governments' spending and ensure the achievement of the city's priorities and the SDGs.

Additionally, in the context of rapid population growth of developing cities, infrastructure development is necessary to safeguard and improve the quality of life for residents. It is essential that infrastructure investments are prioritised and delivered in an inclusive way, with all residents benefiting from access to high quality spaces, good transport connections to work and leisure activities, and decent homes sustainably supplied with energy and water – and that all residents are included in the digital revolution. The process of Capital Investment Planning sets out the programme of infrastructure delivery that is believed necessary for a city's future and puts into monetary terms the method and timeline of achieving the goals set about in the legislated spatial plan.

A CIP aims to:

- Use available funding to maximize efficiency and impact contributing to the achievement of the city's goals. Given cities limited financial resources it is important to focus available funding in a strategic way and invest in those projects that are most needed and that are most necessary to achieve the cities' objectives.
- Have a clear and transparent project prioritization procedure that provides structure to capital spending. CIP process establishes a methodology to select projects that will be financed by the city. The criteria should be transparent and correspond to the city's needs and goals. Since the strategic spatial plan reflects the desired development patterns to meet current and future needs and achieve sustainable development, it is imperative that the prioritisation criteria directly relates to the plan's implementation as well as to the spatial data.
- Establish a coordinated, decentralized system, and process for decision-making across sectoral projects. Most departments work on project proposals in silos and capital investment planning aims at creating a centralized decision system that prioritizes these investments and allows synergies across departments.
- Contribute to the realization of project ideas by integrating capital expenditures into the city's budget process. Plans and strategies are often not tied to specific projects and capital spending is thereby never being implemented. A capital investment plan aims at materializing these plans and strategies into specific investments on the ground. The portfolio of projects selected by this process aims at being realistic and matching the city's development objectives within the available funding and financial capacity.

1.4. THE RATIONALE OF LINKING CAPITAL INVESTMENT PLANNING WITH STRATEGIC SPATIAL PLANS

Urban capital investment planning is shaping the cities and economies of the future and is fundamental to the achievement of the SDGs. Each year, subnational governments spend more than $1 trillion on capital investments, with subnational governments in developing countries spending an estimated $314 billion per year (OECD-UCLG, 2016). However, between one-third and one-half of public investment is wasted due to misguided and inefficient allocation (Schwartz et al. (2020), meaning that up to $2.4 trillion is spent

on inefficient subnational capital expenditures in developing countries over the 15-year period allocated to achieve the sustainable development goals.

The Habitat III conference and the New Urban Agenda (Habitat III) identify the major role that local governments will play to achieve the SDGs and recognizes that funding the gap, together with planning and governance frameworks, are the three main challenges preventing the effective implementation of public policies and infrastructure necessary to reach SDG objectives (OECD). Given the high investment needs of cities, their central role in the development process, and the annual investment gap, improving the efficiency of public capital investment planning is both imperative and urgent.

The major challenge for capital investment planning is where to prioritize limited funds among a large number of potential project options. This prioritization process is often complex and needs to consider a wide range of factors to address the most pressing social, environmental and economic needs in the most cost-effective way. Furthermore, with so many competing infrastructure and development needs across the city, and a finite capital budget, trade-offs through prioritisation inevitably have to be made. In many cases, existing city and regional spatial plans have a hierarchy system and are prioritised accordingly. However, investment priorities developed in this way rarely are founded on a spatial evidence-based process, which links development projects and targeted investment priority areas with spatial indicators and targets.

Many questions regarding the impact of projects can be more objectively answered with spatial data, reducing subjectivity and potential for bias in prioritization. In addition, the total impact and spatial distribution of all budgeted projects collectively can be more easily conceptualized when they are mapped, and linkages between them can be more easily recognized. The spatial plan for cities describes where and what development should take place to achieve the overall city goals and objectives – and identifies interventions and projects that are required to realise this. At the same time, various sectoral plans and strategies may also identify critical infrastructure investment projects to ensure service delivery. The spatial characteristics of infrastructure projects consist of two main factors. These are the physical location of the infrastructure project that will realize a broader development goal or strategy. The second, is the service threshold area of the infrastructure, which means a radius of 15 minutes walking distance from the infrastructure project, including accessibility, walkability, and permeability of the road network, as well as the population density distribution within that radius and capacity of the infrastructure. Therefore, spatial plans realise broader strategies, by identifying investment projects through spatial analysis of the existing and future urban context (what), locating them geographically (where), and prioritising them to define priority areas of investment (how).

Hence, a spatially informed capital investment planning process assists the city in finding an optimal balance in infrastructure delivery to secure and improve the current asset base, achieve the objectives for upgrading and development in under-serviced areas and accommodate the future development aspirations and needs of the city. It considers the benefits of long-term maintenance and operating cost saving through renovation projects, as well as revenue and land value generating projects. It outlines and prioritises a specific set of projects to take place within a specified timeframe within a defined spatial location to realise the benefits of spatially agglomerated projects, and synergies of project types and location for short and long-term cost efficiency.

Capital investment implies the physical development of infrastructure and building assets in specific, spatial locations. In the context of Khorog, this includes the development of new infrastructure and building units, as well as maintenance, rehabilitation, replacement and repair projects ('state of good repair' investment). This does not, however include operational capital. Therefore, in Khorog, capital investment projects include:

- Infrastructure projects, such as engineering services (roads and stormwater, electricity, water, sanitation, public transport, and ICT networks)
- Social infrastructure projects (schools, libraries, parks, clinics, and public facilities).
- Public and social housing.

Physical space is the common denominator to define and monitor WHERE, WHAT, and HOW (including how much) the city is investing its budget. The city's vision, as described in its spatial plan, can, therefore, only be fully realised through a spatially targeted capital investment plan.

The key components required to undertake a capital investment planning process successfully and how they were applied in Khorog are outlined in the following section.

Challenges of existing investment planning	Contribution of spatially-informed and systematic capital investment planning (the methodology described in the following chapter)
Plans are inadequate for spatial coordination.	Actionable spatial planning that covers projected growth, investment gaps, strategic areas of transformative investment and required investments is a critical building block for improved capital investment planning
There is a lack of alignment between strategic plans, spatial plans and the budgeting process.	Improved capital investment planning incorporates criteria on alignment with strategic and spatial plans.
A city's comprehensive investment requirements are not considered in total.	Assessing the comprehensive needs of the city, including requirements for future growth, investments needed for transformation and asset management needs is one step in an improved CIP process.
Projects are prioritized on the basis of limited political interests rather than broader strategic benefits.	Systematic ratings on predefined criteria, particularly those objectively measured in a spatial system can reduce the potential for bias.
Investments fail to realise their transformational outcomes because they are planned and implemented in isolation.	Spatialized project selection allows for a more holistic picture of project synergies and complementarities.
There is a lack of transparency about capital budget prioritization, reducing public accountability.	Spatial criteria are often easy for the public to understand, and criteria-based project selection lends transparency to the prioritization process.
Financial system shortcomings are prevalent.	Evidence-based project prioritization can enable more strategic fundraising from higher levels of government, investors and donors.

Table 2. Challenges with existing investment planning

Fig 2. New high-rise building being constructed, UN-Habitat, September 2022

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SPATIALLY INFORMED CAPITAL INVESTMENT PLANNING

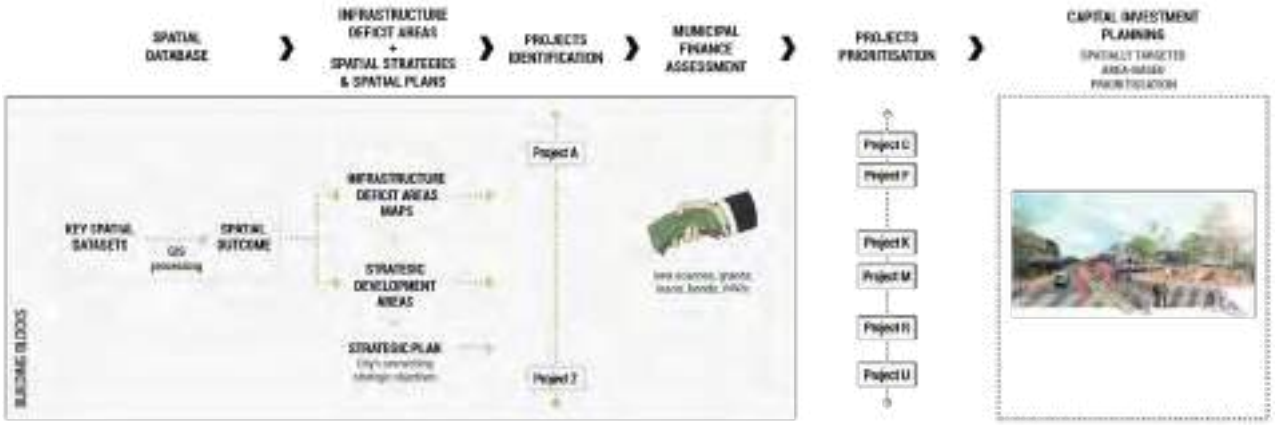


Fig 3. Overall CIP process and key linkages between building blocks

2.1. GATHERING KEY BUILDING BLOCKS FOR CIP IN KHOROG

2.1.1. Key building blocks for CIP

Effective city investment planning is only ensured when the CIP process properly aligns and integrates with other inputs deriving from planning and management processes occurring in the city. Although it is a difficult task to describe the CIP process since it varies from city to city, there are some key building blocks that are required to develop a spatially informed capital investment planning process. This section describes those critical components, their relevance and how they were gathered in Urban Lab's project in Khorog.

1) **Spatial Database** with key spatial datasets that were essential to the analysis and using a dynamic people centred base to assess the urban morphology and functionality. This provided an understanding of how the city functions in terms of various indicators and parameters. The key spatial datasets gathered and analysed, and their corresponding key spatial outcomes in Khorog were as follows:

Key Spatial Datasets	Spatial Outcomes
Population	
• Density • Forecasted growth	• Population density distribution • Urban growth extent
Land Use	
• Building footprints • Land use types	• Building density distribution • Distribution of land uses (residential areas, economic nodes, open space, etc.)
Public assets: location, quality and asset management requirements	
• Street network • Public transit system • Utility networks • Social and community facilities • Public space and parks	• Accessibility of infrastructure and public services • Efficient provision and distribution of utilities • Multimodal transport mobility
Development restrictions	
• Environmental features • Hazard risks • Other restricted areas	• Protected and restricted areas • Risk mitigation

Table 3. Key spatial datasets and spatial outcomes assessed in Khorog

2) **Infrastructure deficit areas maps** derived from spatial outcomes and helped in identifying which areas in Khorog are lacking or not meeting the standard of service required. An infrastructure deficit area map indicates areas that are underserved or not served at all by a particular utility, service, or facility.
3) **Spatial strategies and spatial plans** that set goals and priorities for the city and established strategic development areas. No city can provide all the infrastructure needs for maintenance and future growth at the same time. Cities must prioritise their investments and that requires a spatial priority area plan. At a city level, strategic areas or zones are similar to an urban core, development corridors, an urban regeneration area, or an economic node. This means that any area indicated as priority for development is where investment should follow.
4) **Current capital projects and proposed interventions** that respond to the existing needs identified in Khorog. Infrastructure projects are mostly fixed assets. This implies that a project will have a physical location and that it serves a particular area (area of influence). This spatial characteristic of infrastructure is used to determine where and how investment could contribute to solving current infrastructure problems (e.g. capacity shortage, deterioration, backlogs, etc.) and new capacity requirements for future growth projections. New projects and existing projects under execution should be captured to form a complete picture of the infrastructure system.
5) **Municipal Finance Assessment** tthat assesses how a city manages its revenues and expenditures within its capital and operating budgets. Annual budgeting processes need to be closely linked to the CIP process, since the required capital investments identified in the CIP will only be realised if they are considered within the annual budget. The financing capacity of a city and available financing mechanisms will significantly influence the CIP and should, therefore, be an integral part of the plan. In Khorog, it was challenging to perform an analysis of the municipal finances due to the lack of archived data and a complex data sharing process involving high level political approvals. Due to time constrains and the urgency for a roadmap to implementation, it was assumed that there was no budget envelop available within the municipality to carrying out capital investments. Thus, this CIP prioritisation process provides an interesting avenue to look for external investments and to pitch for the transformative projects that would respond to the existing and future potential needs of Khorog.

An iterative rationalised methodology should be applied to overlay and interpret the abovementioned information to answer critical spatial questions, and consequently, to inform the capital investment planning prioritisation.

How many people live where?

- Population density maps: spatial location and distribution of the current population (can be enhanced with population indicators such as income distribution); and future population estimated based on the spatial strategies and proposed strategic densification nodes.

Which areas are affected by severe infrastructure deficit areas?

- Social facilities deficit areas maps spatially indicating areas not serviced or under-serviced by community facilities such as clinics, libraries, schools, and open spaces.

- Utility deficit areas maps indicating areas under-serviced by roads, water,sanitation, and electricity.

Where should development happen?

- Priority development areas maps, spatial focus area for future growth and intervention.

Where and which types of projects are planned?

- Maps indicating the spatial location of projects and the areas where they will potentially address the identified needs.

2.1.2. Step by step process to compile key building blocks for CIP

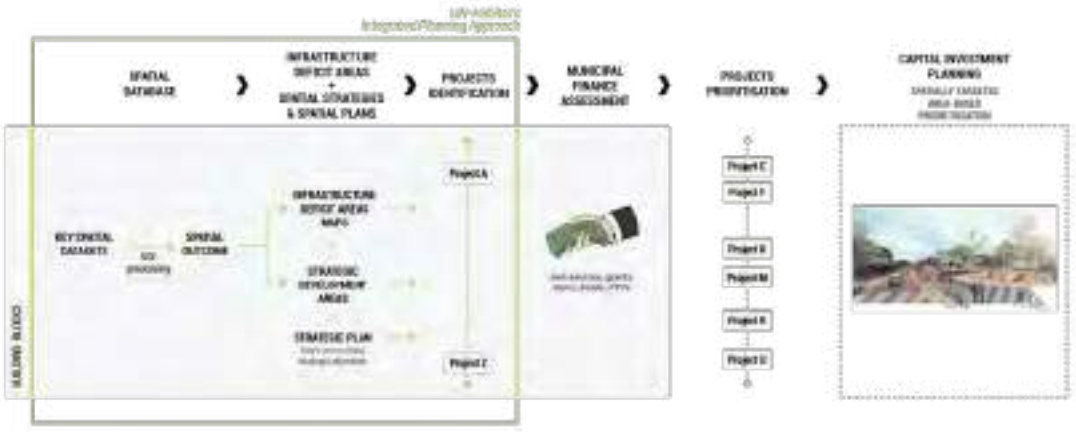


Fig 4. UN-Habitat's Integrated Planning Approach within the CIP process

UN-Habitat's Integrated Planning Approach intends to address the complexity of cities and region's challenges by developing a spatial and non-spatial strategic solution in partnership with stakeholders, to ensure sustainable urban development outcomes. The approach achieves this through a methodology based around three key main stages: **1) Understanding the City; 2) Planning the City; 3) Transforming the City**.

These main stages are overlaid with three key elements that together form UN-Habitat's Three-Pronged Approach: **a) Urban Legislation; b) Urban Planning and Design; c) Urban Finance.**

The Integrated Planning Approach methodology places a particularly strong emphasis on the project's transformative outcomes, as well as on a thorough contextual assessment of relevant municipality/ institutional and development environment. This is done to better understand the potential challenges and needs at all scales. It is structured around three main areas of enquiry: ***What are the challenges? What needs to be done? How and where does actions need to be prioritised?***

The outlined approach guided the development of the Integrated Spatial Plan for Environmental and Socio-Economic Resilience for Khorog (Phase I and Phase II). It aimed at responding to the abovementioned key spatial questions by gathering the key inputs required to develop a Spatially Informed Capital Investment prioritisation process. The outcomes of each stage and steps are summarised below.

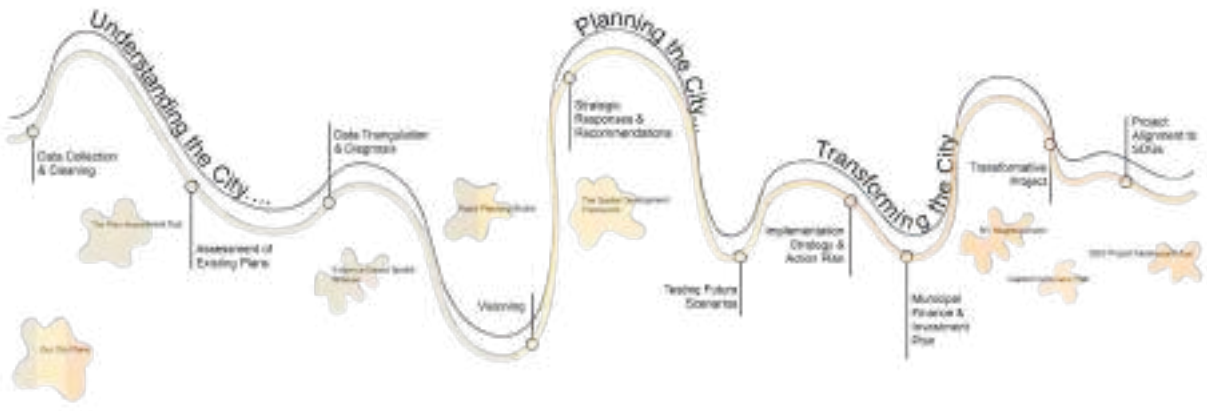


Fig 5. UN-Habitat's Integrated Planning Approach

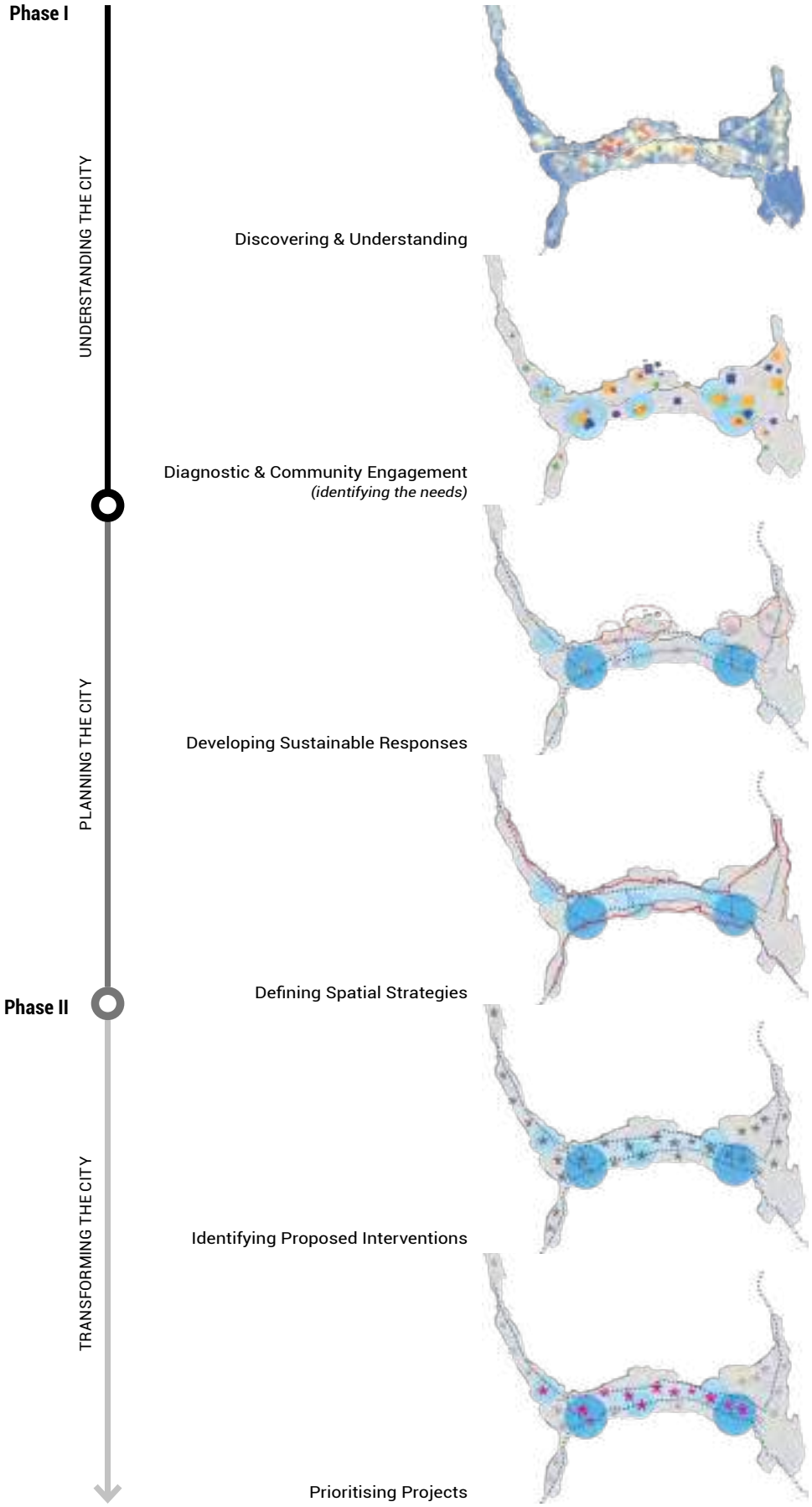


Fig 6. Application of UN-Habitat's Integrated Approach in Khorog

UNDERSTANDING THE CITY

The aim of this stage of the project was to obtain and illustrate a thorough overview of the city context. Using existing data and knowledge from the city, as well as specific stakeholder engagement activities, the steps taken under this phase of the process focused on acquiring and developing a core evidence base for the elaboration of a strategic spatial plan. Starting by getting familiarised with the city's priorities and plans and mapping the key stakeholders in the city, this is then followed by data gathering and cleaning (quantitative & qualitative) using both official and open data where relevant and sufficiently reliable. Once sufficient data was gathered, data triangulation, analysis exercises, and GIS mapping were undertaken, a series of maps were created which helped to illustrate the current urban dynamics and provide spatial evidence for planning recommendations.

This phase was concluded with Site visits and interactive stakeholder workshops to optimise and validate the evidence. This opened the door to the *Planning the City* phase of the project. The steps undertaken in this phase were as follows:

Discovering & Understanding (assessing the city)

This first step encompassed a comprehensive desk review of publicly available information, studies and report from both governmental and independent sources. It provided an overview of the preliminary development challenges and information gaps. It highlighted the need for targeted data collection and a stakeholder engagement strategy to ensure an integrated evidence-based and participatory approach to plan a resilient Khorog.

Fig 7. Mapping exercise of the preliminary development challenges in Khorog

Diagnostic & Community Engagement (identifying the needs)

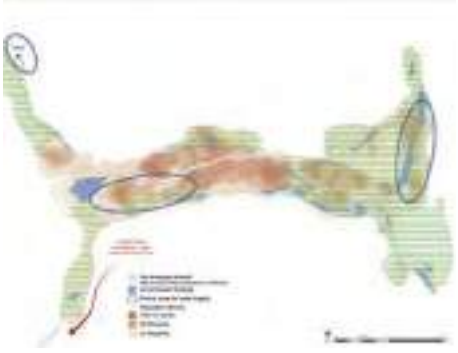
Built upon the first step, "Discovery & Understanding", this step provided a composite picture of existing challenges and needs to be addressed in the following phases. The structure of the analysis was designed considering resilience as a critical driver of assessment. Hence, this diagnostic step was carried out grounded on existing frameworks and their definition of urban resilience. Four categories of resilience were assessed under the framework of diagnosis: Institutional Resilience; Socio-economic Resilience; Spatial and Environmental Resilience; and Resilient Infrastructure. As a result, an integrated spatial consolidation of the analysis was provided and unpacked in six key combined issues, namely: 1) Urban Expansion in Hazard Zones; 2) Under-used Land; 3) Fragmented Urban Fabric; 4) Car Dependency & Lack of Pedestrian Linkages; 5) Insufficient Utility Infrastructure; 6) Unequitable Distribution of Social Facilities. Ultimately, the analysis provided a set of maps indicating areas that are not meeting the standard of service required and would need to be addressed.

Issue 1 - Urban Expansion in Hazard Zones

Issue 2 - Underused Lands

Issue 3 - Fragmented Urban Fabric

Issue 4 - Car Dependency & Lack of Pedestrian Linkages



Issue 5 - Insufficient Utility Infrastructure

Issue 6 - Car Dependency & Lack of Pedestrian Linkages

Fig 8. Maps of the six issues identified during the diagnostic stage

Outcomes of "Understanding the City" stage that would inform CIP:

- Compiling and assessing a **Spatial Database**;
- Population density maps (current and future);
- Identification of key existing issues that would inform the **Infrastructure Deficit Areas Maps.**

PLANNING THE CITY

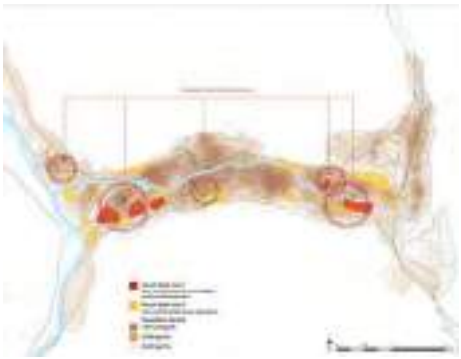
Under the planning stage, the analysis and findings, once validated, formed the basis of the planning exercise. This next phase of the process followed closely after the city discovery and diagnostics phases and focused on consolidating the challenges the city is facing. These were then used to initiate a co-design process of engaging the stakeholders to develop a set of sustainable, integrated, evidence-based, spatial and non-spatial, strategic responses to address the issues mapped. These took into consideration the priorities for the city and were embedded within the five city objectives: compact, vibrant, inclusive, connected, and resilient city . Not only can these set of plans and strategies support sustainable development in the city, but an understanding of the process can also be an opportunity for the local government and stakeholders to adopt an evidence-based, participatory and collaborative approach to planning. The steps undertaken in this phase were as follows:

Developing Sustainable Responses

After recognizing the key challenges from the diagnostic phase, six sustainable responses were identified to respond to these challenges and a framework was provided from which to develop both strategic level solutions (the eight Spatial Strategies) and systematic actions (the Action Plan). The responses included spatial, legal, institutional, and socio-economic dimensions to address each challenge in a comprehensive manner.

The vision for the city was captured through strategic spatial plans that recommend not only how to alleviate the existing deficits, but also which projects or interventions are required to transform deficit areas into sustainable and resilient urban components that aim at creating urban prosperity (e.g. where access to services is lacking, where jobs and people are located, transport patterns, locations of environmental risk or opportunity, etc.). The six sustainable responses mapped were: 1) Growth Restriction & Hazard Mitigation; 2) Regeneration & Utilisation of under-used Areas; 3) Mixed-use Economic Centres & Permeability of Urban Fabric; 4) Infrastructure for NMT & Public Space Network; 5) Improvement of Utility Infrastructure; 6) Equitable Access & Efficient use of Social Facilities.

Response 1 - Growth Restriction & Hazard Mitigation

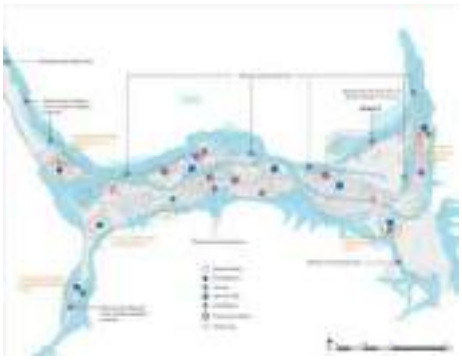


Response 2 - Regeneration & Utilisation of Underused Areas

Response 3 -Mixed-use Economic Centres & Permeability of Urban Fabric

Response 4 - Infrastructure for NMT & Public Space Network

Response 5 - Improvement of Utility Infrastructure



Response 6 -Equitable Access & Efficient use of Social Facilities

Fig 9. Six sustainable responses mapped under the planning phase

Defining Spatial Strategies

The diagnosis conducted in the first phase identified 'issues' and 'responses' that were further summarised into eight key urban planning strategies. These highlight key areas for transformation as well as the interventions required to achieve the vision for the city and ensure sustainable and resilient outcomes. The eight spatial strategies are as follow: Growth Management Strategy (GMS); Adequate Housing & Relocation Strategy (HRS); Urban Regeneration Strategy(URS); Hazard Mitigation Strategy (HMS); Natural & Cultural Conservation Strategy (NCCS); Agricultural & Food Supply Strategy (AFS); Basic Service Provision Strategy (BSPS); and Resilient Streets Strategy (RSS).

During the factfinding and validation workshops all the planning and design solutions and ideas that had been gathered through a series of participatory sessions, were collected and classified into the planning strategies. These ideas were further prioritized during the technical workshop with local experts. This prioritisation informed one of the scoring criteria for the capital investment planning which will be unpacked in the following chapters.

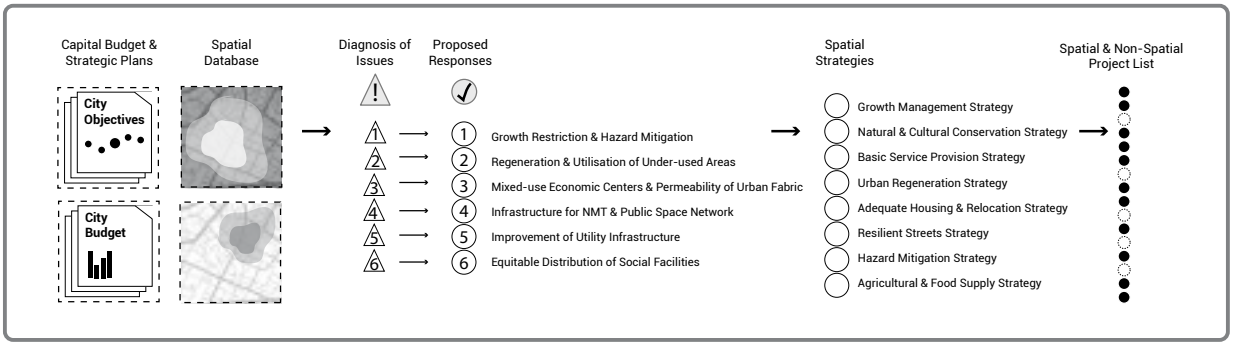


Fig 10. Translation of Responses into Spatial Strategies

Outcomes of "Planning the City" stage that would inform CIP:

- Identification of six Sustainable Responses that would inform the **Spatial Plans;**
- Translating Sustainable Responses into **Spatial Strategies**.

TRANSFORMING THE CITY

This stage of the process involved translating the strategic responses into area-based actions and interventions to provide clear direction and next steps required for implementation. Key areas for transformation were identified to showcase the practical implementation of the plan, how the SDGs can be localised and how an integrated approach to development can be applied. It provided an area-based focus for targeted investment and a more detailed list of projects and interventions for incorporation into the capital investment plan. Projects and interventions were then incorporated in a multi-criteria prioritisation model to indicate the most important projects to fund. This prioritisation process was undertaken in collaboration with key stakeholders. Cost estimates and preliminary budget sources were identified and aligned to proposed phasing of interventions and compiled into priority project areas investment cards. This step is critical and aims to promote effective and sustainable management of capital assets, to explore new funding opportunities, ensuring effective and targeted donor investments to support the projects' implementation.

Identifying Proposed Interventions

The first step under this phase aimed at translating the spatial strategies into implementable projects that would guide the current urbanisation pattern to a sustainable development track, preventing urban expansion in hazard areas while ensuring safe and healthy places for living. The design solutions were developed alongside the strategic vision for Khorog and are an outcome of the six strategic responses and eight spatial strategies, analysing and demonstrating these strategies at the neighbourhood scale. To maximise the process of citywide transformation, projects at the city level were identified through the evidence-based spatial analysis and followed an area-based approach considering the functional linkages between the projects. The process of project identification was then validated with a range of key stakeholders. Each project was located on a map in a consultative manner and further georeferenced and added to the database of proposed projects, a necessary component for the capital investment planning (further explained in the following sections). The georeferencing of the projects was conducted following the project grouping in thematic areas that have a specific rationale for scoring within the group (capacity, accessibility, etc.).

All the projects within each thematic areas have necessary attributes (index, address, brief description, etc.). The identified and georeferenced projects are fully aligned with strategic responses and spatial strategies and, in addition, are analysed as interlinked spatial systems. For example, the identified public spaces projects are considered as a network – an integral part of green infrastructure, which includes diverse projects, for example slope and river reinforcements and construction of terracing to reduce the impact of landslides.

Understanding the functional relationship between projects will benefit the process of implementation, creating an enabling environment for other identified initiatives. This rationale of interlinkages and proximity between projects is reflected in the scoring mechanism of the capital investment planning.

Fig 11. Process of Project Georeferencing

Prioritising Projects (this step will be further unpacked in the following chapter as it represents the outcome of the CIP prioritisation process)

Under this step, the actions and interventions identified and mapped were then incorporated in a multi-criteria prioritisation system to indicate the most important projects to fund. This provided a clear indication of what interventions are required, where, and when to achieve a planned outcome. Priority project areas for targeted investments were identified (with higher priority areas in red and lower priority in blue as in the example map below) as well as the general schedule (phasing plan) for implementation and compiled in investment cards which included recommendations on Priority Project Areas Financials (total costs including maintenance and operations, current investment commitments, and investment needs for the current and following years, etc.), Priority Project Areas Timeline, Priority Project Areas Partners and Priority Project Areas Maintenance Plan.

This step aims to promote effective and sustainable management of capital assets and to explore new funding opportunities, ensuring effective and targeted donor investments. The Capital Investment Plan provides the nexus where spatial plans, capital projects, and municipal budgets are integrated to provide a clear roadmap for the implementation of the development strategy. It incorporates three broad categories for capital investment.

1) Maintenance and reconstruction of existing infrastructure
2) Backlogs in service provision
3) Capacity creation for future urban growth (within the existing network – Urban Regeneration, and where warranted, Urban Expansion)

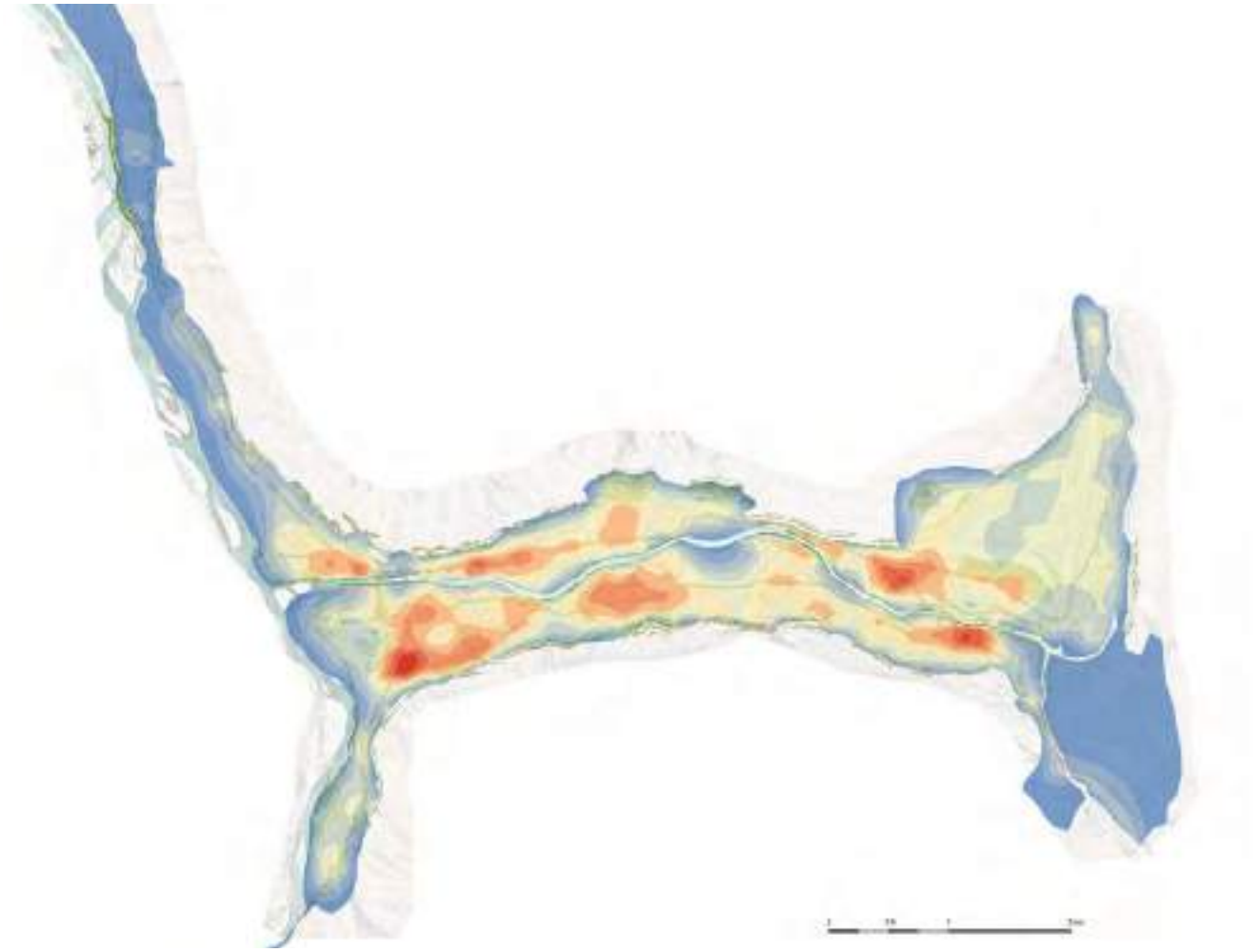


Fig 12. Priority project areas map

Outcomes of "Transforming the City" stage that would inform CIP:

- Identification of **Current Capital Projects** and **Proposed Interventions**;

Note: **Prioritisation of Projects** as a final outcome of the Spatially Informed Capital Investment Planning process which is further unpacked in the following sections.

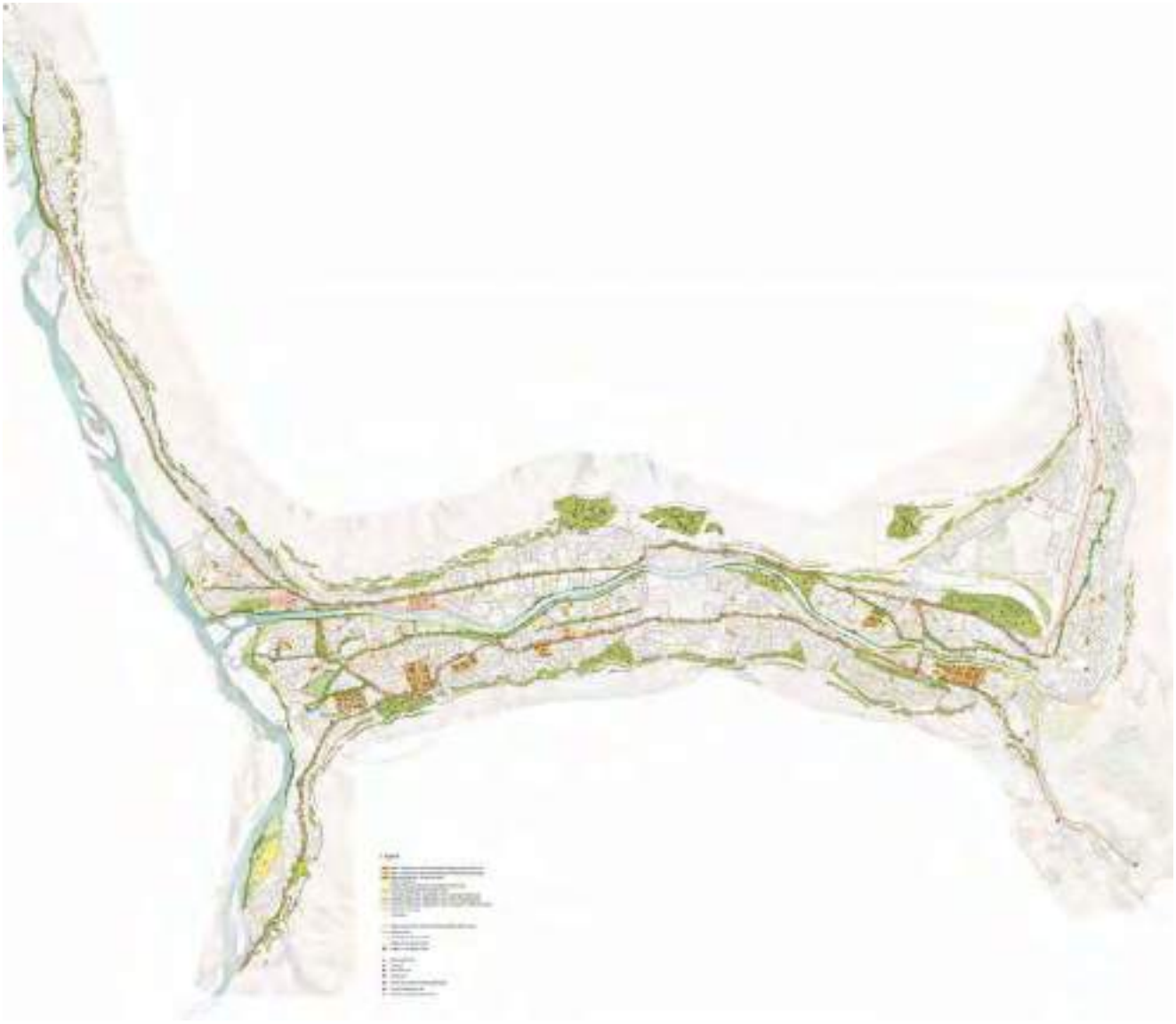


Fig 13. Transforming the city – how Khorog would look like if all projects would be implemented

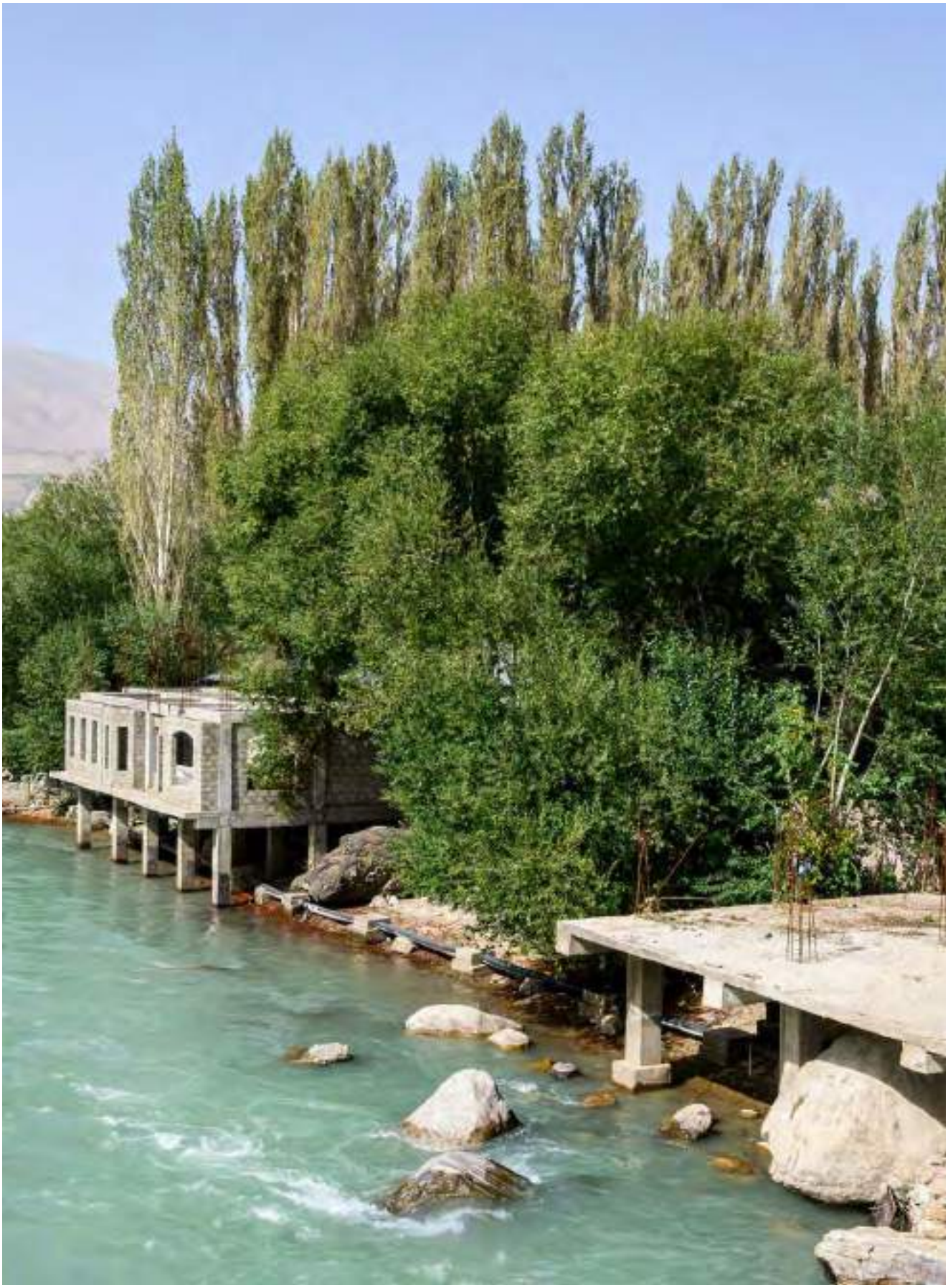
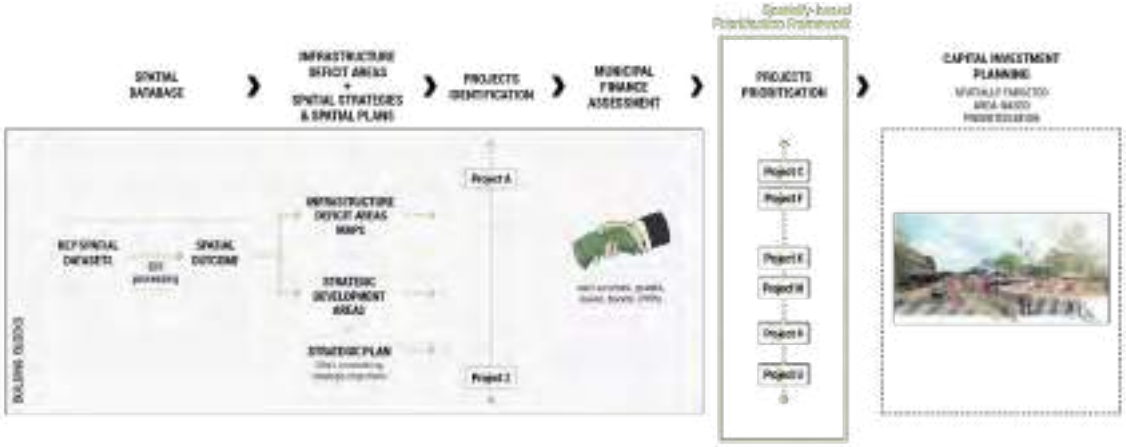


Fig 14. Constructions alongside the river bank, September 2022

2.2. BUILDING KHOROG'S SPATIALLY-BASED PROJECT PRIORITISATION FRAMEWORK

2.2.1. Set up the prioritisation matrix



Investment needs far exceed budget availability. Prioritisation is, therefore, critical to fit capital needs into a multi-year municipal budget aligned to the city's vision, as outlined in its spatial plans and sectoral development strategies. The Capital Investment Plan process is a multi-criteria analysis that allows to reflect a compromise between multiple priorities while discrepancies between outcomes and city strategic vision are traded off using preference weights. Each main criterion is further divided into sub criteria which are further broken down into indicators. Most of the indicators can be assessed through spatial data inputs. Where data is not available, new information to fill these gaps can be gathered in cooperation with service providers and stakeholders. By focusing on indicators that can be answered with data inputs, the space for subjectivity is minimized as it often does not require any qualitative input.

However, non-spatial criteria are extremely important in a multi-criteria assessment and contain pertinent qualitative information that enhances the overall analysis, especially when interlinked with spatial data. Qualitative insight allows for multiple perspectives of dynamic features to be considered and can help with contextualising the spatial data. For example, qualitative information on capacity and conditions of the existing infrastructure in Khorog was crucial to fully understand how the city and its infrastructure systems are currently performing. Similarly, qualitative data on the city's financials and governance system provided valuable inputs into the capital investment planning process. Non-spatial data was collected during workshops with key stakeholders and through surveys developed by UN-Habitat that were circulated within AKAH and other relevant stakeholders (e.g. service providers, the city's finance department, etc.).

Therefore, the preferred system of prioritization must include both spatial, and non-spatial criteria. In Khorog spatial and non-spatial criteria included the following:

Spatially based criteria:

- Infrastructure deficit areas
- Spatial development priorities
- Community voices: beneficiaries impacted (current and future)

Non-spatial criteria:

- High level strategic objectives
- Community voices: stakeholders participation; increase community social resilience; vulnerable groups; community based projects; etc.
- Financial sustainability & governance

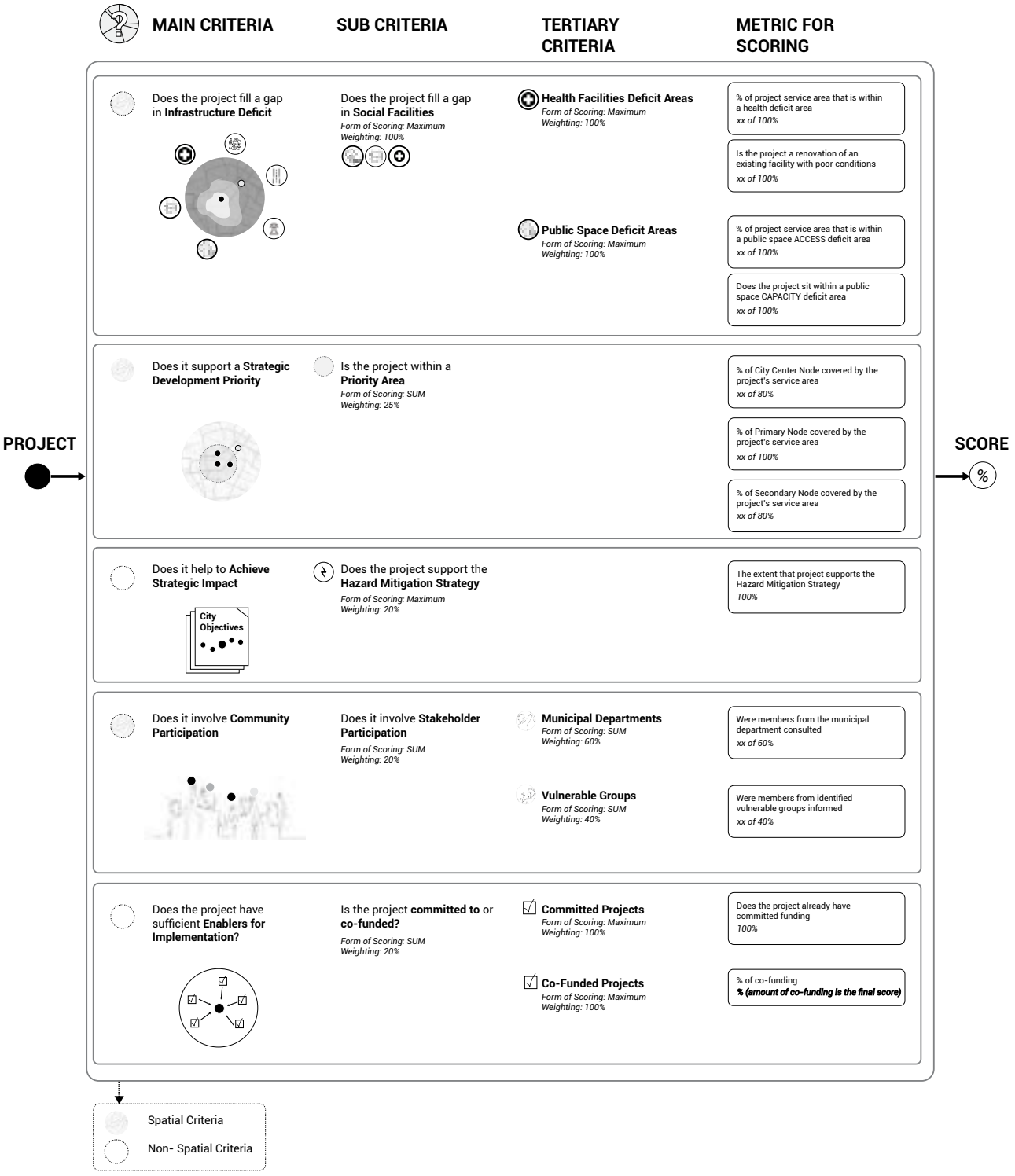


Fig 15. How to read Khorog's Multi-Criteria Framework. This graphic comes from the Urban Lab's Spatial Capital Investment Planning methodology and is adapted for diverse urban contexts and projects

2.2.2. Define criteria, sub-criteria, variables, and weighting method

In Khorog, the main criteria identified are those which were considered priority aspects. These are fundamentally relevant and are embedded in making a catalytic impact in achieving a more sustainable and resilient urban development. Therefore, different weights were assigned for each criterion to reflect their relative importance to the decision. A stronger weighting was assigned to the spatial development priorities which refer to the locations identified as strategic for growth and economic development, and which derived from a comprehensive evidence-based spatial analysis. Within each criterion, sub-criterion and indicators were further assigned different weighting according to their contribution to the main criteria. The different weighting for these criteria will be explained in the following sections (see Annex A for the full CIP Multi-criteria Matrix).

The application of the CIP methodology in Khorog piloted a two-step prioritization. The first step focused on scoring the projects against the first four main criteria and shortlisting the projects that would better respond to the identified needs which are aligned with both the spatial development priorities and the high-level strategic objectives while impacting a higher number of beneficiaries and increasing community social resilience. The second step then assessed whether the shortlisted projects meet the requirements to be implemented by evaluating their compliance with law and financial feasibility under the 'Enablers for Implementation' criteria. The CIP methodology applied in Khorog outlines the following main criteria that will be evaluated for each project subject to the prioritization process (Fig. 17).

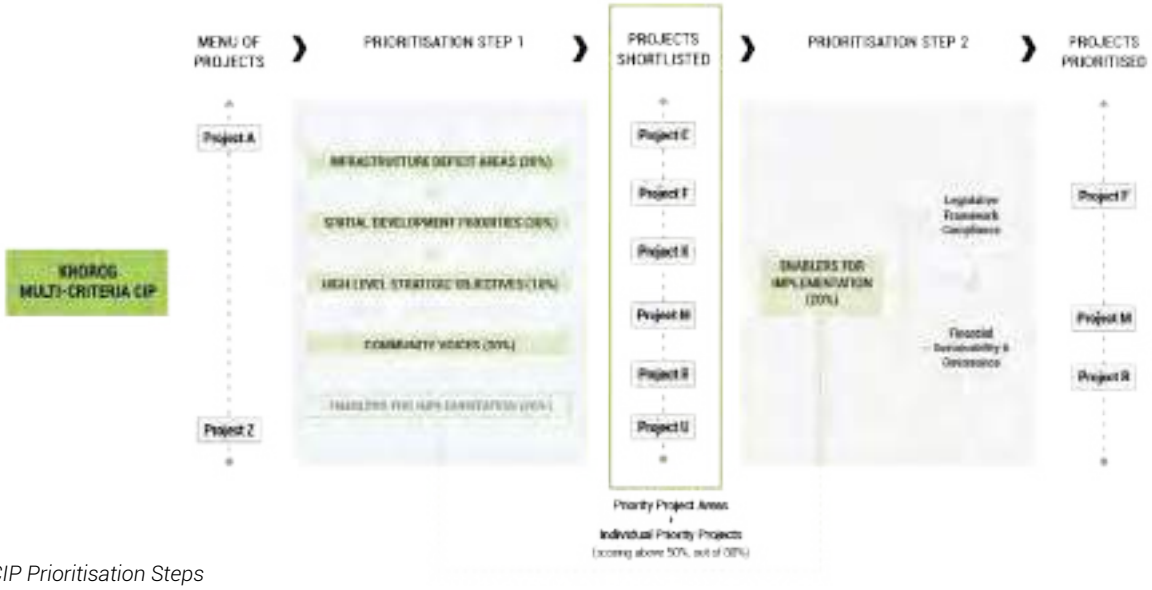


Fig 16. CIP Prioritisation Steps

Fig 17. Main Criteria CIP

Criteria 1: INFRASTRUCTURE DEFICIT AREAS

Infrastructure Deficit Areas *(how does the project respond to the existing needs while securing continued and improved service delivery?)*

This criterion assesses whether the project contributes to improving the infrastructure deficits identified by the spatial analysis including accessibility, capacity provision, and quality of the service. As an example, two core components identified in Khorog include:

- **Social Facilities Deficit Areas:** health; education; public open space; sports; markets; cemeteries.
- **Utility Deficit Areas:** electricity; sewer; water supply; solid waste; heating system; roads; stormwater; climate change & disaster risk.
- **Business & Industry and Housing:** existing general deficit related to access to housing and job opportunities in all Khorog. Housing projects and projects that contribute to livelihoods creation would score against this criterion.

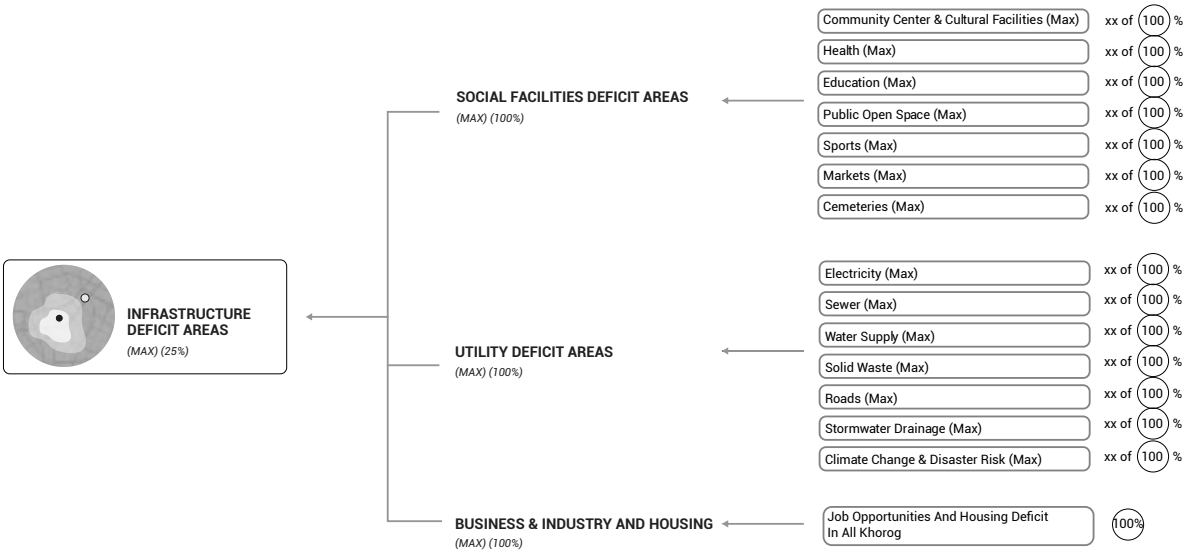


Fig 18. Infrastructure Deficit Areas Criteria

Scoring of these infrastructure types are related to the deficit maps created for each infrastructure type. The scoring is sector-specific, for example, public space projects can only score within public space deficit areas, and water supply projects can only score within water supply deficit areas, and so forth.

Any sector project contributing to resolving the deficit area will score under this criterion. It includes deficit for maintenance of existing facilities and where there are deficits (not adequate network coverage) in terms of the agreed standard of service. The project score is related to the percentage of its service area that is within the deficit area.

Below are some examples of the Social Facilities Deficit Areas Map and the Utilities Deficit Areas Map.

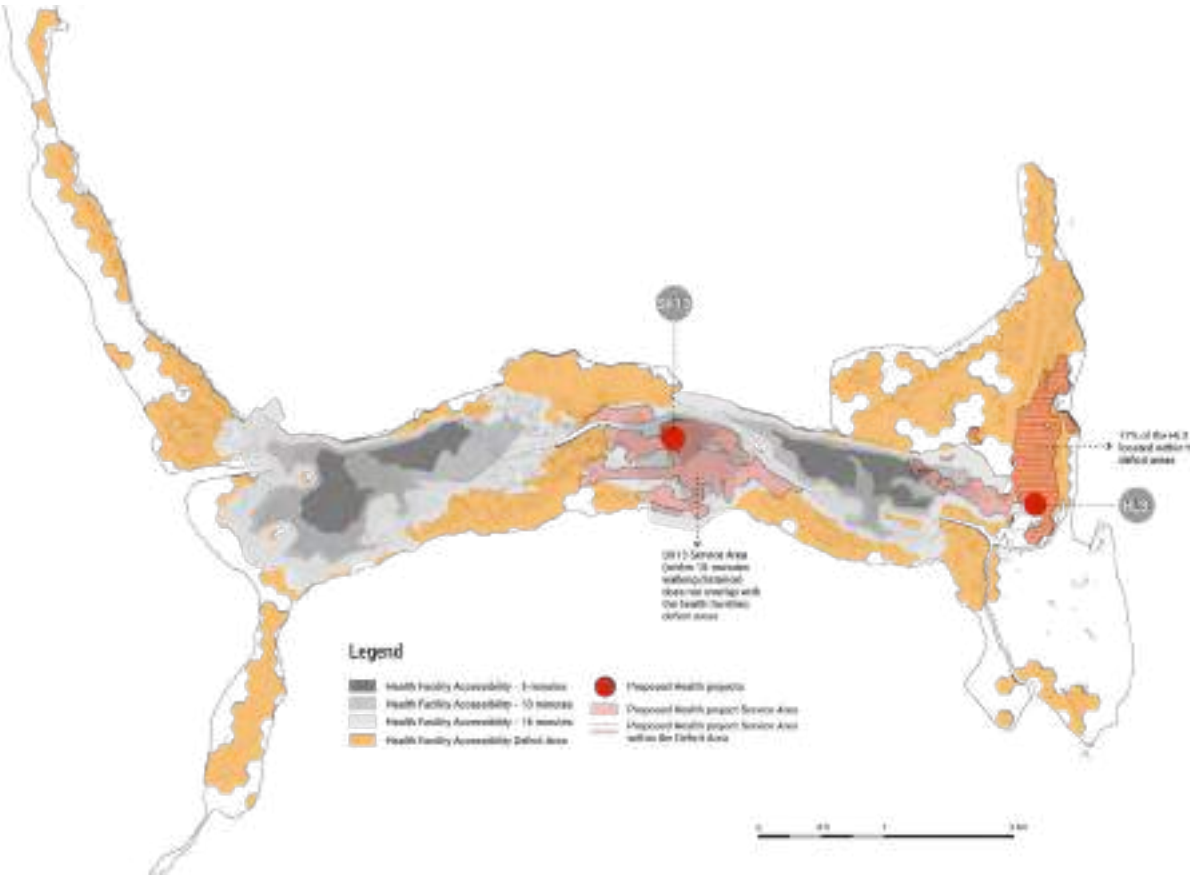


Fig 19. Health Facility Deficit Area Map & Proposed Health Facility Projects' Service Area. This health facility map represents an example of the deficit assessment and scoring methodology – all categories within Social Facilities follow the same scoring process against this criteria.

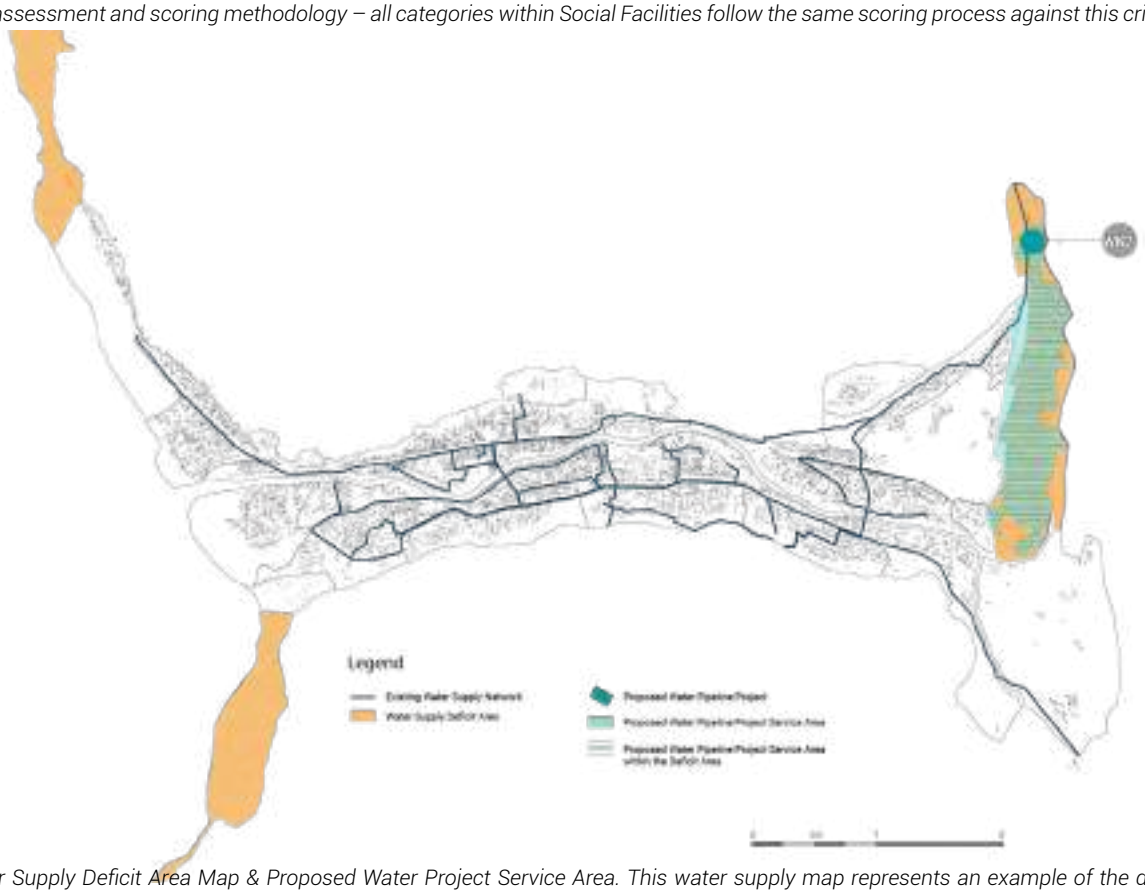


Fig 20. Water Supply Deficit Area Map & Proposed Water Project Service Area. This water supply map represents an example of the deficit assessment and scoring methodology – all categories within Utilities follow the same scoring process against this criteria.

Criteria 2: SPATIAL DEVELOPMENT PRIORITIES

Spatial Development Priorities (how does the project contribute to the priority development areas identified in the strategic spatial plans?)

This criterion assesses the location of projects against the strategic locational priorities identified by the strategic plan. It identifies strategic areas that are critical to direct sustainable development in the city. Projects receive a score depending on if their area of influence is contributing to the spatial development priorities. Four core spatial development priorities identified in Khorog include:

- **Priority Nodes (centralities):** areas identified in the strategic spatial planning process as key to the implementation of the development strategy. Any project contributing to the execution of the planned development in a strategic area will score under this criterion. Strategic development areas can be ranked in terms of their importance to the strategic plan and different weights can form part of an outcome of the spatial planning process. Within this criterion, the project score is related to the percentage of the priority node covered by the service area of the project. Projects located within the priority node will tend to have a higher percentage, as their coverage will be higher
- **Economic Activity Nodes:** economic growth is usually a key part of any development strategy. Any project contributing to the execution of the planned development in an economic node will score under this criterion. Within this criterion, the score is related to the percentage of the economic activity node covered by the service area of the project. Projects located within the economic activity node will tend to have a higher percentage, as their coverage will be higher.
- **Social Projects Synergy:** synergy is defined as the effect resulting from the interaction of two or more causes, whose outcome is greater than their individual effects added together. Its application in the evaluation of priority areas allows the identification of clusters of social projects of a diverse nature. Within this criterion, the project score is related to the number of social projects of different typologies in which there is a proximity of less than 100 meters. Projects located in areas concentrating a higher diversity of projects in a defined area will tend to have a higher score.
- **Contribution to Mitigating or Adapting to Climate Change & Disaster Risk Management:** areas identified during the assessment as vulnerable to climate change effects and hazard occurrence are crucial for the decision-making process. Any project contributing to the decrease of this vulnerability will score under this criterion. Within this criterion, the score outcome is related to the percentage of its service area that is within the risk area. Projects located in close proximity to the source of the disaster will tend to have a higher score since the analysis takes into consideration the topography and flow dynamics, meaning that the project will minimise risk impact on a larger service area.

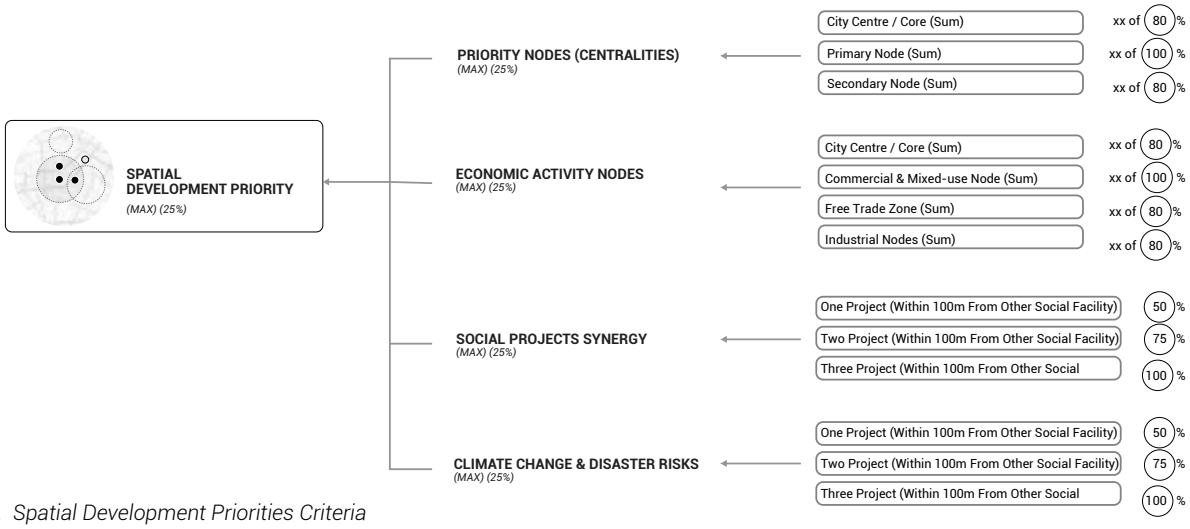


Fig 21. Spatial Development Priorities Criteria

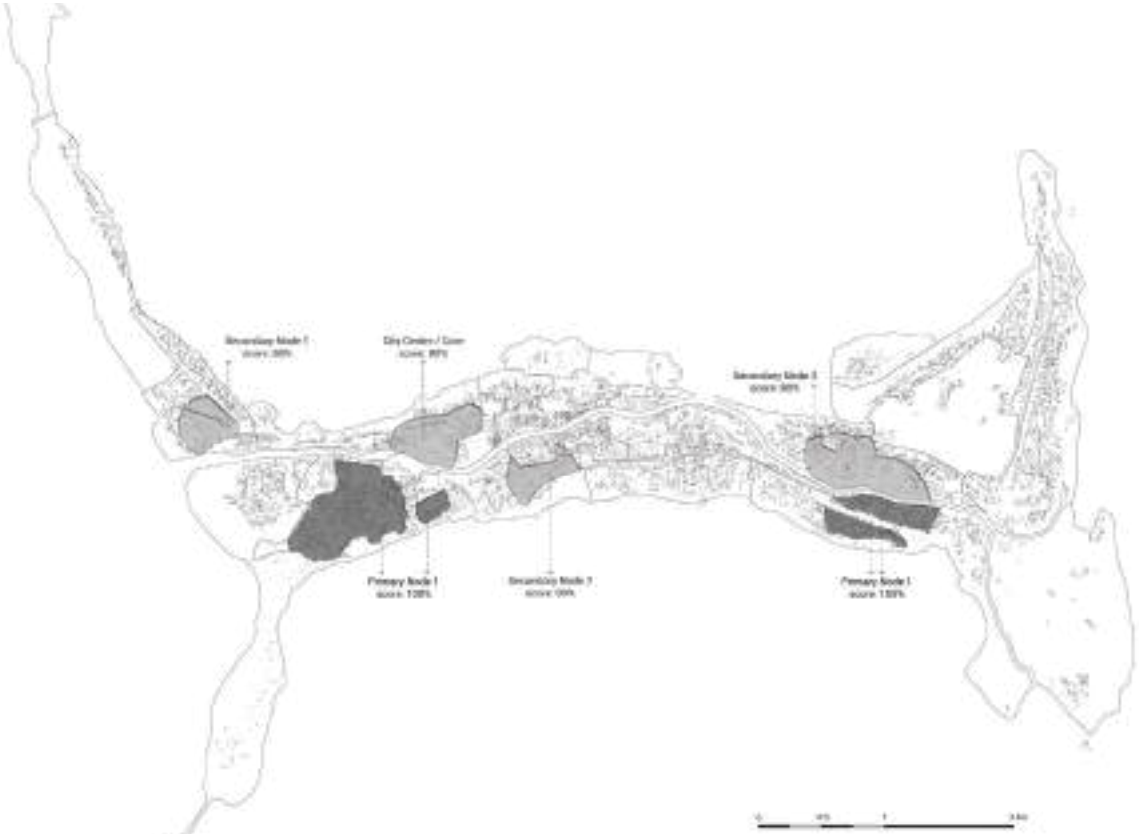


Fig 22. Priority Nodes Location and Scoring

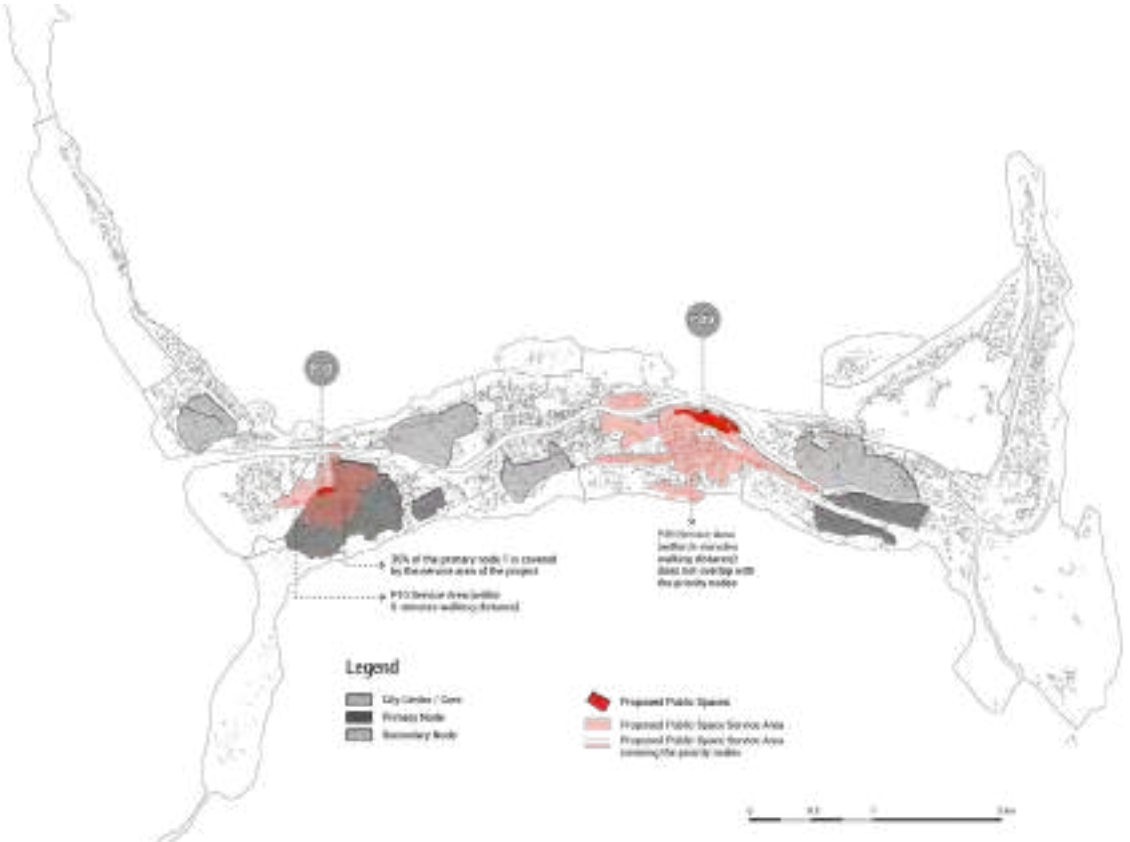


Fig 23. Priority Nodes (centralities) Map and Proposed Public Space Projects' Service Area. This public space map represents an example of the spatial development priorities assessment and scoring methodology – all categories within Social Facilities follow the same scoring process against this criteria.

Criteria 3: HIGH LEVEL STRATEGIC OBJECTIVES

High Level Strategic Objectives (How does the project align/contribute to City Specific Objectives?)

Each city has specific strategic aims and objectives identified within their vision and plans. The criteria in this section are based on the aspects that the city has already endorsed. Projects score if the proposed projects tangibly contribute to achieving the various objectives. Several example core component criteria captured in Khorog include:

- **Grown Management Strategy:** this strategy is a city-wide, multi-stakeholder approach to minimise the adverse impacts of city growth, whilst promoting sustainable urban development principles. This strategy is spatial and policy based, and requires legislation and management plans to maintain.
- **Hazard Mitigation Strategy:** this strategy not only involves location-specific, targeted projects to reduce or eliminate the impacts of natural hazards, but they are coupled with non-spatial, policy-based strategies that facilitate monitoring, coordination, communication and learning, and promote broader behavioural changes to both prevent and respond to natural hazards.
- **Basic Service Provision Strategy:** this strategy is congruent with ensuring basic human rights are met in a city, supporting governments to supply existing and future populations with adequate and equitable electricity, water, and sanitation services. This strategy comes together with financial planning, maintenance and management frameworks, capacity-building, and community engagement.
- **Adequate Housing and Relocation Strategy:** this strategy promotes the right to adequate housing for all, not only by considering existing communities at risk, but also through the provision of new housing in the city. This strategy is supported by legislative and urban design guidelines and must be implemented in a participatory manner.
- **Urban Regeneration & Economic Strategy:** this strategy responds to the negative impacts in select areas of the city resulting from changes in urban growth or productivity. This strategy attempts to address the negative on-set effects of underutilised areas of the city to improve the efficiency of the urban fabric (density and design) and incentivise economic growth in a sustainable, socially, and environmentally equitable way.
- **Resilient Streets Strategy:** this strategy encompasses several other concepts, principles and actions, and involves the active and on-going participation of local and city-wide actors and community members. Resilient Streets include the 'Complete Street' concept, where all modes of mobility are considered in an integrated approach, prioritising pedestrian and cycling infrastructure. This strategy promotes safety, green spaces, mixed-uses, and economic opportunities, as well as active and human-scale active facades.
- **Agriculture & Food Supply Strategy:** this strategy tackles food security and supply chains and inflation, to improve resilience to several factors including conflict, natural hazards, climate change, and socio-economic change.
- **Natural & Cultural Conservation Strategy:** this strategy addresses heritage through an environmental and socio-economic lens, considering architecture, urban morphology, and open space planning to promote certain employment sectors and provide platforms, spaces, and programming for diversity inclusion practices while promoting education and capacity-building for natural resource management.

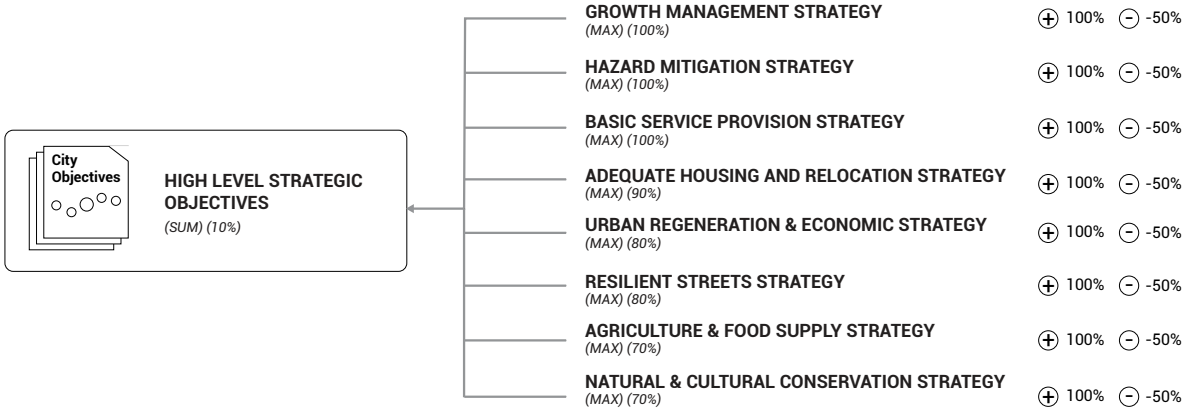


Fig 24. High Level Strategic Objectives

Criteria 4: COMMUNITY VOICES

Community Voices (How many people will benefit from the project?)

Putting people at the core of all investments is key to a sustainable future for the city. These criteria help to ensure that projects that are 'people centred' sore well. Projects score depending on the extent to which they impact beneficiaries or respond to community related issues. Examples of criteria for core components outlined in Khorog include:

- **Spatial assessment of impacted population (current and future):** this branch measures the number of current and future beneficiaries that the infrastructure investment will benefit from (based on the population distribution layers). The more people who benefit from an intervention, the higher the score. It is an important measure of service delivery and therefore, carries a substantial weighting.
- **Targeting vulnerable groups:** this sub-criterion evaluates if a project is specifically designed to target vulnerable groups. A drop-down menu of project's typologies identified by the different vulnerable groups as priority was developed. A project scores against this branch if its typology is covered in the drop-down menu.
- **Increasing Social Resilience:** this branch evaluates if a project directly contributes to increasing community social resilience. A drop-down menu of project's typologies that would promote community gatherings and socialisation was established. A project scores against this branch if its typology is covered in the drop-down menu.
- **Stakeholders Participation:** this sub-criterion evaluates the level of stakeholder engagement in the decision-making process. It evaluates if both Municipal Departments and Vulnerable Groups were informed, consulted, or involved in the project decision. The higher the level of engagement, the higher the score of the project in this branch.
- **Community-based Projects:** this sub-criterion evaluates whether an identified project has been proposed by the community. Community based projects get the maximum score established for this main criterion, as they would be targeted directly to specific needs identified by the community and would be aligned with the community criteria.

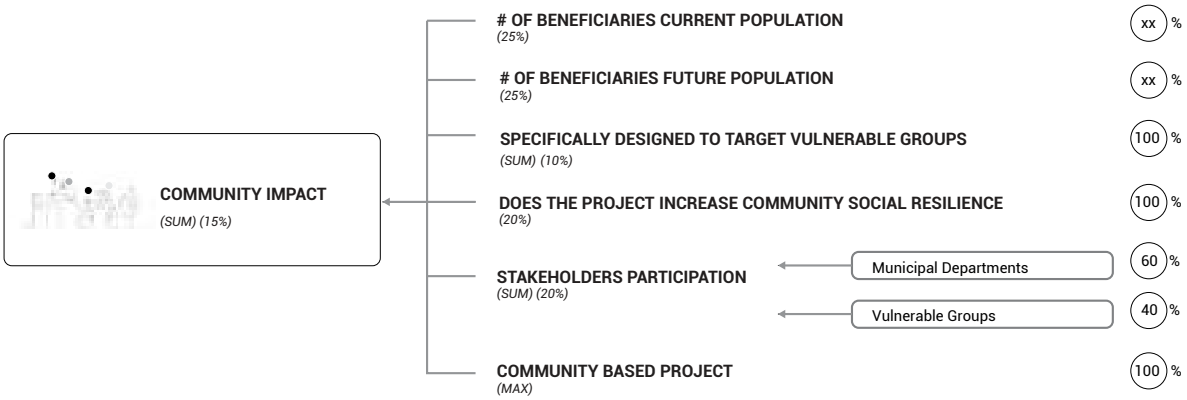


Fig 25. Community Voices Criteria

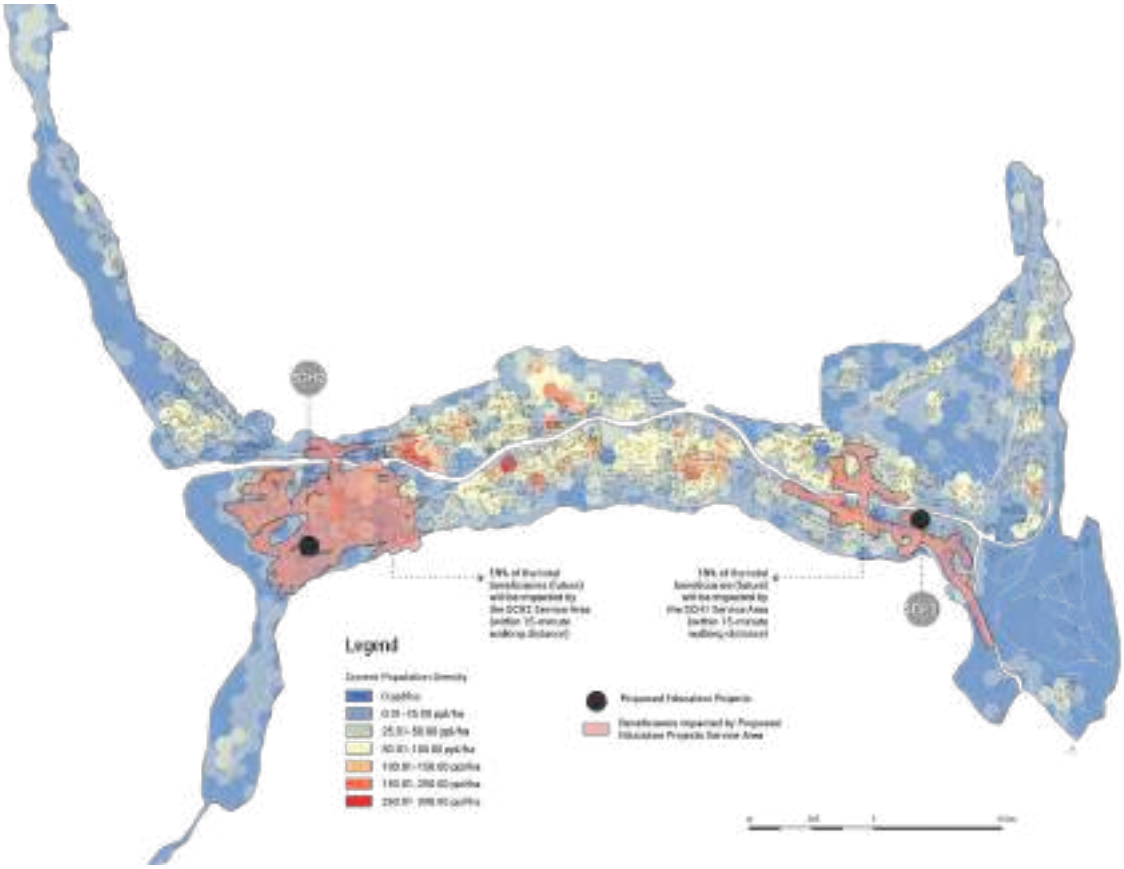


Fig 26. Number of beneficiaries impacted by Proposed Education Projects' Service Area. This education facility map represents an example of the community impact assessment and scoring methodology – all categories within Social Facilities follow the same scoring process against this criteria.

Criteria 5: ENABLERS FOR IMPLEMENTATION

Enablers for Implementation (Is the project viable and compliant with legal frameworks?)

This criterion relates to the enabling environment that could contribute to implementation. It assesses whether the project is compliant with the legislative framework and analyses the projects' financial sustainability.

The practical elements of the project are key to ensure that the project can be implemented, and can advance to have funds allocated. Projects score depending on the extent to which they respond to various execution constraints.

Example core component criteria evaluated in Khorog include:

Legislative Framework Compliance:

- This sub-criterion evaluates if a project contributes to implementing the legislative benchmarks or conflicts with the legislative framework. If a project is conflicting with the legislative framework, it scores negatively in this branch, which enables the de-prioritisation of projects that are not fully compliant with the law.

Financial Sustainability:

- **Project Cost:** this branch assesses the project cost estimation. If a project costs 70% above the median cost of all projects, it gets penalized with a negative score.
- **Project Cost Credibility:** this sub-criterion evaluates the level of accuracy of a project cost estimate. The more accurate the project cost estimate is, the higher the score. Advanced cost estimates are a good indicator of project readiness for implementation and assist in the budgeting process if accurate figures are captured.
- **Project Lifespan:** this sub-criteria assesses the lifespan of the project. The longer the lifespan of the infrastructure the higher the score.
- **Committed/co-funded:** this sub-criterion is related to weather a project is committed or co-funded. If a project is committed (ongoing or pre-funded) it directly enters the prioritization process. If the project is funded wholly or in part from external financial sources, then the project has more importance than a project that doesn't receive co-funding.
- **Revenue Base Increase:** this branch evaluates if a project increases the city's revenue. Utility infrastructure that adds substantial income streams to the city budget (mainly service charges for utilities) can be considered as providing an additional benefit and therefore accumulates a higher score within this category. Roads and transport infrastructure are the exception and are included here as they increase land value, and are therefore considered an income determinant. Different utilities can carry different weights related to their income contribution. New infrastructure projects would bring more additional revenue than a maintenance/ refurbishment project, hence, these would score higher. However, since maintenance/ refurbishing projects are investments that intend to increase the values of existing assets, they would enhance the quality of services and reduce future operating costs, therefore saving expenditure/increasing revenues. Maintenance projects should also be planned considering future growth and synergies/complementarities between projects in order to improve efficiency, cost effectiveness, naturally resulting in higher profits.
- **Implementation Readiness:** this sub-criterion assesses the readiness of the project to be implemented within the planned budget period. It assesses the main factors that lead to implementing failure and ensure that a project has completed all the requirements before committing major funds for capital investment. For example, allocating funding to build a health facility without having the land, and/or use rights secured, will lead to failure to implement within the budget time frame. The scoring methodology only highlights the typical criteria and should be customised to the local context. The lowest score from all the readiness criteria goes through and gets calculated with the parent criteria weighting.

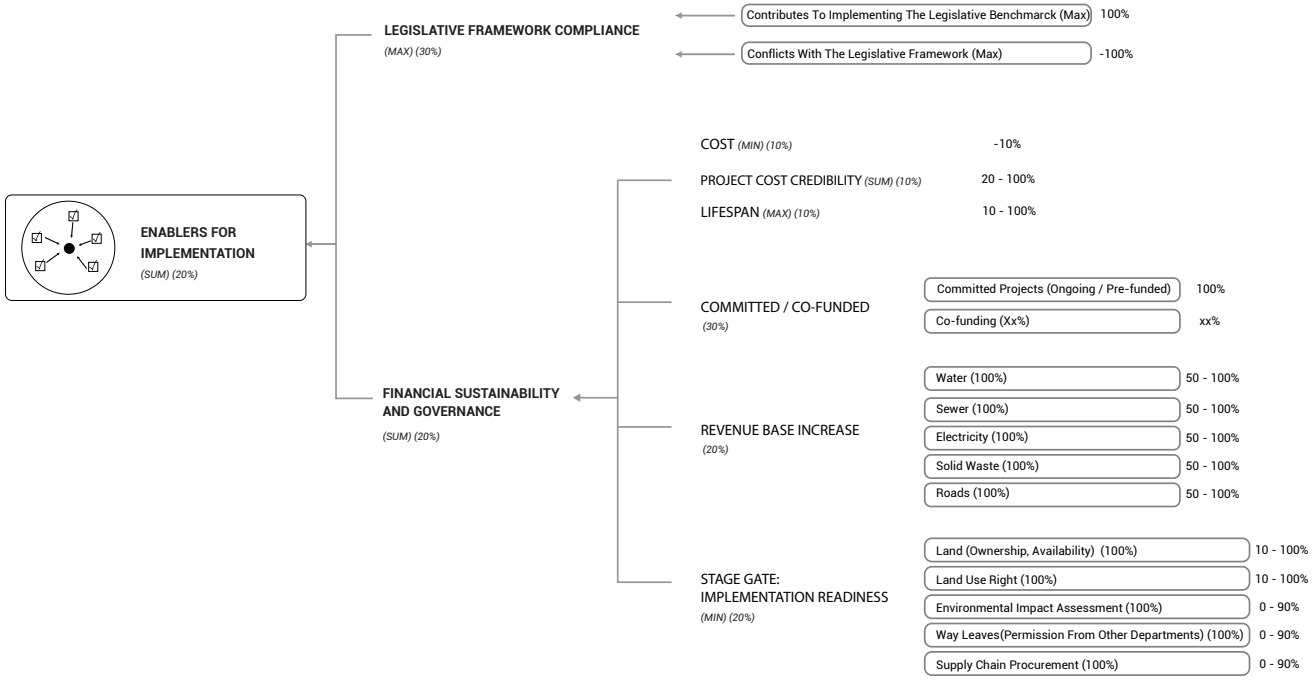


Fig 27. Enablers for Implementation

2.3. EVALUATING AND PRIORITISING PROJECTS

Once the spatially based project prioritisation framework is defined as well as both list and map of projects compiled with all essential elements, the process of project scoring took place, following the prioritisation framework outlined in the previous section.

The application of the CIP methodology in Khorog piloted a two-step prioritization. The first step focused on scoring the projects against the first four main criteria and shortlisting the projects that would better respond to the identified needs. These projects, therefore, aligned with both the spatial development priorities and the high-level strategic objectives while impacting a higher number of beneficiaries and increasing community social resilience. The scoring process consisted of assessing of each project through all relevant criteria using available data and spatial assessments. The resulting metrics were transformed into scores on a common scale, weighted and combined. The scoring model was developed using a spreadsheet software and a linear additive model, which multiplies the score on each criterion by the assigned weight and adds it together to achieve a total score.

As an outcome of step 1 of the prioritisation process, spatially targeted areas concentrating the higher priority projects were identified, mapped and included into step 2 of the prioritisation process. Those projects that did not meet the sufficient criteria, were not included in the shortlist for step 2.

The second step then assessed whether the shortlisted projects meet the requirements to be implemented by evaluating their compliance with law and financial feasibility under the Enablers for Implementation criteria.

As a result of the overall prioritisation process, a ranking list of 170 projects was generated. A total of 149 projects within 7 targeted 'priority areas' and 21 individual priority projects outside of the priority areas, were listed and mapped. Investment cards were developed for each seven project priority areas, and one was created for the individual priority projects. The investment cards contain information on projects' objective, impact, beneficiaries, partners, life cycle, time frame and financial details aimed at supporting the mobilization of resources by linking the prioritised infrastructure investments to potential partners for financing and implementation.

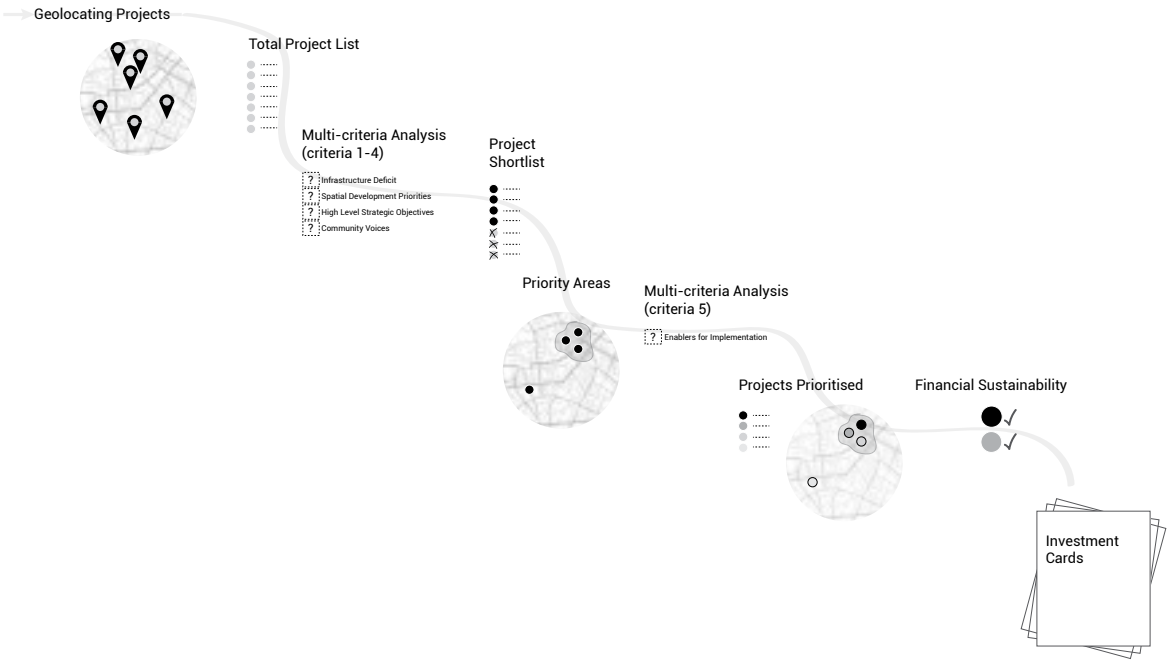


Fig 28. Khorog CIP Prioritisation Process

2.4. FITTING THE BUDGET

While the amount of budget available to invest in infrastructure in cities is finite, the demand for capital investments always exceeds the municipal capital available. The amount of funding available for capital investments is influenced by the long term municipal financial planning and the financial regulations and policies governing municipal finance.

Faced with limited financial resources and capacities, cities usually struggle to direct their budget towards the most impactful projects which often increases inefficiencies and widens the gap between planning and implementation. Hence, a comprehensive CIP prioritisation system is critical to ensure that the most important projects fit into the available capital budget envelop: the budget fitting process.

In Khorog, (as mentioned in chapter 2.1.1) it was challenging to perform a municipal finance analysis due to the lack of archived data combined with a complex data sharing process which included high level political approvals. Furthermore, due to time constrains and the urgency for a roadmap implementation, it was assumed that there is no budget envelop available within the municipality to carry out capital investments. Hence, and upon agreement with AKAH's team, it was decided that the results of the CIP prioritisation process would be the identification of priority project areas which will be translated into investment cards with key information about the high-priority projects to promote resource mobilization. These investment cards link the prioritised infrastructure investments to potential partners for financing the implementation.

Thus, this CIP prioritisation process provides an interesting avenue to look for external investments and to pitch for the transformative projects that would respond to the existing and future potential needs. Additionally, it presents a comprehensive tool for the local government to managing and monitoring the future urban development and investments in the city.

2.5. IMPLEMENTING AND MONITORING

The next steps for the projects identified within the CIP process in Khorog is the implementation and monitoring. This is necessary due to different contingent reasons. Projects may be off schedule or postponed and not implemented. Some projects may require additional funding due to previous unrealistic cost estimation or additional contingent spending needs that may appear when implementing a project. It is important to track project implementation and keep adapting and re-assessing budget spending. Funding availability can also change due to contingent crises or events that may make a diversion of funds needed throughout the year. These changes will be taken into account within the next year's prioritization process. In this sense, it is crucial to have a project database that tracks implementation and completion of projects. Projects that have not been implemented or were delayed can be re-evaluated in the next CIP process.

It is, therefore recommended for Khorog to keep a record of projects that could not be implemented or are incomplete. This should be taken into account within the next year's prioritization process. It is also important to keep tracking how much the projects prioritized have actually been completed and how much they have contributed to address urgent infrastructure needs and strategic priorities of the city. Specifically, it is important to monitor how the infrastructure deficit areas identified by the spatial analysis have been addressed and improved. This could be done through the mapping of challenges undertaken in the diagnostic stage (in phase I of the project), in order to see the positive or negative shift in city objectives and associated indicators This would help the city assess how much the prioritization process and should feedback again into the spatial and strategic planning process helping to identify how the city has advanced in reaching its objectives and moving forward.

3

PRIORITISED AREAS FOR FUTURE INVESTMENT

3.1. PRIORITY PROJECT AREAS RATIONALE AND RESULTS

As described, a spatially targeted area-based analysis was carried out to assess where the high scoring projects were located and what were the synergies between them. Two types of project categories were used throughout this analysis: utility projects (including roads) and social facilities & mitigation projects. Each group was then subjected to a detailed analysis including the geographical location and the score obtained by each project. This resulted in a layer of information that showed which areas of the city had the most concentrated priority projects. This step helped to inform the decision-making process by identifying strategic areas for investment.

Utilities Prioritised Areas (Fig.29)

As a result of this analysis, it was possible to identify a concentration of prioritised utilities projects in the central core area that mainly proposed the improvement of existing infrastructure assets (renovation projects). This reinforces the importance of concentrating efforts and resources in resolving existing issues rather than investing in new projects that extend into areas that are poorly served, to secure continued and improved service delivery.

Social Facilities + Mitigation Prioritised Areas (Fig.30)

The same assessment was carried out for social facilities and mitigation projects but presented a rather different outcome where it was possible to observe a decentralisation of prioritised social facilities projects which reinforces the spatial development strategies of investing in promoting higher densities and mix-used development in new strategic regeneration nodes within the existing built-up area.

Combined Map of Priority Project Areas and Individual Priority Projects (Fig. 31)

Once both Utilities and Social Facilities and Mitigation projects maps were combined, a final density map with priority projects clustered by areas was generated.

For the combined result, a weighting system was attributed to the two main categories: 3 to social facility and mitigation projects; 1,5 to utility projects. These categories were weighted in this way because in the understanding and diagnostic phases, it became apparent that social facility projects would provide a greater degree of impact on urban regeneration and development while addressing the needs of the current and future population of Khorog. This assessment does not aim to degrade the relevance of utility and mitigation projects but rather potentiate the projects that would contribute to a larger urban transformation.

This spatially targeted area-based approach provides a better understanding of the functional relationships between projects which will benefit the process of implementation. This means that the prioritised projects are those that would create an enabling environment for the implementation of other initiatives. Additionally, it also reflects the rationale of how interlinkages and proximity between projects form city-wide networks and systems. Although other areas were identified as priority (red/orange) as shown in the map below, the seven priority areas selected to be further detailed present more diverse types of projects (social facilities, mitigation and utilities) which will likely lead to a more transformative impact. Complementary to the spatially targeted area-based approach, projects outside of the priority areas that scored above 50 in the Step 1 of prioritisation were also shortlisted to Step 2 and are listed and mapped in the following section. (Fig. 32).

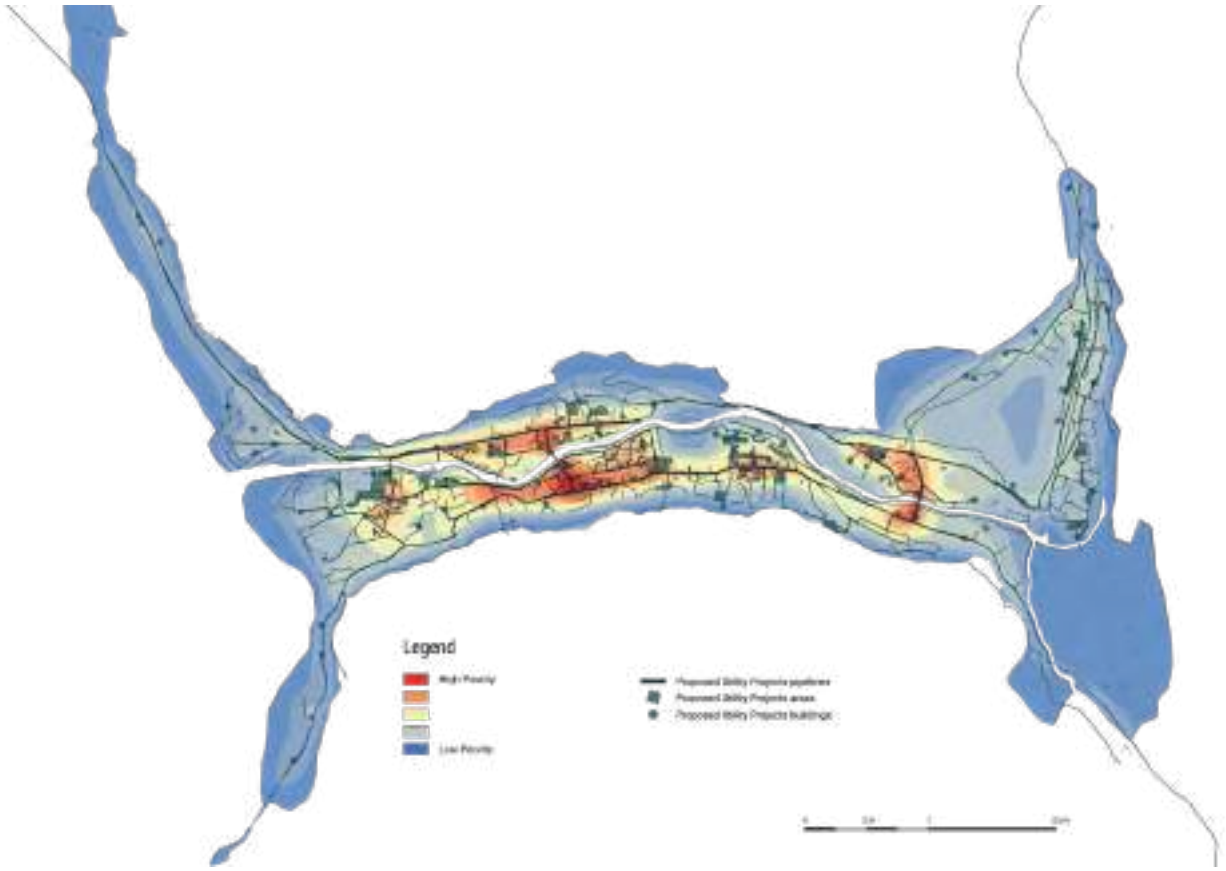


Fig 29. Utilities Prioritised Areas Map. The 'hotspot' that is centrally located in this map highlights a concentration of projects relating to utilities networks and relates to the transformative node identified through the strategic responses to the city's challenges. This area, although crucial to the improvement of basic services has not been created as an investment card as it does not provide an agglomeration of varied project types (impacting numerous sectors) that can be a catalyst for change and provide a demonstration of the city's strategy.

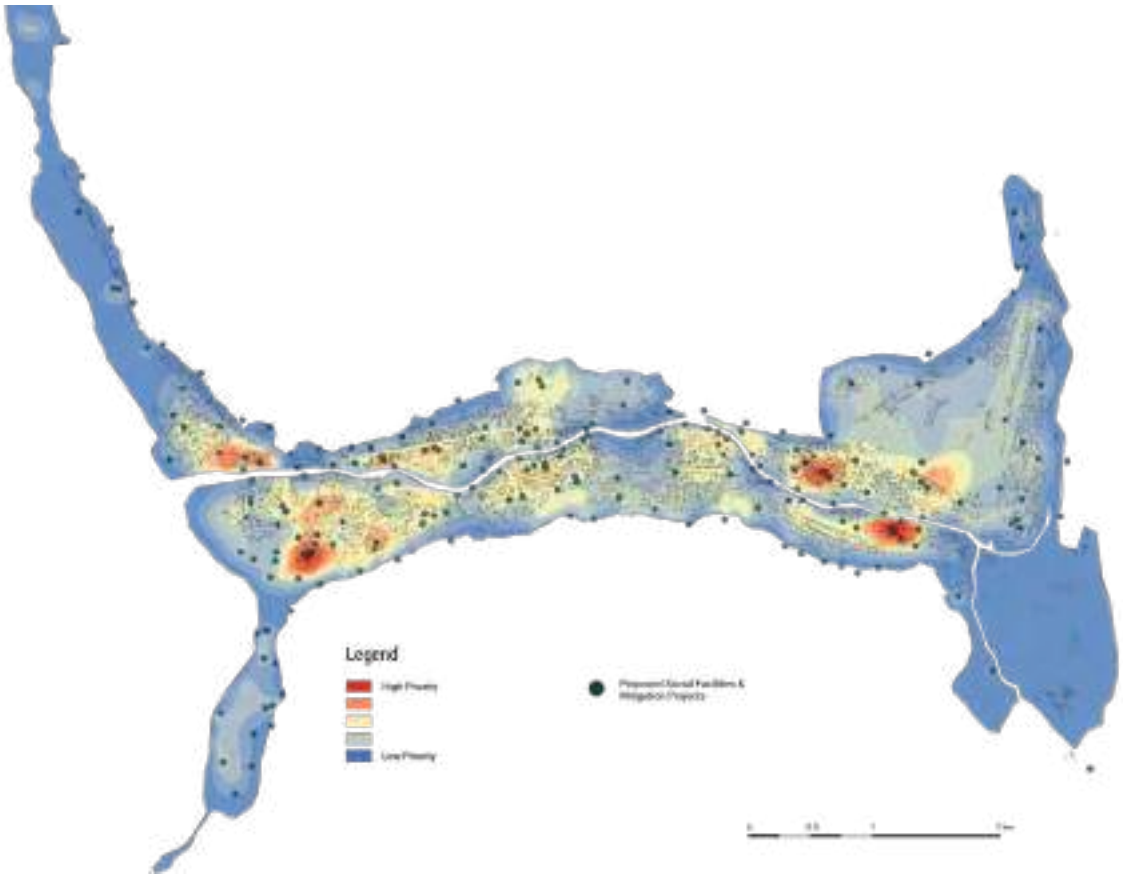


Fig 30. Social Facilities & Mitigation Prioritised Projects Map

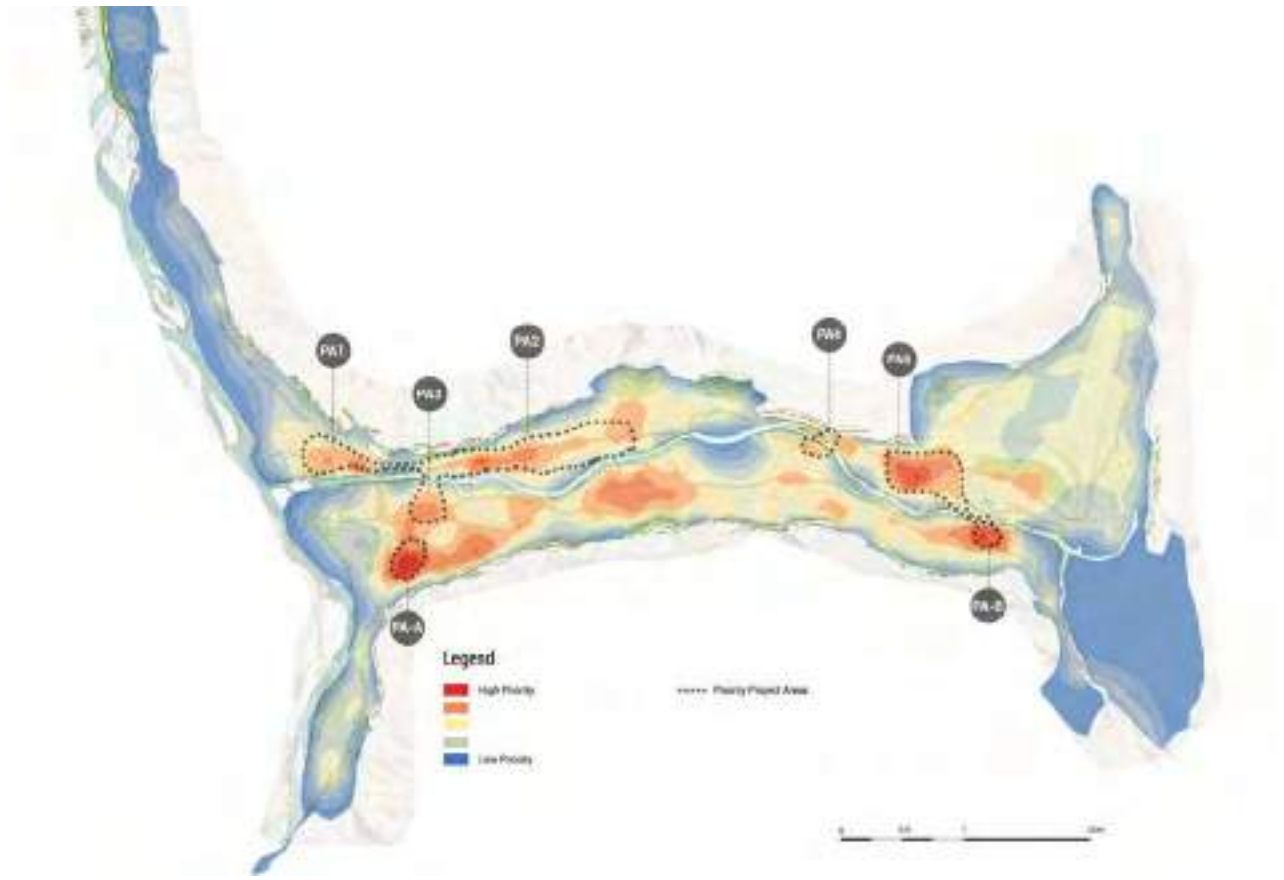


Fig 31. Combined Priority Project Areas Map

Fig 32. Individual Priority Projects Map

Fig 33. Accessibility - residents of Khorog circulating in one Mahalla located in a slope, September 2022

3.2. PRIORITY AREAS INVESTMENT CARDS

Before describing the details of each of the priority areas identified, a summarised assessment of the current state of the infrastructure in Khorog is provided below. This overview provides a direct link and justification for the projects identified and prioritised.

Located in a relatively isolated mountainous region and highly exposed to frequent and diverse types of natural hazards, **Khorog faces several challenges when it comes to environmental, socio-economic and infrastructure resilience**. During the first phase of the project, it was identified that in various parts of the city, both people and the urban fabric are at risk from natural hazards. Depending on the intensity, type and frequency of the hazards that occur in each of these respective areas, urban expansion limitation, mitigation, conservation and/or disaster response coordination strategies are necessary. Areas such as Sharifobod, the North of Saifullo Abdulo, Khufak, North Kichordev, Northwest Khorugi Bolo, Imomobod, Northern Valdosh Gulmamad and Chukht- Khorog, and Western Gulobod, have all been identified as those with either a high population or land area at risk, or as experiencing multiple hazards at a frequent rate or high intensity. Considering the population density distribution against the areas affected by natural hazards renders evident that the hazard area forms a natural boundary to the urban extension. This demonstrates the risk to existing structures in these border areas and that city expansion in these areas will exacerbate existing threats.

One critical challenge identified in Khorog is the **insufficiency of the current water and sewerage infrastructure** for the existing population and its heavily unbalanced distribution across the city. The nature of utilities provision is interrelated. Without maintenance, water channels can leak and increase the risk of ground water flooding, which in turn, impacts areas that lack access to the sewerage network and rely on septic tanks. Tem, Tabobatkhona, Barakat, Voldosh Gulmamad and Chukht-Khorug were identified as priority areas for interventions to address this. Overflowing dump sites in the city, some of which are informal or consist of open pits, cause unsanitary conditions. The city landfill also lacks infrastructure to limit pollution from leaching into the nearby river and water system. The lack of a waste management system means that refuse is not regularly collected, and recycling is practiced in the city. Another critical challenge is the high reliance on informal water access, leaving consumption uncontrolled. Scarcity of employment opportunities make the introduction of utility bills challenging, however, water is regularly over-used. Moreover, the low quality of water pipes and channels requires intervention to reduce leaks and ensure they can withstand the low temperatures and earthquakes. An integrated, city-wide approach, that integrates provision of all services is necessary to ensure the entire city is accommodated with household water supply and irrigation, consistent, year-round electricity provision, waste removal, and sewerage networks, the latter two of which are essential to protect the city's water sources from pollution.

A **lack of connectivity** has been identified in the city,

which has created car dependency that negatively affects the natural and socio-economic environment. The lack of pedestrian linkages and poor quality of pedestrian infrastructure, particularly pedestrian bridges, makes walking across the city challenging. This exacerbates car-dependency. Two bridges in the city centre fall within a military zone, meaning that they are not publicly accessible. East of this point, there are no pedestrian bridges, leaving weak connectivity between the north and south sides of the city in the eastern periphery. This has an impact on resident access to employment and public services and can hinder emergency responses. The lack of urban permeability driven by fragmentation, isolates neighbourhoods and results in poor accessibility. Despite the good public transport coverage, unregularized stops and an unclear schedule makes the public transport system unreliable. The lack of integrated pedestrian network significantly contributes to car dependency, further reducing walkability in the city. As was revealed during the Capacity Needs Assessment, road quality is a critical issue that also affects the regional connectivity within GBAO region. Finally, regulations to protect the riverside from construction have not been enforced, and construction in the area has reduced accessibility to the river. There is, therefore, limited public use of the river and almost no visual connection to the river from within the city. The river's impact on the environment and on the identity of the city, as a landmark for navigation, potential pedestrian link and an opportunity for public space has been directly reduced by this construction.

When it comes to the **distribution and provision of social facilities** there is low levels of access to fundamental public services in certain areas of Khorog. Tem has limited access to health facilities, Nivodak, Dashti Bolo and Valdosh Gulmamad do not have access to any sports facility, and kindergartens are lacking in the eastern part of the city. Sharifibod, Nivodak, Gulobod, Andarsitez, Dashti Bolo, Valdosh Gulmamad and Chukht Khorog face the most critical shortages of public service provision. While new service centres are being constructed, this is often a response to the pressure of high demand and capacities can become stretched. For example, AKAH constructed a sport facility in Andarsitez, which has become the only public space in the area and is often overcrowded as a result. Several facilities are under high demand in Saifullo Abdulo, Tabobatkhona and Khorugi Bolo. Facilities with insufficient capacity to accommodate the high population density in their vicinity will be stressed further as the population grows. Some facilities are located within hazard zones. Moreover, the current facility distribution and the lack of multifunctional or flexible operational modes of the buildings do not align with the hazard assessment nor a strategy of hazard adaptation which result in scarce facilities that can support hazard responses (for example storage or emergency accommodation).

Building on the key challenges identified, strategic recommendations are developed into implementable actions and compiled into a consolidated spatial plan that would shift the urbanisation pattern towards a more sustainable development track, preventing

urban expansion in hazard areas and ensuring safe and healthy places for living. The investment cards outlined in this section are the outcome of the Spatial Capital Investment Planning (CIP) process, which is one of the final steps in the project, and links proposed projects to sustainable urban transformation. The Investment Cards provide costs based on existing projects within the city, to provide a suggestion for budgeting requirements for key components of each project. Costs, however, do not take into account final designs, nor labour or forecasting future costs if the project is not implemented for a number of years. In addition, the investment cards provide an estimate for the beneficiaries of each project. The beneficiaries are calculated as a percentage of the whole city population. This takes into account the population that there will be considering the increase in residents accommodated by the proposed mixed-use development nodes. However, it is important to note that the project beneficiaries does not take into account unpredicted, major shifts in population influx. Finally, investment cards are a useful way to begin the process of service provider procurement, project design and investment. They do not include risk assessments or monitoring and evaluation.

Notwithstanding these parameters, decisions on what, where, how, and when projects get financed and implemented have a critical long-lasting impact on the liveability of cities. Considering the limited resources that cities usually have for capital investment, the CIP helps to improve the efficiency of municipal governments' spending and ensure the achievement of the city's priorities and the SDGs.

The CIP process integrates the strategies from different departments and helps guide an integrated municipal strategy, prioritising projects based on the established criteria. In the context of rapid population growth of developing cities, such as Khorog, infrastructure development is necessary to safeguard and improve the quality of life for residents. The process of CIP sets out the programme of infrastructure delivery that is believed necessary for a city's sustainable future and puts into monetary terms the method and timeline of achieving the goals set about in the legislated spatial plan. The CIP provides the nexus where spatial plans, capital projects, and municipal budgets are integrated to provide a clear roadmap for the implementation of the development strategy.

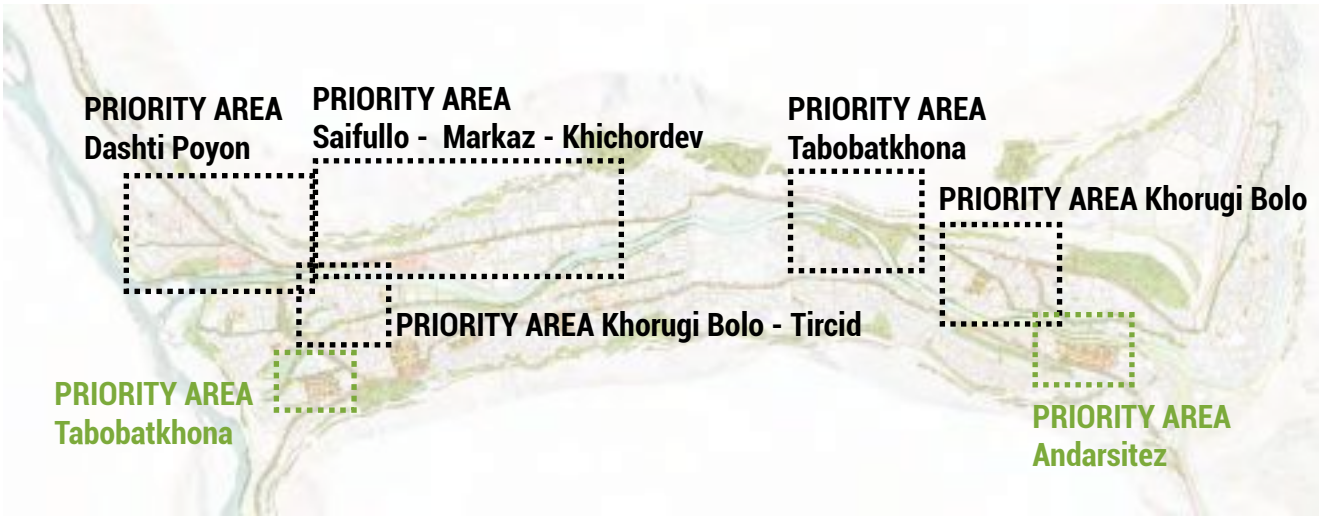


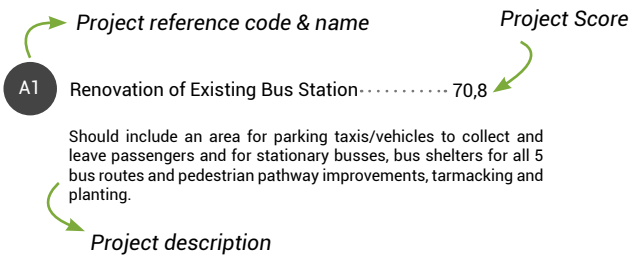
Fig 34. Locations of priority areas in Khorog. There is no heirarchy of priority areas, only of projects.

How to read this card

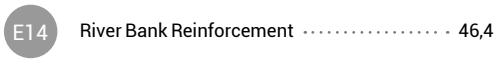
The Spatial Capital Investment Planning process identifies, prioritises, and estimates a city's investment needs over a 10 year horizon, given existing infrastructure and services gaps and projected growth.

These investment cards are grouped by priority area (as shown in the map above), which is defined through the grouping of projects. Urban Design detail has been provided for Priority Areas Tabobatkhona and Andarsitez, which is elaborated further in the Khorog Urban Design Guidelines report.

Each priority area includes a series of projects that have been evaluated - the score for each project is the outcome of a multi-criteria analysis. All projects are coded for reference and have been grouped by functions (for example, community facilities, public spaces, roads, transport etc.) so that project partners are able to trace each project back through the Spatial Capital Investment Planning process and analysis.

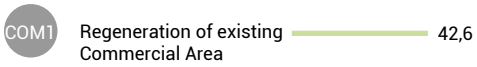


Projects that are scored lower than 50% are considered less of a priority and categorised with a grey project code, as in the example shown here.



Projects that are the least priority, or rely on many other projects within the area to be completed in order to be effective, are shown as in the example below.

Projects that have a catalytic and essential role within the priority area are shown as in the below example with a green line. Projects within the priority area rely on this key project, due to it's broader impact. An example of this is a hazard mitigation measure - projects that are located within the area protected by the hazard mitigation measure are dependent on it.



Finally, project codes highlighted with a white circle, are those that stretch beyond the boundary of the priority area. These are city-wide projects and are detailed further at the end of this document. These wider scale projects are also included in the list for each priority area, to show how they contribute to the transformative impact of the area. However, the cost of these city-wide projects are not included in the cost estimate for the whole priority area.

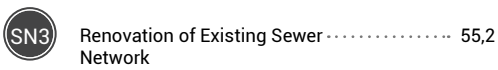
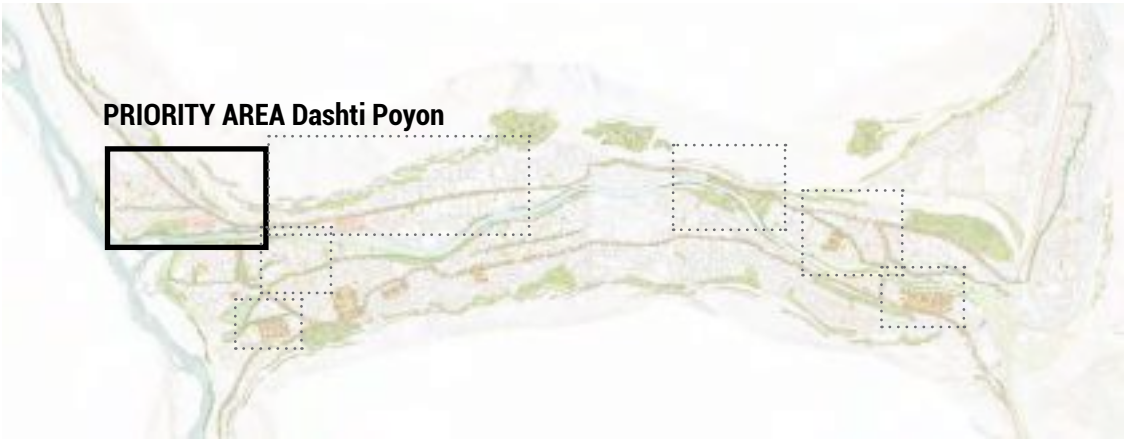
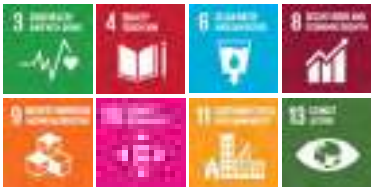


Fig 35. Khorog, UN-Habitat, September 2022

3.3. PRIORITY PROJECT AREA DASHTI POYON



PROJECT AREA NAME	Priority Area Dashti Poyon
PROJECT AREA LOCATION	Mahalla Dashti Poyon
PROJECT AREA PARTNERS	Khorog Municipality Donors/Financiers/Private Sector Utility Service Providers International Development Agencies Potential External Partners
PROJECT AREA TIMELINE	**Short-term:** 2023-2025 **Medium-term:** 2026-2030 **Long-term:** beyond 2031 * suggested timeline per project outlined below
ESTIMATED BUDGET	USD **$20,939,174.01** * city-wide projects excluded from total **breakdown of costs per project outlined below
TARGET BENEFICIARY GROUP	**Direct Beneficiaries:** Residents and users of Dashti Poyon Mahalla **Indirect Beneficiaries:** Residents of Khorog Municipality * breakdown of impacted population per project outlined below
SDG ALIGNMENT	

PROBLEM STATEMENT

The design solutions for the Priority Area Dashti Poyon target problematic issues linked with connectivity and accessibility to adequate services. Being an extension of the city centre, it is developing as a new administrative and commercial node, with Military and Government Offices, Development Organisations and Headquarters of Private Sector companies, restaurants, a new market facility, central bus station, etc. While there is a high concentration of activities and mobility of people, adequate access to infrastructure and services is still a critical issue in this area.

PROJECT OBJECTIVE

The objective of this transformative area is, therefore, to regenerate the existing market area and reinforce the development of a growth economic node in Dashti Poyon by promoting the implementation of green public spaces, new social facilities (such as a new Health Facility) and commercial areas while improving pedestrian connectivity and accessibility to public transport. Renovation of existing, and extension of infrastructure networks such as sewer, drainage and heating will address one of the key issues identified in this area.

PROJECT IMPACT

The regeneration of the market area will create a new centrality while improving pedestrian and public transport connectivity. The public transportation stops and the location of the site near the main transportation axis make economic activities beneficial to all the residents of Khorog. The proposed regeneration area contributes to rebalancing the city's functioning by creating a new hotspot with improved accessibility to social facilities, employment, leisure and infrastructure options.

PROJECT PARTNER

- **Khorog Municipality & National Government**: Main responsible, owner and implementer of the projects' implementation in coordination with potential donors and external partners.
- **Donors/ Financiers/ Private Sector:** Funding entity(ies) would be requested to support the implementation of projects within Priority Area 1.
- **NGOs/CSOs:** Potential external partners could be considered to support the projects' implementation throughout the overall process (e.g. capacity building/training, maintenance plan, etc.).

PROJECT LIFE CYCLE

- **Risk Assessment:** to identify and analyse the potential risks that may occur during the implementation of each project as well as to determine the likelihood and potential impact of each risk.
- **Feasibility study:** preliminary exploratory assessment to examine technical, economic, financial, legal and environmental viability of projects.
- **Concept Design:** early phase of the design process to test function, form, linkages, requirements, etc.
- **Detailed Design:** stage where the concept design is refined and a complete precise set of plans are developed. At this stage, the projects are ready for implementation.
- **Construction and Maintenance:** implementation of the projects on the ground and regular maintenance works during projects' life span.
- **Monitoring and Evaluation:** framework that outlines the indicators that are used to track the progress of the projects to ensure whether all objectives are being achieved.

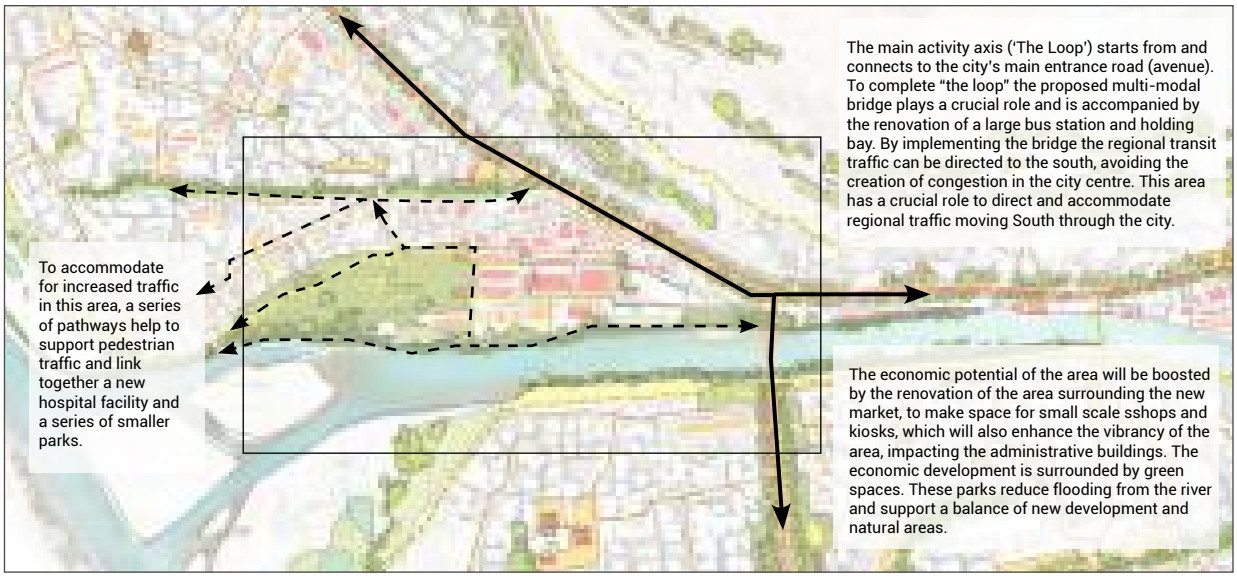
PROJECT FINANCIALS

Total Estimated Cost: $20,939,174.01
Current Investment Commitments and Type: External funding is needed
Investment Needs: Risk Assessment, Feasibility Study, Concept Design and Detailed Design, Construction and Maintenance Plan, Monitoring and Evaluation

ADDITIONAL SUPPORT NEEDED

Identification of synergies and/or dependencies between projects is critical to ensure a sustainable implementation of the Priority Area. This rationale of interlinkages and proximity between projects is reflected in the scoring process, however a more detailed assessment of budget availability and projects' time frame is needed to ensure the intended impact. Aspiring for an impactful and sustainable implementation process, this investment card aims to support the Municipality of Khorog to consider the suggested projects when analysing investment decisions in order to align the budget envelops with investment needed - e.g. smaller projects that could be covered by own source revenues; education and health facilities that could be delivered by Central Government; infrastructure and wider development projects that could be of interest for donors/private sectors to invest.

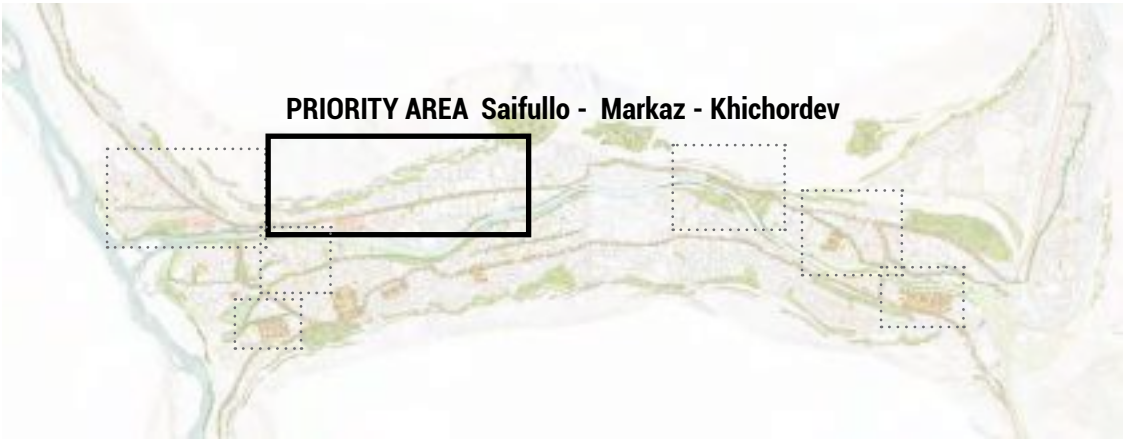

Wetland Park
Thermal Isolation of Building
Pocket Public Spaces
Hazard Mitigation Projects
HS1
HS3
AN42
M1
M2
HS3
P5
P58
WN2
M3
R5
P6
SD2
SW2
WN7
HL4
SN3
A1
P1
COM 1
SD1
R1
R15
PM1
P2
R92
R46
E14
B1
Regeneration of existing Commercial Area
Multimodal Bridge
Main Multimodal Axis 'The Loop'
City-Wide Projects
Catalyst Projects
Higher Priority Projects
Lower Priority Projects
Water Supply Network
Roads/Pedestrian Paths
Heating System
Stormwater Draining Network
Sewer System
Social Facilities
Bus Stops
New Solid Waste Collection Points
Public Spaces


The main activity axis ('The Loop') starts from and connects to the city's main entrance road (avenue). To complete "the loop" the proposed multi-modal bridge plays a crucial role and is accompanied by the renovation of a large bus station and holding bay. By implementing the bridge the regional transit traffic can be directed to the south, avoiding the creation of congestion in the city centre. This area has a crucial role to direct and accommodate regional traffic moving South through the city.
To accommodate for increased traffic in this area, a series of pathways help to support pedestrian traffic and link together a new hospital facility and a series of smaller parks.
The economic potential of the area will be boosted by the renovation of the area surrounding the new market, to make space for small scale sshops and kiosks, which will also enhance the vibrancy of the area, impacting the administrative buildings. The economic development is surrounded by green spaces. These parks reduce flooding from the river and support a balance of new development and natural areas.

	PROJECT NAME	SCORE %	ESTIMATED COST	BENEFICIARIES % of future population	TIME FRAME	DESCRIPTION
A1	Renovation of Existing Bus Station	70,8	$ 47 000	100%	Short-term	Should include an area for parking taxis/vehicles to collect and leave passengers and for stationary busses, bus shelters for all 5 bus routes and pedestrian pathway improvements, tarmacking and planting.
HS3	Thermal Isolation Soc. Facilities, Adm. Buildings	59,9		100%	Medium-term	City-wide project: 57 social facilities and admin buildings across the city. It is not possible to estimate costs for heating projects.
HS1	New Water Heating Pipeline Grid	59,9		100%	Short-Medium Term	City-wide project: connected to a planned central heating system. It is not possible to estimate costs for heating projects.
SD1	Rehabilitation of Existing Drainage Calvets	57,3	$ 3 275 000	71%	Short-term	City-wide project: cost presented is for the entire project
R1	Main Multimodal Axis (loop)	56,9	$1 009 000	56%	Short-term	City-wide project: total cost for the loop (R1, R2, R3, R4) presented. R1 estimated cost: $259 000. The loop is complete with the bridge projects.
SD2	Extending Existing Drainage Network	56,1	$ 5 300 000	78%	Short-Medium Term	City-wide project: cost presented is for the entire project
SN3	Renovation of Existing Sewer Network	55,2	$ 3 800 000	83%	Short-Medium Term	City-wide project: the project considers the renovation of the existing sewer network; number of beneficiaries and cost presented is for the entire city-wide project.
P1	Multi-functional Public Space	54,5	$ 2 400 000	8%	Short-term	Construction of a public space adjacent to the Market and the wetland park (sports, places to sit and to rest, play, etc.)
P2	Multi-functional Public Space	53,7	$ 557 000	13%	Short-term	Construction of the public space adjacent to the Market and the main access to Dashti Poyon with a renovated bus station and vegetation
WN2	Rehabilitation of Irrigation Channel 1	53,0	$ 970 000	25%	Medium-term	City-wide project: cost presented is for the entire project
PM1	Wetland Park Connected to Market	52,6	$ 6 000 000	8%	Medium-term	Construction of the public space with elevated sidewalks, "sponge" elements" for flood mitigation, and include a place for animal market
B1	New Multimodal Bridge	52,4	$ 472 500	19%	Short-term	Construction of a new muti-modal bridge to complete the proposed transport loop as a backbone of mobility in the city. The bridge will accommodate vehicular, pedestrian and bicycle movements.
P6	Pocket Public Space	51,8	$ 312 000	5%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play.
M1	Hazard Mitigation to Prevent Rockfalls	51,8			Short-term	Not possible to estimate costs (detailed design is needed). Impacted beneficiaries not able to be assessed as a risk assessment is required to identify indirect population impacted by the project.
P58	Pocket Public Space	50,5	$ 240 000	5%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P5	Pocket Public Space	49,8	$ 67 000	3%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
M2	Hazard Mitigation to Prevent Rockfalls	49,6			Short-term	Not possible to estimate costs (detailed design is needed). Impacted beneficiaries not able to be assessed as a risk assessment is required to identify indirect population impacted by the project.
R46	Pedestrian Pathway	48,7	$ 5 800	19%	Short-term	Construction of a pedestrian pathway for convenient walking and socialising (also suitable for cycling)
M3	Hazard Mitigation to Prevent Rockfalls	48,4			Short-term	Not possible to estimate costs (detailed design is needed). Impacted beneficiaries not able to be assessed as a risk assessment is required to identify indirect population impacted by the project.
HL4	New Health Facility	46,7	$ 1 560 000	7%	Short-term	A proposed facility based on the deficit in the area. Catalytic role in the transformation of the PA1
E14	River Bank Reinforcement	46,4	$ 460 000		Short-Medium Term	Impacted beneficiaries is 0% as only direct beneficiaries were assessed. For a more accurate result, a risk assessment is required to identify indirect population impacted by the project.
WN7	Solarizing the Water Pumps	45,9	$ 147 000	21%	Short-Medium Term	
SW2	New Solid Waste Collection Points	44,6	$ 14 000	18%	Short-term	To be implemented across the city (20 in total planned within all priority areas)
COM1	Regeneration of existing Commercial Area	42,6	$ 8 750 000	100%	Short-term	Upgrade of the market, design of the kiosks & internal public space with activities
R92	Tarmacking the existing Pedestrian Pathway	40,5	$ 5 300	8%	Short-term	Upgrading the existing pathway to ensure convenient and safe walking, cycling, and socialising conditions
R5	Green Axis	40,5	$ 110 000	8%	Short-term	Redesign of the street (widening the pedestrian sidewalks, vegetation, infrastructure)
AN42	New Bus Stop	35,6	$ 6 100	7%	Short-term	

Fig 36. Khorog, UN-Habitat, September 2022

3.4. PRIORITY PROJECT AREA SAIFULLO - MARKAZ - KHICHORDEV



PROJECT AREA NAME	Priority Area Saifullo - Markaz - Khichordev
PROJECT AREA LOCATION	Mahalla Saifullo Abdulo Mahalla Markaz Mahalla Khichordev
PROJECT AREA PARTNERS	Khorog Municipality Donors/Financiers/Private Sector Utility Service Providers International Development Agencies Potential External Partners
PROJECT AREA TIMELINE	**Short-term:** 2023-2025 **Medium-term:** 2026-2030 **Long-term:** beyond 2031 * suggested timeline per project outlined below
ESTIMATED BUDGET	USD **$7,682,000** * city-wide projects excluded from total **breakdown of costs per project outlined below
TARGET BENEFICIARY GROUP	**Direct Beneficiaries:** Residents and users of Saifullo Abdulo, Markaz & Khichorderv Mahallas **Indirect Beneficiaries:** Residents of Khorog Municipality * breakdown of impacted population per project outlined below
SDG ALIGNMENT	

PROBLEM STATEMENT

This Priority Area is fundamental to the city's sustainable development. It is located along the central mobility access of the city, 'The Loop', and provides the central hub of activity. This area has a number of social, cultural and administrative buildings, however there are challenges associated with deteriorating infrastructure (including roads, post-office, library, basic services), and a potential danger of congestion with the city's growth. Cycle and pedestrian paths are currently not continuous through the site, and secondary roads connecting to 'The Loop' are often of poor quality. In addition, dis-organised parking leads to chaotic and sometimes dangerous traffic, and a lack of formal bus stops adds to the congestion in this central area. Apart from Chorbog, there are limited smaller parks in this area to serve local communities. Finally, although this is a thoroughfare from East to West through the city, there is constricted North-South movement, due to the lack of a pedestrian bridge connected with this central hub of activity.

PROJECT OBJECTIVE

The objective for Priority Area Saifullo-Markaz-Khichordev, is the improved efficiency of movement through this area (for pedestrians, cars, buses and cyclists). The goal for the projects within this area is to maintain its current vibrancy, whilst improving the quality and permeability of the street network.

PROJECT IMPACT

The impact of the projects in this area will reduce congestion, improve the reliability of the bus service, improve the safety of, and increase pedestrian and cycling activity. The impact of these projects will, therefore, not only affect those within this Priority Area, but, due to it's significance as a main hub of activity for the whole city, will impact daily commuter routes for surrounding neighbourhoods, as well as regional transport routes, for traffic travelling through the city centre. Finally, maintenance is necessary at this stage, as it will secure the popularity, safety and vibrancy of this area for the future population growth.

PROJECT PARTNER

- **Khorog Municipality & National Government**: Main responsible, owner and implementer of the projects' implementation in coordination with potential donors and external partners.
- **Donors/ Financiers/ Private Sector:** Funding entity(ies) would be requested to support the implementation of projects within Priority Area 2.
- **NGOs/CSOs:** Potential external partners could be considered to support the projects' implementation throughout the overall process (e.g. capacity building/training, maintenance plan, etc.).

PROJECT LIFE CYCLE

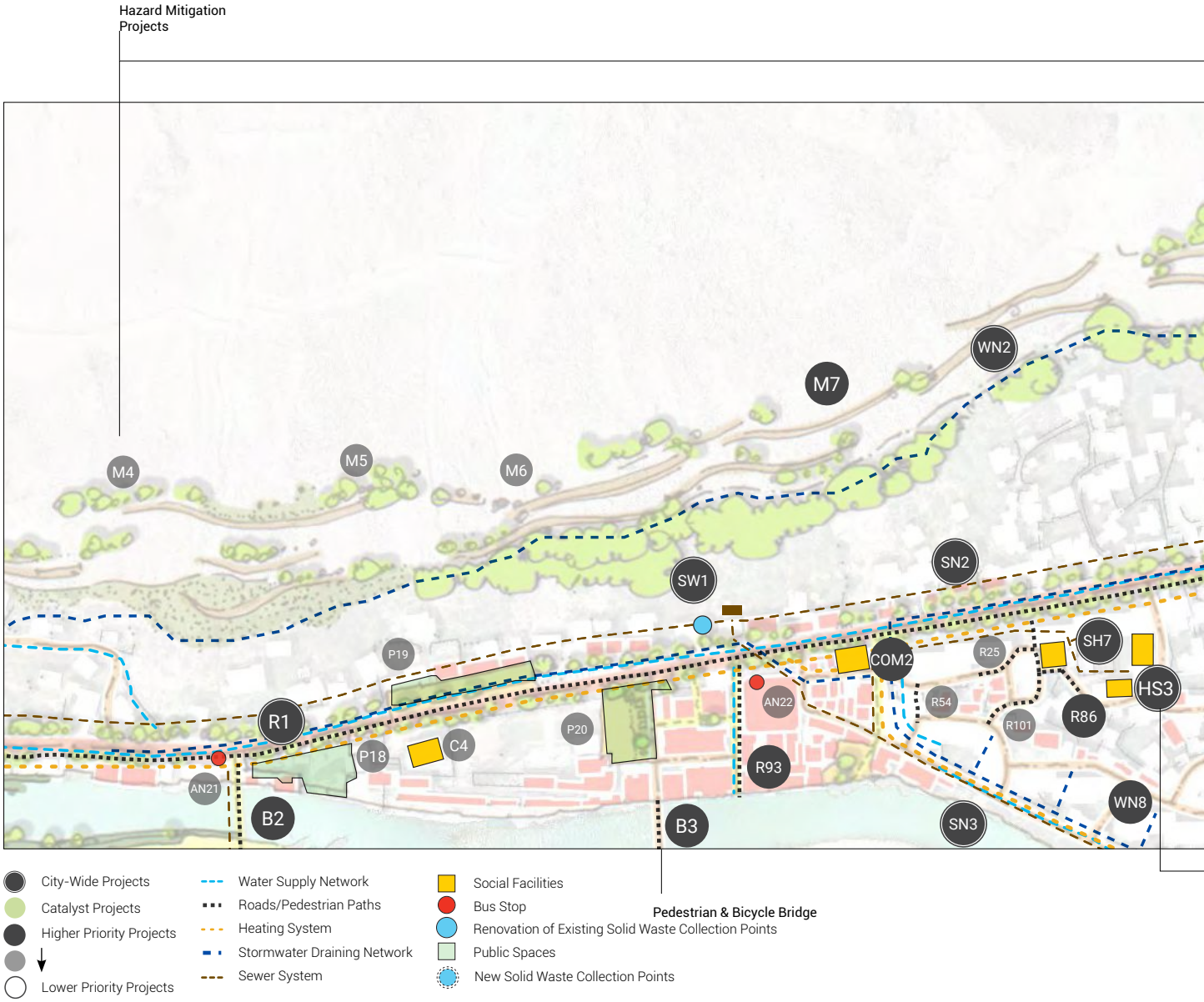
- **Risk Assessment:** to identify and analyse the potential risks that may occur during the implementation of each project as well as to determine the likelihood and potential impact of each risk.
- **Feasibility study:** preliminary exploratory assessment to examine technical, economic, financial, legal and environmental viability of projects.
- **Concept Design:** early phase of the design process to test function, form, linkages, requirements, etc.
- **Detailed Design:** stage where the concept design is refined and a complete precise set of plans are developed. At this stage, the projects are ready for implementation.
- **Construction and Maintenance:** implementation of the projects on the ground and regular maintenance works during projects' life span.
- **Monitoring and Evaluation:** framework that outlines the indicators that are used to track the progress of the projects to ensure whether all objectives are being achieved.

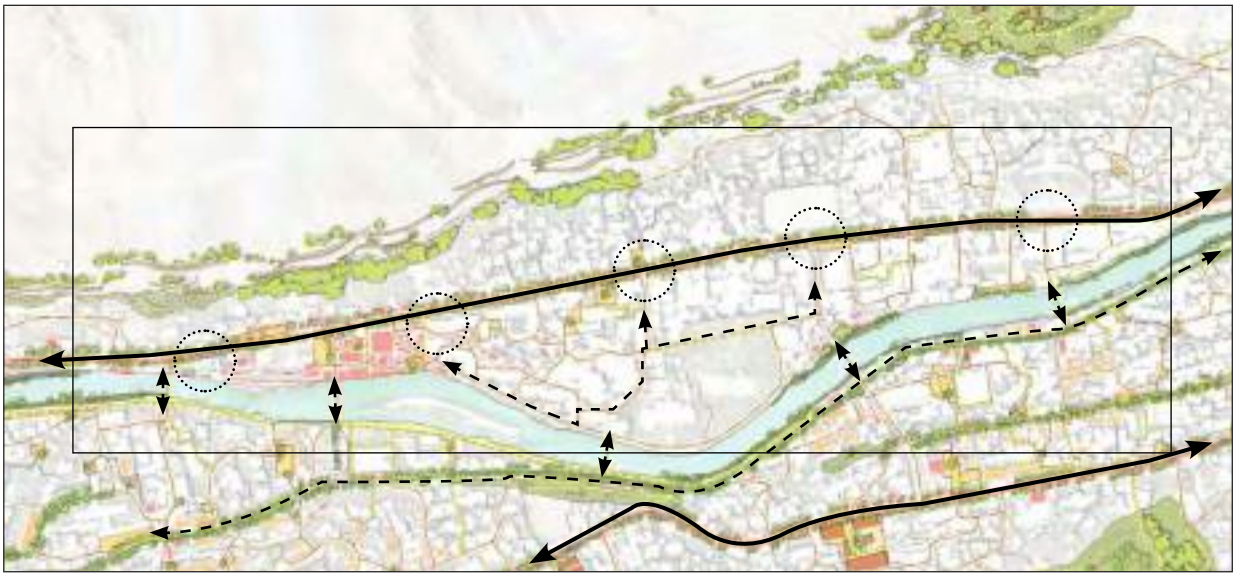
PROJECT FINANCIALS

Total Estimated Cost: $7,682,000
Current Investment Commitments and Type: External fund is needed
Investment Needs: Risk Assesssment, Feasibility Study, Concept Design and Detailed Design, Construction and Maintenance Plan, Monitoring and Evaluation

ADDITIONAL SUPPORT NEEDED

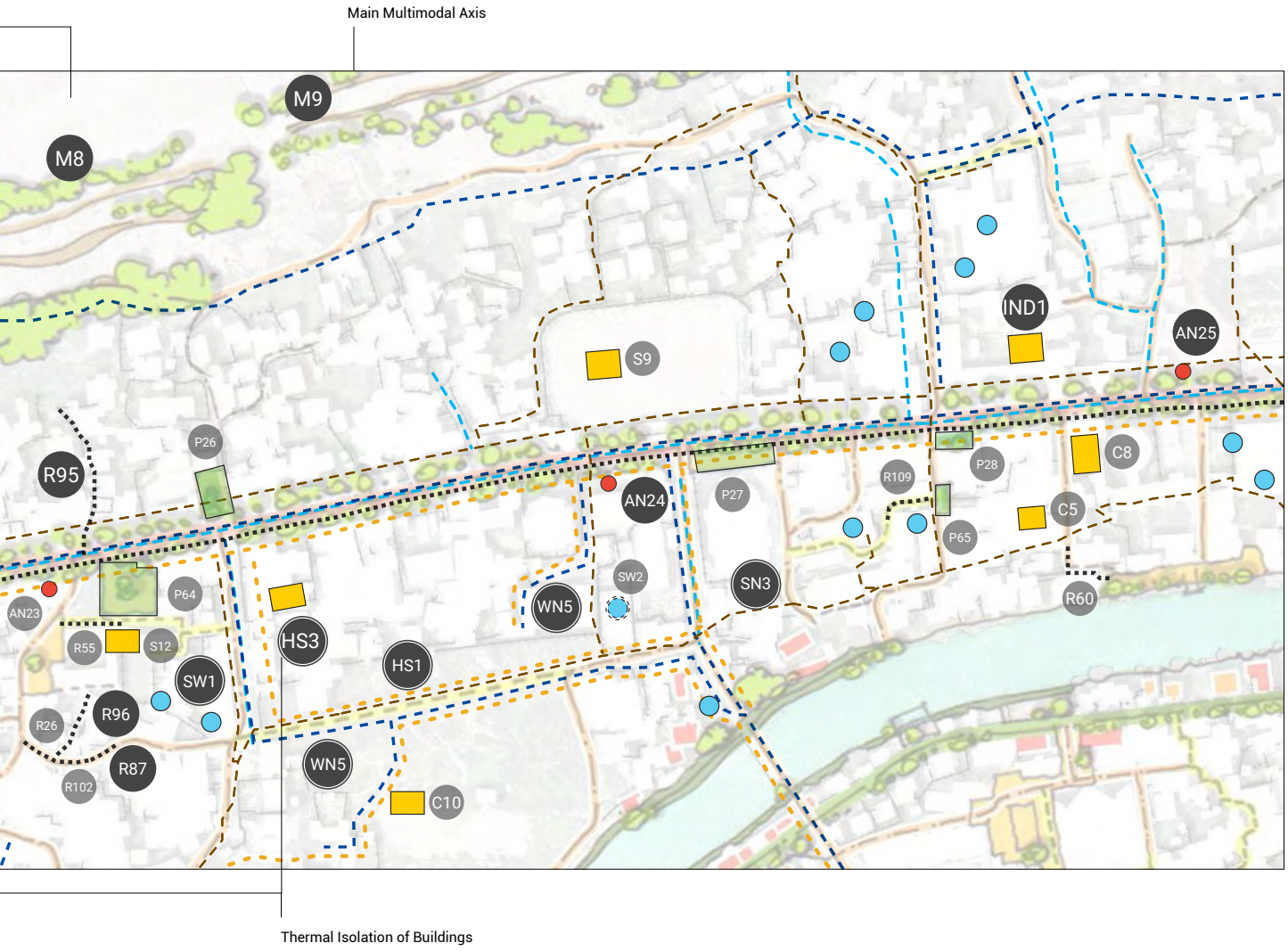
Identification of synergies and/or dependencies between projects is critical to ensure a sustainable implementation of the Priority Area. This rationale of interlinkages and proximity between projects is reflected in the scoring process, however a more detailed assessment of budget availability and projects' time frame is needed to ensure the intended impact. Aspiring an impactful and sustainable implementation process, this investment card aims to support the Municipality of Khorog to consider the suggested projects when analysing investment decisions in order to align the budget envelops with investment needed - e.g. smaller projects that could be covered by own source revenues; education and health facilities that could be delivered by Central Government; infrastructure and wider development projects that could be of interest for donors/private sector to invest.





New pedestrian and multi-modal transport connections (through, for example, bridges and road improvements) help to both increase access to this main axis, as well as efficiently funnel traffic away from it.

'The Loop', the main central axis of transport and activity, is enhanced through clusters of economic activities and is strengthened by a balance of new social facilities (such as community centres) and public spaces.



Reminder:

- Scored above 50
- Is a city-wide project
- Scored below 50
- Scored very low
- Is a project that other projects rely on / is fundamental to the transformation of this area

	PROJECT NAME	SCORE %	ESTIMATED COST	BENEFICIARIES % of future population	TIME FRAME	DESCRIPTION
SH7	Adaptation of the Health Facility as Safe Haven	63,0	$ 550 000	22%	Short-term	Adaptation of the existing Health Facility as Safe Haven
HS3	Thermal Isolation Soc. Facilities, Adm. Buildings	59,9		100%	Short-Medium Term	The project considers the thermal isolation of 57 (total city-wide) administrative buildings in Khorog. Not possible to estimate costs for heating projects
HS1	New Water Heating Pipeline Grid	59,9		100%	Short-Medium Term	City-wide project: connected to a planned central heating system Not possible to estimate costs for heating projects
COM2	New Commercial Area	59,5	$ 1 200 000	26%	Short-term	Reconstruction of the marketplace, including rehabilitation of existing structures, construction of the new stalls, adjacent public spaces and internal courtyard
B3	Pedestrian Bridge	58,9	$ 200 000	27%	Short-term	The regeneration of the bridge to include infrastructure for adequate pedestrian movements - currently being constructed by AKAH.
R87	Tarmacking existing Road	58,5	$ 2 200	20%	Short-term	Pavement of the existing road and overall upgrading to ensure multimodal movements (driving, cycling, pedestrian)
R96	Tarmacking existing Pedestrian Pathway	58,3	$ 2 500	26%	Short-term	Upgrading the existing pathway to ensure convenient and safe walking, cycling, and socialising conditions
R1	Main Multimodal Axis (loop)	56,9	$1 009 000	56%	Short-term	City-wide project: total cost for the loop (R1, R2, R3, R4) presented R1 estimated cost: $259 000
SW1	Rehabilitation of Solid Waste Collection Points	58,6	$ 72 450	61%	Medium-term	Rehabilitation of existing collection points (due to poor conditions) across the city - cost estimation for all points planned (70 in total planned within the priority areas)
R95	Tarmacking existing Pedestrian Pathway	57,7	$ 4 600	24%	Short-term	Upgrading the existing pathway to ensure adequate and safe walking, cycling, and socialising conditions
R86	Tarmacking existing Road	57,6	$ 10 200	21%	Short-term	Pavement of the existing road and overall upgrading to ensure multimodal movements (driving, cycling, pedestrian)
R93	Tarmacking existing Pedestrian Pathway	57,4	$ 4 500	27%	Short-term	Upgrading the existing pathway to ensure adequate and safe walking, cycling, and socialising conditions
SD1	Rehabilitation of the existing Drainage Calvets	57,3	$ 3 275 000	71%	Short-Medium Term	City-wide project: cost presented is for the entire project
WN5	Rehabilitation of the old Water Pipeline	57,0	$ 2 800 000	68%	Short-Medium Term	City-wide project: cost presented is for the entire project
SN2	Extension of Sewer Network	57,0	$ 5 703 000	70%	Medium-term	City-wide project: cost presented is for the entire project
B2	Pedestrian Bridge	56,5	$ 170 000	29%	Short-term	The regeneration of the bridge to include infrastructure for adequate pedestrian movements.
SD2	Extending the existing Drainage Network	56,1	$ 5 250 000	78%	Short-term	City-wide project: cost presented is for the entire project
SN3	Renovation of the existing Sewer Network	55,2	$ 3 860 000	83%	Short-Medium Term	City-wide project: cost presented is for the entire project
AN25	New Bus Stop	55,0	$ 6 100	27%	Short-term	
WN2	Rehabilitation of Irrigation Channel 1	53,0	$ 970 000	25%	Short-term	City-wide project: cost presented is for the entire project
IND1	Renovation of existing Post-office Building	52,5	$ 393 000	26%	Short-term	Renovation of the existing building to create a technopark
M8	Hazard Mitigation to Prevent Rockfalls	52,5			Medium-term	Not possible to estimate costs (detailed design is needed). Impacted beneficiaries not able to be assessed as a risk assessment is required to identify indirect population impacted by the project.
AN24	New Bus Stop	51,6	$ 6 100	24%	Short-term	
M9	Hazard Mitigation to Prevent Rockfalls	51,3			Medium-term	Not possible to estimate costs (detailed design is needed). Impacted beneficiaries not able to be assessed as a risk assessment is required to identify indirect population impacted by the project.
M7	Hazard Mitigation to Prevent Rockfalls	50,9			Medium-term	Not possible to estimate costs (detailed design is needed). Impacted beneficiaries not able to be assessed as a risk assessment is required to identify indirect population impacted by the project.

	PROJECT NAME	SCORE %	ESTIMATED COST	BENEFICIARIES % of future population	TIME FRAME	DESCRIPTION
M6	Hazard Mitigation to Prevent Rockfalls	49,1			Medium-term	Not possible to estimate costs (detailed design is needed). Impacted beneficiaries not able to be assessed as a risk assessment is required to identify indirect population impacted by the project.
M4	Hazard Mitigation to Prevent Rockfalls	48,4			Medium-term	Not possible to estimate costs (detailed design is needed). Impacted beneficiaries not able to be assessed as a risk assessment is required to identify indirect population impacted by the project.
M5	Hazard Mitigation to Prevent Rockfalls	48,4			Medium-term	Not possible to estimate costs (detailed design is needed). Impacted beneficiaries not able to be assessed as a risk assessment is required to identify indirect population impacted by the project.
AN23	New Bus	48,3	$ 6 100	24%	Short-term	
S12	Renovation of existing Sports Facility	48,0	$ 79 000	23%	Short-term	Basketball, volleyball, football, running/athletics) - School open playground
C4	Renovation of existing	47,8	$ 590 000	22%	Medium-term	
R60	Pedestrian Path-	47,7	$ 2 440	25%	Medium-term	Construction of a pedestrian pathway for adequate walking and socialising (also suitable for cycling)
C5	Renovation of existing	45,8	$ 212 000	25%	Medium-term	
C8	Renovation & expansion of Music/Art School	45,2	$ 490 000	26%	Medium-term	Renovation and expansion capacity of the existing building
C10	Renovation of existing Theater - convert into a Museum	44,9	$ 212 000	21%	Medium-term	Renovation of the existing theater building to be converted into a museum
SW2	New Solid Waste Collection Points	44,6	$ 14 000	18%	Short-term	To be implemented across the city (3 in total planned within all priority areas)
S9	Renovation of existing Sports Facility	43,7	$ 711 000	25%	Short-term	Basketball, volleyball, football, running/athletics) - Central Stadium
R55	Pedestrian Path-	42,9	$ 1 960	23%	Medium-term	Construction of a pedestrian pathway for convenient walking and socialising (also suitable for cycling)
R54	Pedestrian Path-	42,2	$ 1 370	19%	Medium-term	Construction of a pedestrian pathway for adequate walking and socialising (also suitable for cycling)
P64	Pocket Public Space	41,6	$ 332 000	5%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
AN22	New Bus	40,9	$ 6 100	25%	Medium-term	
AN21	New Bus	39,1	$ 6 100	28%	Medium-term	
P27	Pocket Public Space	38,6	$ 293 000	6%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P65	Pocket Public Space	38,0	$ 34 000	3%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P28	Pocket Public Space	37,3	$ 70 000	4%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P26	Pocket Public Space	36,2	$ 164 000	5%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P20	Pocket Public Space	30,8	$ 717 000	5%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P19	Pocket Public Space	29,7	$ 490 000	4%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P18	Pocket Public	28,9	$ 616 000	3%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play

Fig 37. Khorog, UN-Habitat, September 2022

3.5. PRIORTY PROJECT AREA TABOBATKHONA

PROJECT AREA NAME	Priority Area Tabobatkhona
PROJECT AREA LOCATION	Mahalla Tabobatkhona
PROJECT AREA PARTNERS	Khorog Municipality Donors/Financiers/Private Sector Utility Service Providers International Development Agencies Potential External Partners
PROJECT AREA TIMELINE	**Short-term:** 2023-2025 **Medium-term:** 2026-2030 **Long-term:** beyond 2031 * suggested timeline per project outlined below
ESTIMATED BUDGET	USD **$7,682,000** * city-wide projects excluded from total **breakdown of costs per project outlined below
TARGET BENEFICIARY GROUP	**Direct Beneficiaries:** Residents and users of Tabobatkhona Mahalla **Indirect Beneficiaries:** Residents of Khorog Municipality * breakdown of impacted population per project outlined below
SDG ALIGNMENT	

PROBLEM STATEMENT

This Priority Area is disconnected from the city centre, due in some ways by its location adjacent to the river from above, and without sufficient permeability and connectivity to 'The Loop' below. The regional hospital located within this area functions at full capacity as is the largest in the region and with outdated basic services, and some congestion challenges, this area is at the intersection of a number of challenges. This Priority Area also has a poor quality of the natural and urban environment.

PROJECT OBJECTIVE

The primary objective for this Priority Area is to improve the quality of services provided (including as a priority, the regional hospital, with a proposed adjacent facility). A network of pedestrian and cycle-friendly pathways are also proposed to promote accessibility and reduce car-use through this area. These pathways connect a series of small parks that aim to improve the quality of the environment. One key improved intersection aims to both provide a public space as well as a traffic calming measure. Finally, a series of city-wide basic service improvements, and some small extensions of the existing networks will support the functioning of this Priority Area.

PROJECT IMPACT

This area will function much more efficiently for the purpose of the hospital, both in terms of accessibility and basic services. This will enhance Khorog's role as a regional centre. Improved mobility pathways and North-South accessibility across the Priority Area, will not only reduce congestion and road safety, it will also improve the permeability of the site and integrate it better with the rest of the city.

PROJECT PARTNER

- **Khorog Municipality & National Government**: Main responsible, owner and implementer of the projects' implementation in coordination with potential donors and external partners.
- **Donors/ Financiers/ Private Sector:** Funding entity(ies) would be requested to support the implementation of projects within Priority Area 3.
- **NGOs/CSOs:** Potential external partners could be considered to support the projects' implementation throughout the overall process (e.g. capacity building/training, maintenance plan, etc.).

PROJECT LIFE CYCLE

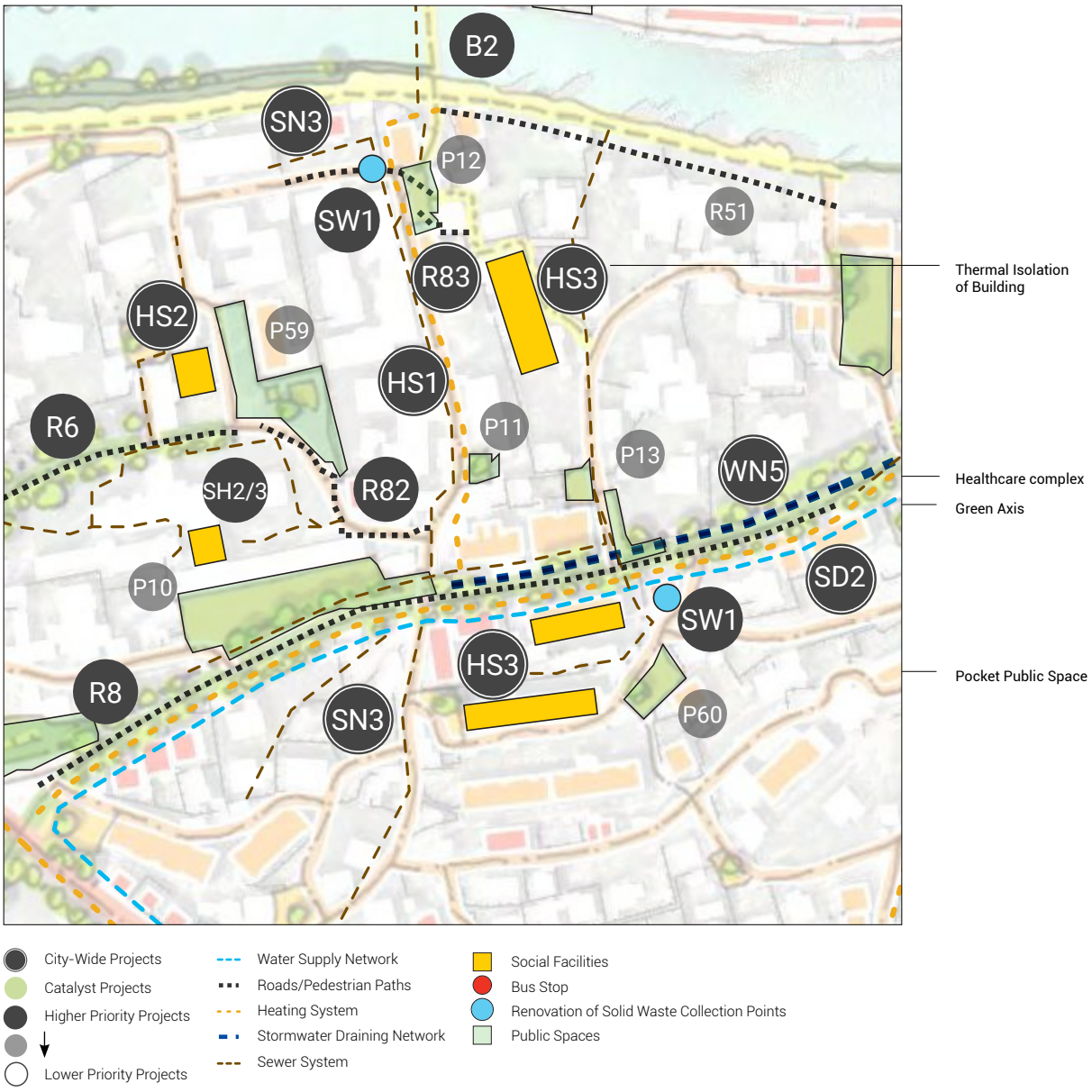
- **Risk Assessment:** to identify and analyse the potential risks that may occur during the implementation of each project as well as to determine the likelihood and potential impact of each risk.
- **Feasibility study:** preliminary exploratory assessment to examine technical, economic, financial, legal and environmental viability of projects.
- **Concept Design:** early phase of the design process to test function, form, linkages, requirements, etc.
- **Detailed Design:** stage where the concept design is refined and a complete precise set of plans are developed. At this stage, the projects are ready for implementation.
- **Construction and Maintenance:** implementation of the projects on the ground and regular maintenance works during projects' life span.
- **Monitoring and Evaluation:** framework that outlines the indicators that are used to track the progress of the projects to ensure whether all objectives are being achieved.

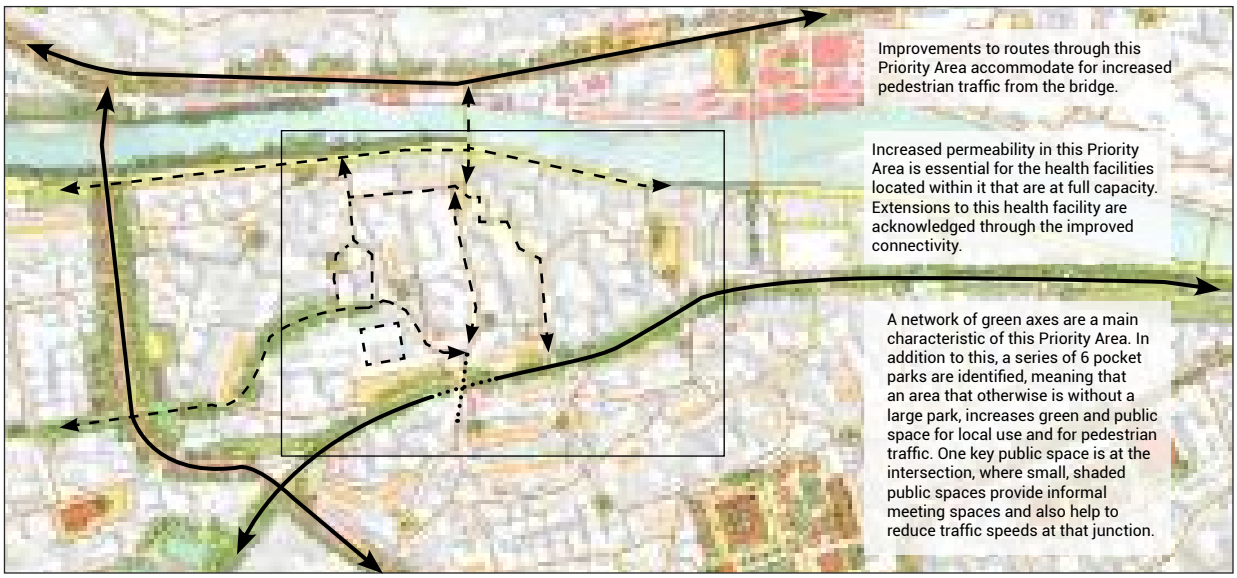
PROJECT FINANCIALS

Total Estimated Cost: $7,682,000
Current Investment Commitments and Type: External fund is needed
Investment Needs: Risk Assessment, Feasibility Study, Concept Design and Detailed Design, Construction and Maintenance Plan, Monitoring and Evaluation

ADDITIONAL SUPPORT NEEDED

Identification of synergies and/or dependencies between projects is critical to ensure a sustainable implementation of the Priority Area. This rationale of interlinkages and proximity between projects is reflected in the scoring process, however a more detailed assessment of budget availability and projects' time frame is needed to ensure the intended impact. Aspiring an impactful and sustainable implementation process, this investment card aims to support the Municipality of Khorog to consider the suggested projects when analysing investment decisions in order to align the budget envelops with investment needed - e.g. smaller projects that could be covered by own source revenues; education and health facilities that could be delivered by Central Government; infrastructure and wider development projects that could be of interest for donors/private sector to invest.


B2
SN3
P12
SW1
R51
R83
HS3
HS2
P59
HS1
R6
P11
P13
WN5
SH2/3
R82
P10
SD2
SW1
HS3
R8
SN3
P60
Thermal Isolation of Building
Healthcare complex
Green Axis
Pocket Public Space
City-Wide Projects
Catalyst Projects
Higher Priority Projects
Lower Priority Projects
Water Supply Network
Roads/Pedestrian Paths
Heating System
Stormwater Draining Network
Sewer System
Social Facilities
Bus Stop
Renovation of Solid Waste Collection Points
Public Spaces


Improvements to routes through this Priority Area accommodate for increased pedestrian traffic from the bridge.
Increased permeability in this Priority Area is essential for the health facilities located within it that are at full capacity. Extensions to this health facility are acknowledged through the improved connectivity.
A network of green axes are a main characteristic of this Priority Area. In addition to this, a series of 6 pocket parks are identified, meaning that an area that otherwise is without a large park, increases green and public space for local use and for pedestrian traffic. One key public space is at the intersection, where small, shaded public spaces provide informal meeting spaces and also help to reduce traffic speeds at that junction.

	PROJECT NAME	SCORE %	ESTIMATED COST	BENEFICIARIES % of future population	TIME FRAME	DESCRIPTION
SH2	Retrofitting Regional	70,7	$ 3 745 000	100%	Short-term	Renovation (expansion) due to overcapacity: even though the number of beneficiaries calculated based on the 15 min accessibility, the hospital serves the entire city and beyond
SH3	Centre for Disabilities - next to Reg. Hospital	68,5	$ 1 716 000	100%	Short-Medium Term	Expansion capacity of the Regional Hospital due to it's regional significance, which should also function as a safe haven
HS3	Thermal Isolation Soc. Facilities, Adm. Buildings	59,9		100%	Short-Medium Term	The project considers the thermal isolation of 57 (total city-wide) administrative buildings in Khorog. City-wide project. Not possible to estimate costs for heating projects
HS1	New Water Heating Pipeline Grid	59,9		100%	Medium-term	City-wide project: connected to a planned central heating system Not possible to estimate costs for heating projects
HS2	Heating Gas Pilot Project for Selected Schools & Hospitals Buildings	58,7		90%	Short-Medium Term	City-wide project Not possible to estimate costs for heating projects
SW1	Rehabilitation of Solid Waste Collection Points	58,6	$ 72 450	61%	Short-term	Rehabilitation of existing collection points (due to poor conditions) across the city - cost estimation for all points planned (23 in total planned within the priority areas)
WN5	Rehabilitation of the old Water Pipeline	57,0	$ 2 800 000	68%	Short-term	City-wide project: cost presented is for the entire project
B2	Pedestrian	56,5		29%	Short-term	Estimated costs included in Priority Area 2
SD2	Extending the existing Drainage Network	56,1	$ 5 270 000	78%	Short-term	City-wide project: cost presented is for the entire project
R8	Green Axis	55,8	$ 210 000	50%	Short-term	Redesign of the street (widening the pedestrian sidewalks, vegetation, infrastructure)
R83	Tarmacking existing	55,6	$ 2 200	29%	Short-term	Pavement of the existing road and overall upgrading to ensure multimodal movements (driving, cycling, pedestrian)
SN3	Renovation of the existing Sewer Network	55,2	$ 3 860 000	83%	Short-term	City-wide project: cost presented is for the entire project
R6	Green Axis	55,1	$ 67 000	23%	Short-term	Redesign of the street (widening the pedestrian sidewalks, vegetation, infrastructure)
R82	Tarmacking existing	54,6	$ 8 890	26%	Short-term	Pavement of the existing road and overall upgrading to ensure multimodal movements (driving, cycling, pedestrian)
R51	Pedestrian Path-	46,5	$ 3 900	32%	Short-term	Construction of a pedestrian pathway for convenient walking and socialising (also suitable for cycling)
P11	Pocket Public	45,5	$ 59 000	8%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P13	Pocket Public	45,4	$ 140 000	8%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P60	Pocket Public	45,6	$ 121 000	8%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P10	Pocket Public	44,6	$ 1 000 000	8%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P59	Pocket Public	43,4	$ 574 000	7%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P12	Pocket Public	41,4	$ 150 000	5%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play

Reminder:

- Scored above 50
- Is a city-wide project
- Scored below 50
- Scored very low
- Is a project that other projects rely on / is fundamental to the transformation of this area

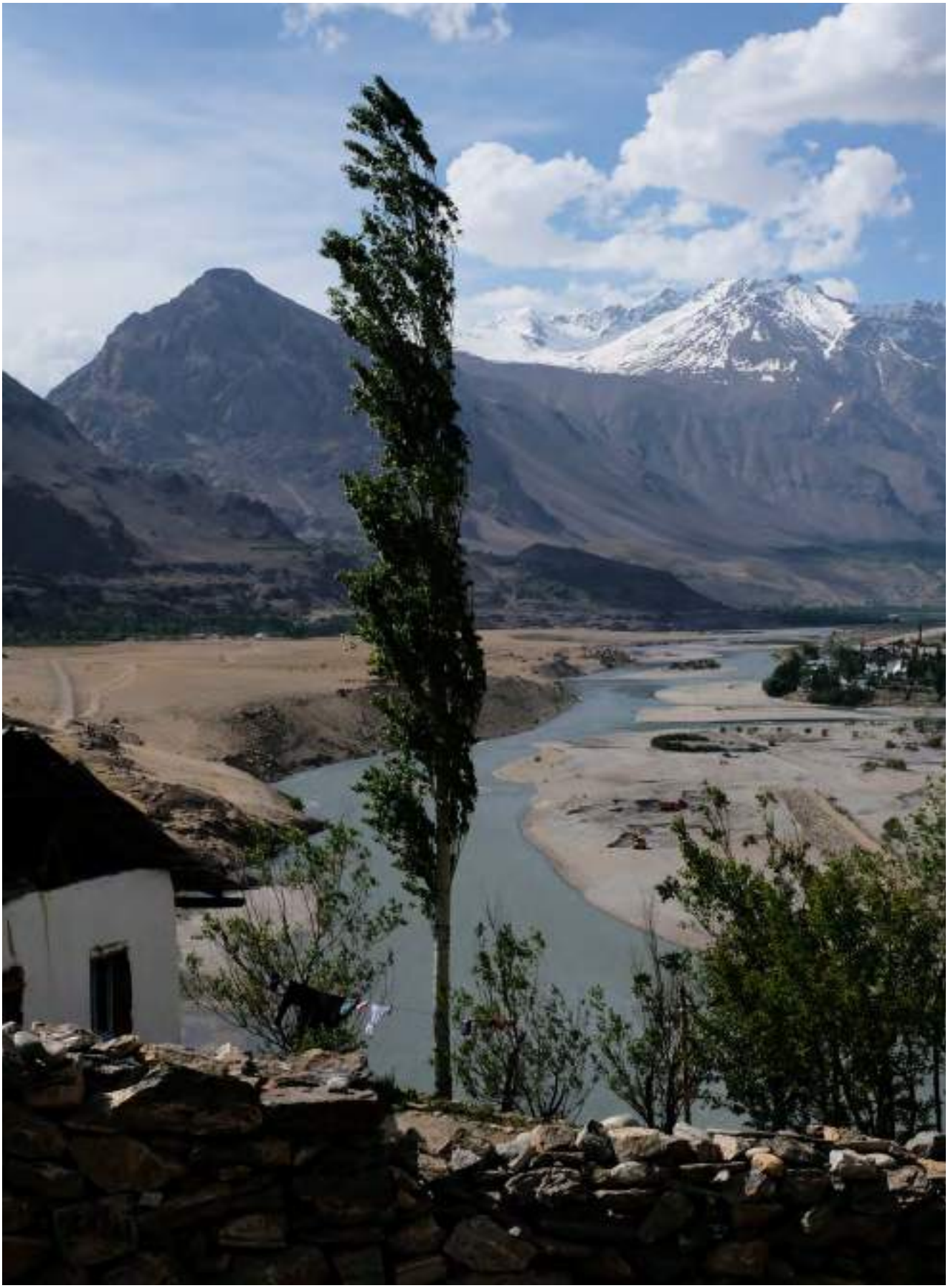


Fig 38. Khorog, UN-Habitat, September 2022

3.6. PRIORITY PROJECT AREA KHORUGI BOLO - TIRCID

PROJECT AREA NAME	Priority Area Khorugi Bolo - Tircid
PROJECT AREA LOCATION	Mahalla Khorugi Bolo Mahalla Tircid
PROJECT AREA PARTNERS	Khorog Municipality Donors/Financiers/Private Sector Utility Service Providers International Development Agencies Potential External Partners
PROJECT AREA TIMELINE	**Short-term:** 2023-2025 **Medium-term:** 2026-2030 **Long-term:** beyond 2031 * suggested timeline per project outlined below
ESTIMATED BUDGET	USD **$21,000 000** * city-wide projects excluded from total **breakdown of costs per project outlined below
TARGET BENEFICIARY GROUP	**Direct Beneficiaries:** Residents and users of Khorugi Bolo and Tircid Mahallas **Indirect Beneficiaries:** Residents of Khorog Municipality * breakdown of impacted population per project outlined below
SDG ALIGNMENT	

PROBLEM STATEMENT

Priority Area Khorugi Bolo - Tircid is located characterised by the large City Parks and a number of structures that are no longer functional. This means that there is a potential for delivering social services. This priority area is located in close proximity to the mountain slope, meaning that the main multi-modal axis, the key route through the city, is at risk of hazards, which would have wider consequences on accessibility for the rest of the city. There is also a lack of pedestrian infrastructure in this area, meaning that there is low pedestrian accessibility through this central point.

PROJECT OBJECTIVE

The objective of this Priority Area is to revitalise under-utilised land as well as non-functional structures within this area and regenerate them for the use of small-scale economic purposes such as a farmers market. In addition, the proposals for this area aim to improve the North-South connectivity of the city, through the renovation of community facilities and the pedestrian bridge.

PROJECT IMPACT

Improving the safety and resilience of this area is key to these city objectives for the city as a whole, due to the strategic location of this Priority Area. In addition, proposals for this area will create a new recreational and cultural centre.

PROJECT PARTNER

- **Khorog Municipality & National Government**: Main responsible, owner and implementer of the projects' implementation in coordination with potential donors and external partners.
- **Donors/ Financiers/ Private Sector:** Funding entity(ies) would be requested to support the implementation of projects within Priority Area 4.
- **NGOs/CSOs:** Potential external partners could be considered to support the projects' implementation throughout the overall process (e.g. capacity building/training, maintenance plan, etc.).

PROJECT LIFE CYCLE

- **Risk Assessment:** to identify and analyse the potential risks that may occur during the implementation of each project as well as to determine the likelihood and potential impact of each risk.
- **Feasibility study:** preliminary exploratory assessment to examine technical, economic, financial, legal and environmental viability of projects.
- **Concept Design:** early phase of the design process to test function, form, linkages, requirements, etc.
- **Detailed Design:** stage where the concept design is refined and a complete precise set of plans are developed. At this stage, the projects are ready for implementation.
- **Construction and Maintenance:** implementation of the projects on the ground and regular maintenance works during projects' life span.
- **Monitoring and Evaluation:** framework that outlines the indicators that are used to track the progress of the projects to ensure whether all objectives are being achieved.

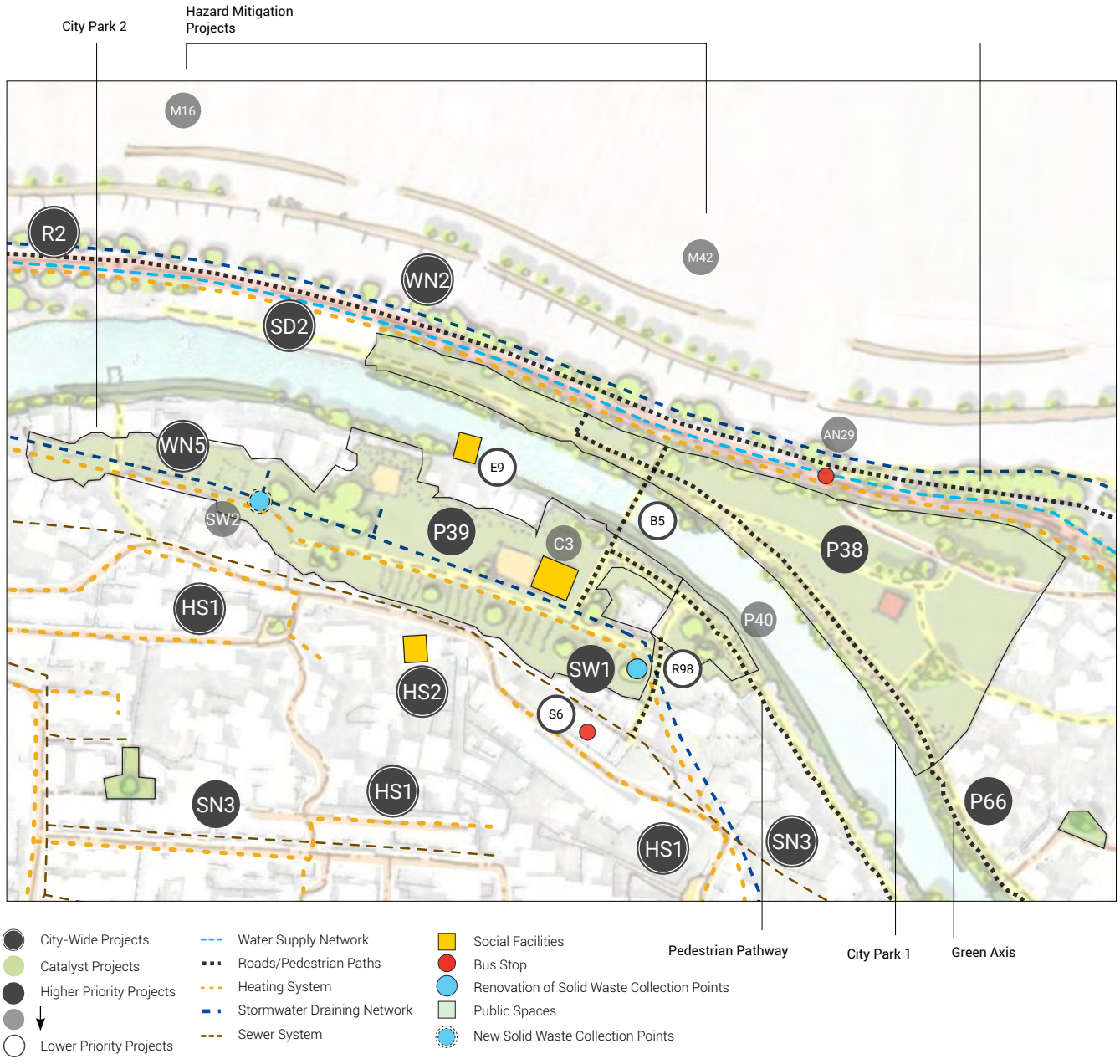
PROJECT FINANCIALS

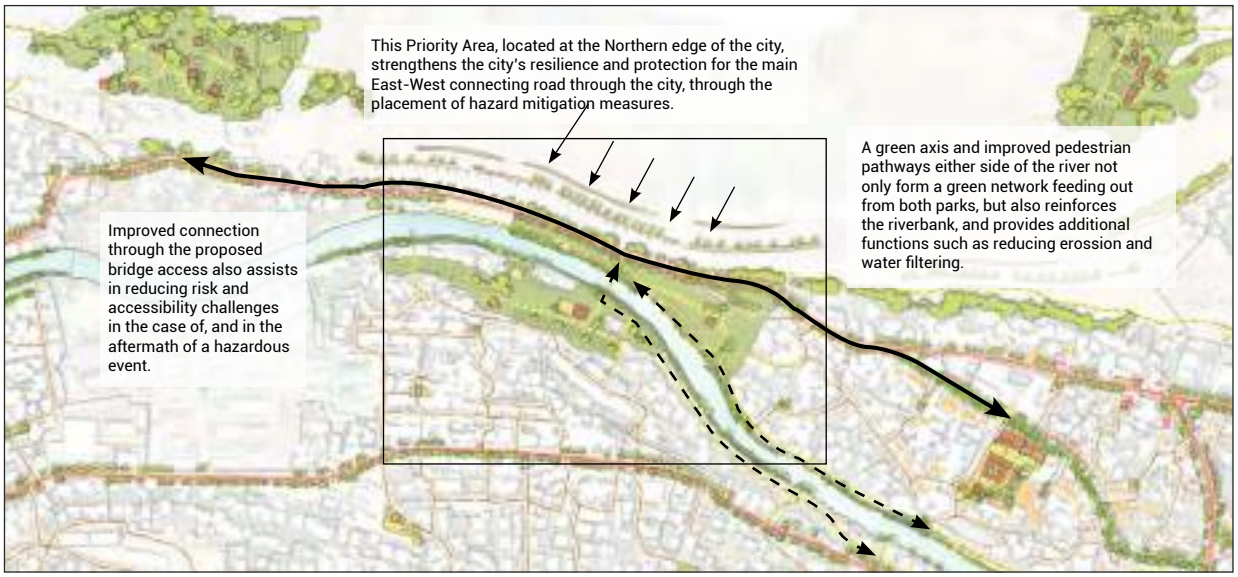
Total Estimated Cost: $21,000 000
Current Investment Commitments and Type: External fund is needed

Investment Needs: Risk Assessment, Feasibility Study, Concept Design and Detailed Design, Construction and Maintenance Plan, Monitoring and Evaluation

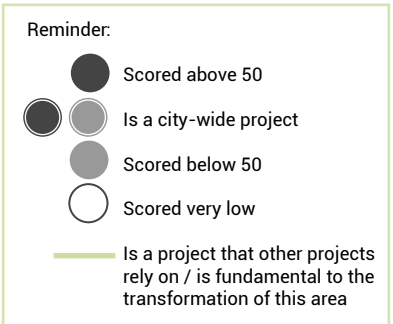
ADDITIONAL SUPPORT NEEDED

Identification of synergies and/or dependencies between projects is critical to ensure a sustainable implementation of the Priority Area. This rationale of interlinkages and proximity between projects is reflected in the scoring process, however a more detailed assessment of budget availability and projects' time frame is needed to ensure the intended impact. Aspiring an impactful and sustainable implementation process, this investment card aims to support the Municipality of Khorog to consider the suggested projects when analysing investment decisions in order to align the budget envelops with investment needed - e.g. smaller projects that could be covered by own source revenues; education and health facilities that could be delivered by Central Government; infrastructure and wider development projects that could be of interest for donors/private sector to invest.


City Park 2
Hazard Mitigation Projects
M16
R2
WN2
M42
SD2
WN5
AN29
E9
SW2
P39
C3
B5
P38
HS1
P40
SW1
R98
HS2
S6
HS1
SN3
HS1
SN3
P66
Pedestrian Pathway
City Park 1
Green Axis
City-Wide Projects
Catalyst Projects
Higher Priority Projects
Lower Priority Projects
Water Supply Network
Roads/Pedestrian Paths
Heating System
Stormwater Draining Network
Sewer System
Social Facilities
Bus Stop
Renovation of Solid Waste Collection Points
Public Spaces
New Solid Waste Collection Points


This Priority Area, located at the Northern edge of the city, strengthens the city's resilience and protection for the main East-West connecting road through the city, through the placement of hazard mitigation measures.
A green axis and improved pedestrian pathways either side of the river not only form a green network feeding out from both parks, but also reinforces the riverbank, and provides additional functions such as reducing erossion and water filtering.
Improved connection through the proposed bridge access also assists in reducing risk and accessibility challenges in the case of, and in the aftermath of a hazardous event.

	PROJECT NAME	SCORE %	ESTIMATED COST	BENEFICIARIES % of future population	TIME FRAME	DESCRIPTION
HS1	New Water Heating Pipeline Grid	59,9		100%	Medium-term	City-wide project: connected to a planned central heating system Not possible to estimate costs for heating projects
HS2	Heating Gas Pilot Project for Selected Schools & Hospitals Buildings	58,7		90%	Short-Medium Term	City-wide project Not possible to estimate costs for heating projects
SW1	Rehabilitation of Solid Waste Collection Points	58,6	$ 72 450	61%	Short-term	Rehabilitation of existing collection points (due to poor conditions) across the city - cost estimation for all points planned (23 in total planned within all priority areas)
WN5	Rehabilitation of the Old Water Pipeline	57,0	$ 2 800 000	68%	Short-term	City-wide project: cost presented is for the entire project
SD2	Extending the existing Drainage Network	56,1	$ 5 273 000	78%	Short-term	City-wide project: cost presented is for the entire project
R66	Pedestrian Pathway	55,4	$ 17 500	33%	Short-term	Construction of a pedestrian pathway for convenient walking and socialising (also suitable for cycling)
SN3	Renovation of the existing Sewer Network	55,2	$ 3 860 000	83%	Short-term	City-wide project: cost presented is for the entire project
R2	Main Multimodal Axis (loop)	53,3	$1 009 000	44%	Short-term	City-wide project: total cost for the loop (R1, R2, R3, R4) presented R2 estimated cost: $ 241 000
WN2	Rehabilitation of Irrigation	53,0	$ 972 000	25%	Short-term	City-wide project: cost presented is for the entire project
P38	City Park 1	51,3	$ 9 145 000	15%	Short-term	Construction of a park with green areas, community gardening, places to rest and socialise, areas for children, youth and elderly people
P39	City Park 2	50,6	$ 8 490 000	11%	Short-term	Construction of a park with green areas, places to rest and socialise, areas for children, youth and elderly people
AN29	New Bus Stop	49,7	$ 6 100	11%	Short-term	
M16	Hazard Mitigation to Prevent Rockfalls	48,4			Short-term	Not possible to estimate costs (detailed design is needed). Impacted beneficiaries is 0% as only direct beneficiaries were assessed. For a more accurate result, a risk assessment is required to identify indirect population impacted by the project.
M42	Hazard Mitigation to Prevent Rockfalls	48,4			Short-term	
P40	Public Space with a Landmark	48,0	$ 789 000	20%	Short-term	Construction of the public space around existing Jamoatkhana to integrate it into the urban environment, creating a vibrant area
SW2	New Solid Waste Collection Points	44,6	$ 14 200	18%	Short-term	To be implemented across the city (3 in total planned within all priority areas)
C3	Renovation of existing Community Centre	42,7	$ 1 372 000	11%	Short-term	Renovation of the existing building to accommodate library and Jamoatkhona
R98	Tarmacking the existing Pedestrian Pathway	34,7	$ 1 600	11%	Short-term	Upgrading the existing pathway to ensure convenient and safe walking, cycling, and socialising conditions
B5	Pedestrian Bridge	32,7	$ 615 000	10%	Short-term	Construction of the pedestrian bridge connecting the two city park areas to improve connectivity and accessibility
S6	Renovation of existing Sports Facility	31,1	$ 154 000	13%	Short-term	Basketball, volleyball and football
E9	River Bank Reinforcement	29,2	$ 342 000		Short-term	Impacted beneficiaries is 0% as only direct beneficiaries were assessed. For a more accurate result, a risk assessment is required to identify indirect population impacted by the project.



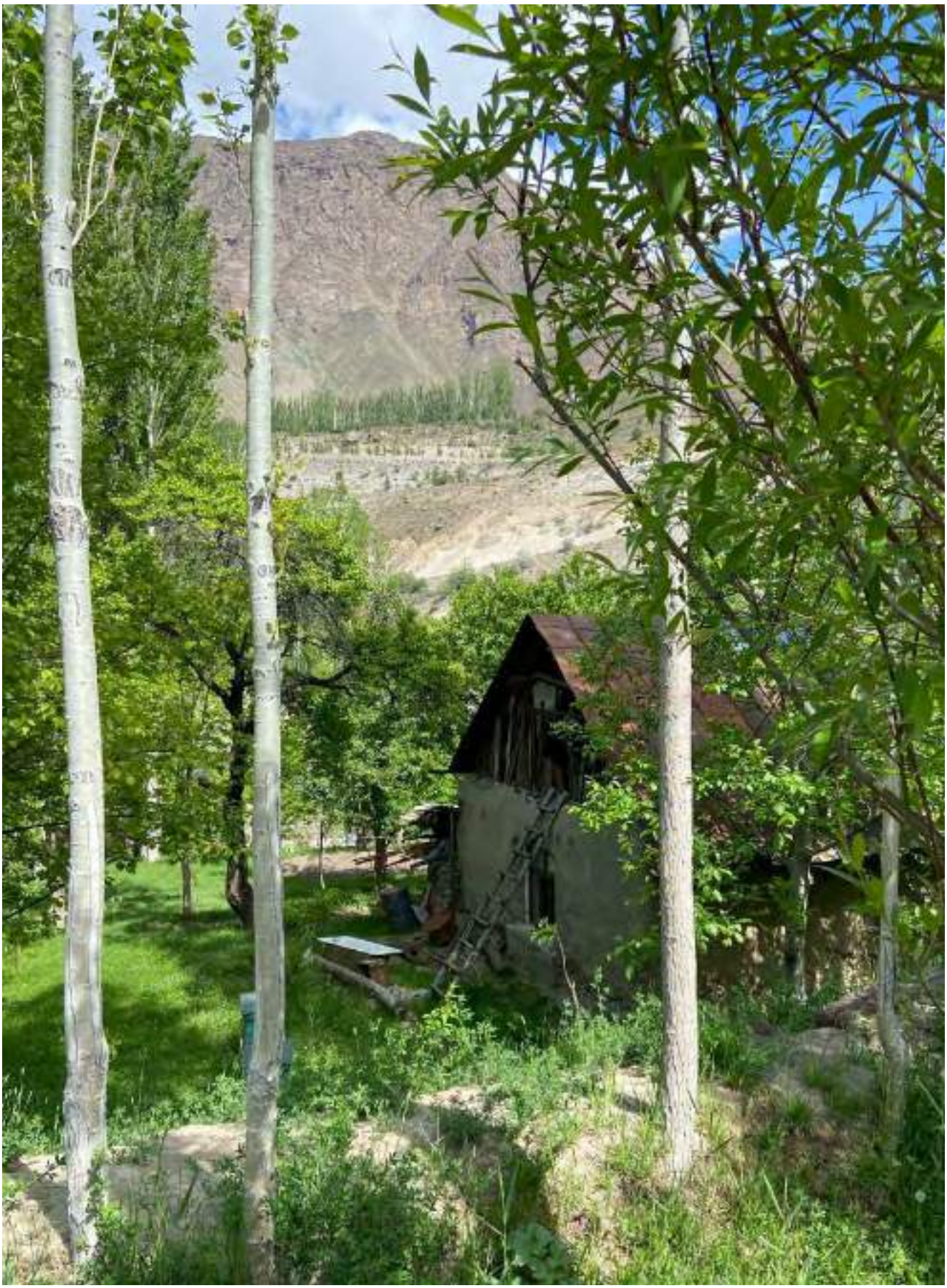
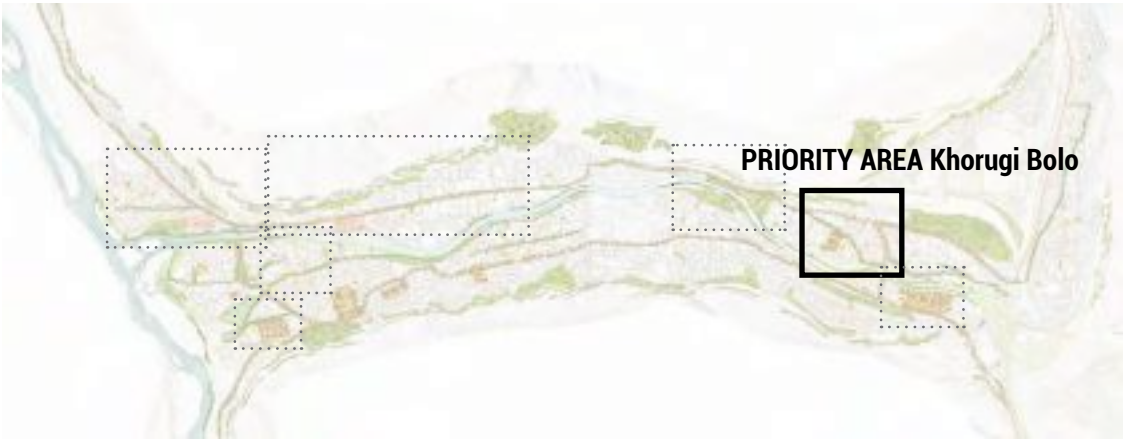


Fig 39. Khorog, UN-Habitat, September 2022

3.7. PRIORITY PROJECT AREA KHORUGI BOLO



PROJECT AREA NAME	Priority Area Khorugi Bolo
PROJECT AREA LOCATION	Mahalla Khorugi Bolo
PROJECT AREA PARTNERS	Khorog Municipality Donors/Financiers/Private Sector Utility Service Providers International Development Agencies Potential External Partners
PROJECT AREA TIMELINE	**Short-term:** 2023-2025 **Medium-term:** 2026-2030 **Long-term:** beyond 2031 * suggested timeline per project outlined below
ESTIMATED BUDGET	USD **$13 700 000** * city-wide projects excluded from total **breakdown of costs per project outlined below
TARGET BENEFICIARY GROUP	**Direct Beneficiaries:** Residents and users of Khorugi Bolo Mahalla **Indirect Beneficiaries:** Residents of Khorog Municipality * breakdown of impacted population per project outlined below
SDG ALIGNMENT	

PROBLEM STATEMENT

The design solutions for the Priority Area Khorugi Bolo target problematic issues linked with connectivity and accessibility to adequate services, as well as poor conditions of existing services, such as kindergartens. The existing truck depot is a key opportunity in order to provide services for the North of the city. While there is a high concentration of activities and mobility of people, adequate access and connectivity to infrastructure and services is still a critical issue in this area.

PROJECT OBJECTIVE

The objective of this transformative area is therefore to create a new multi-functional node in the northeast side of the city with improved education, health and recreational facilities while developing the existing under-utilised land with proposed mixed-use development. By redesigning the existing bridge to accommodate pedestrian and cycle infrastructure, the connectivity between the northern and southern parts of the city will be enhanced.

PROJECT IMPACT

The regeneration of this area will create a new functional hub with improved accessibility to a diversity of services. New connecting streets and improved pedestrian pathways will increase the permeability of the site and provide better accessibility to the key services while enhancing the vibrancy of the area.

PROJECT PARTNER

- **Khorog Municipality & National Government**: Main responsible, owner and implementer of the projects' implementation in coordination with potential donors and external partners.
- **Donors/ Financiers/ Private Sector:** Funding entity(ies) would be requested to support the implementation of projects within Priority Area 5.
- **NGOs/CSOs:** Potential external partners could be considered to support the projects' implementation throughout the overall process (e.g. capacity building/training, maintenance plan, etc.).

PROJECT LIFE CYCLE

- **Risk Assessment:** to identify and analyse the potential risks that may occur during the implementation of each project as well as to determine the likelihood and potential impact of each risk.
- **Feasibility study:** preliminary exploratory assessment to examine technical, economic, financial, legal and environmental viability of projects.
- **Concept Design:** early phase of the design process to test function, form, linkages, requirements, etc.
- **Detailed Design:** stage where the concept design is refined and a complete precise set of plans are developed. At this stage, the projects are ready for implementation.
- **Construction and Maintenance:** implementation of the projects on the ground and regular maintenance works during projects' life span.
- **Monitoring and Evaluation:** framework that outlines the indicators that are used to track the progress of the projects to ensure whether all objectives are being achieved.

PROJECT FINANCIALS

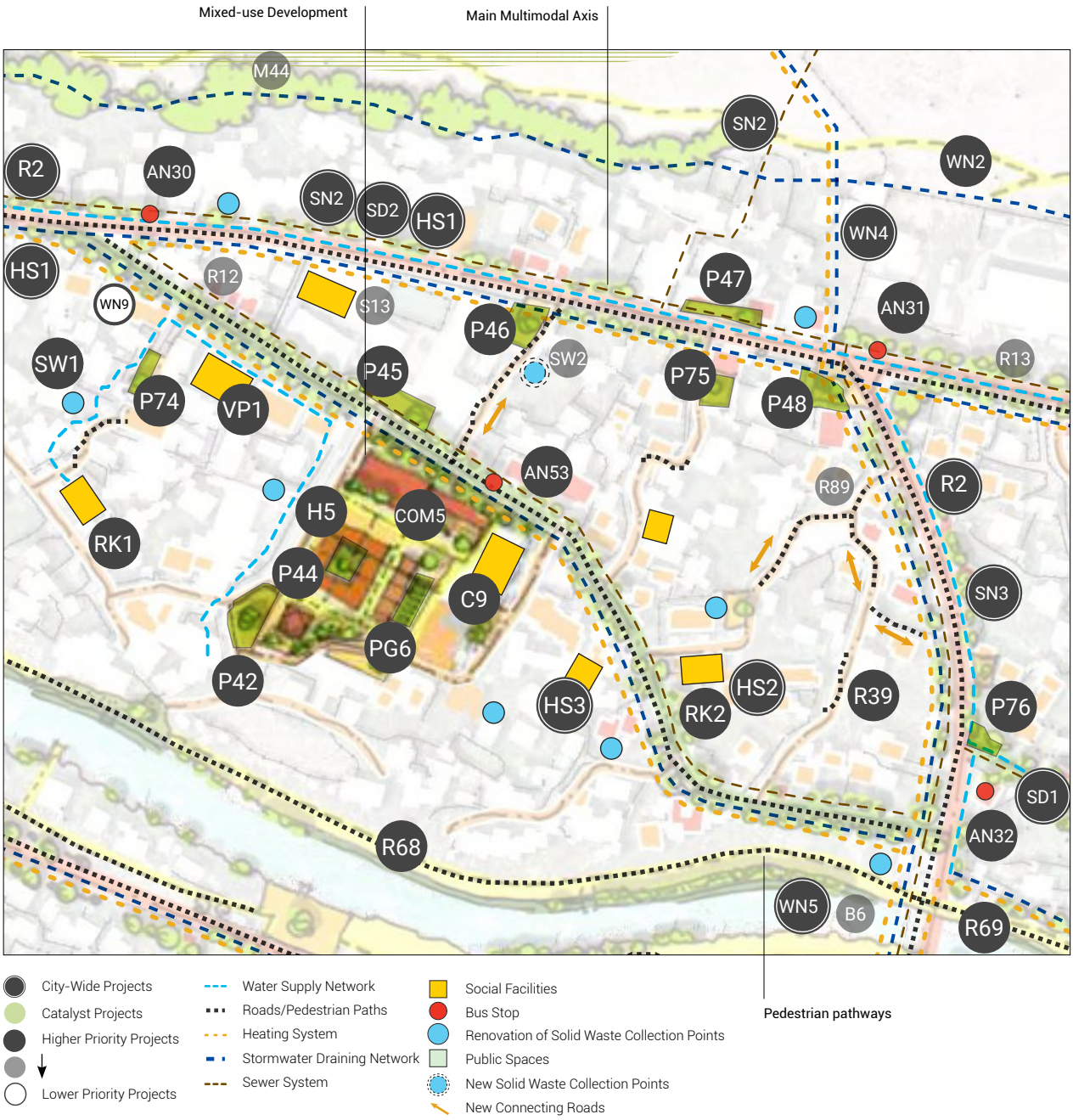
Total Estimated Cost: $13 700 000

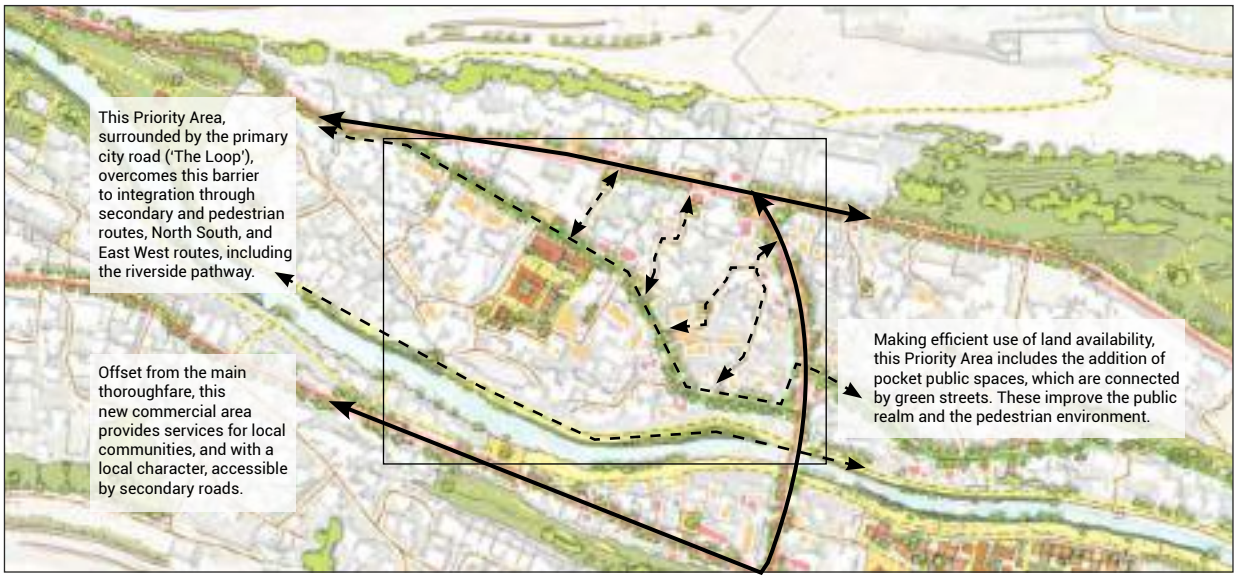
Current Investment Commitments and Type: External fund is needed

Investment Needs: Risk Assessment, Feasibility Study, Concept Design and Detailed Design, Construction and Maintenance Plan, Monitoring and Evaluation

ADDITIONAL SUPPORT NEEDED

Identification of synergies and/or dependencies between projects is critical to ensure a sustainable implementation of the Priority Area. This rationale of interlinkages and proximity between projects is reflected in the scoring process, however a more detailed assessment of budget availability and projects' time frame is needed to ensure the intended impact. Aspiring an impactful and sustainable implementation process, this investment card aims to support the Municipality of Khorog to consider the suggested projects when analysing investment decisions in order to align the budget envelops with investment needed - e.g. smaller projects that could be covered by own source revenues; education and health facilities that could be delivered by Central Government; infrastructure and wider development projects that could be of interest for donors/private sector to invest.


Mixed-use Development
Main Multimodal Axis
M44
R2
AN30
SN2
SD2
HS1
HS1
R12
WN9
S13
SW1
P74
VP1
P45
P46
SW2
SN2
WN2
WN4
P47
AN31
R13
P75
P48
AN53
R89
R2
H5
COM5
RK1
P44
C9
SN3
PG6
P42
HS3
RK2
HS2
R39
P76
SD1
AN32
R68
WN5
B6
R69
City-Wide Projects
Catalyst Projects
Higher Priority Projects
Lower Priority Projects
Water Supply Network
Roads/Pedestrian Paths
Heating System
Stormwater Draining Network
Sewer System
Social Facilities
Bus Stop
Renovation of Solid Waste Collection Points
Public Spaces
New Solid Waste Collection Points
New Connecting Roads
Pedestrian pathways


This Priority Area, surrounded by the primary city road ('The Loop'), overcomes this barrier to integration through secondary and pedestrian routes, North South, and East West routes, including the riverside pathway.
Offset from the main thoroughfare, this new commercial area provides services for local communities, and with a local character, accessible by secondary roads.
Making efficient use of land availability, this Priority Area includes the addition of pocket public spaces, which are connected by green streets. These improve the public realm and the pedestrian environment.

	PROJECT NAME	SCORE %	ESTIMATED COST	BENEFICIARIES % of future population	TIME FRAME	DESCRIPTION
C9	Renovation of existing Music/Art Centre	66,3	$ 312 000	19%	Short-term	Renovation of the existing building due to poor conditions
P44	Community Public Space	64,6	$ 165 000	17%	Short-term	Community public space with vegetation, places to rest, sit and play
AN53	New Bus Stop	64,4	$ 6 100	19%	Short-term	
PG6	Green Public Space with Community Garden	64,1	$ 75, 000	17%	Short-Medium Term	Green public space, park with community gardening (garden beds for growing vegetables, etc.)
RK2	Renovation of Kindergarten 4	64,0	$ 1 188 000	20%	Short-Medium Term	Renovation due to poor conditions
RK1	Renovation of Kindergarten 3	63,3	$ 454 000	15%	Short-term	Renovation due to poor conditions
AN32	New Bus Stop	61,5	$ 6 100	21%	Short-term	
AN31	New Bus Stop	61,2	$ 6 100	20%	Short-Medium Term	
VP1	Medical College (Hospital 6)	60,1	$ 914 000	18%	Medium-term	Expansion of the existing building due to overcapacity
HS3	Thermal Isolation Soc. Facilities, Adm. Buildings	59,9		100%	Short-Medium Term	City-wide project: The project considers the thermal isolation of 57 (total city-wide) administrative buildings in Khorog. Not possible to estimate costs for heating projects.
HS1	New Water Heating Pipeline Grid	59,9		100%	Medium-term	City-wide project: connected to a planned coal central heating system Not possible to estimate costs for heating projects
COM5	New Commercial Area	59,5	$ 1 030 000	19%	Short-term	Construction of a new commercial area, a part of mixed use development
HS2	Heating Gas Pilot Project for Selected Schools & Hospitals Buildings	58,7		90%	Short-Medium Term	City-wide project Not possible to estimate costs for heating projects
SW1	Rehabilitation of Solid Waste Collection Points	58,6	$ 72 450	61%	Short-term	Rehabilitation of existing collection points (due to poor conditions) across the city - cost estimation for all points planned (23 in total planned within all priority areas)
SD1	Rehabilitation of the existing Drainage Calvets	57,3	$ 3 275 000	71%	Short-term	City-wide project: cost presented is for the entire project
WN5	Rehabilitation of the Old Water Pipeline	57,0	$ 2 800 000	68%	Short-term	City-wide project: cost presented is for the entire project
SN2	Extension of Sewer Network	57,0	$ 5 703 000	70%	Short-term	City-wide project: cost presented is for the entire project
R69	Pedestrian Pathway	56,7	$ 9 800	26%	Short-term	Construction of a pedestrian pathway for convenient walking and socialising (also suitable for cycling)
WN4	Rehabilitation of existing 14km Water Line	56,7	$ 1 367 000	63%	Short-term	City-wide project: cost presented is for the entire project
SD2	Extending the existing Stormwater/Drainage Network	56,1	$ 5 272 000	78%	Short-term	City-wide project: cost presented is for the entire project
P75	Pocket Public Space	55,8	$ 97 000	9%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
SN3	Renovation of the existing Sewer Network	55,2	$ 3 860 000	83%	Short-Medium Term	City-wide project: cost presented is for the entire project
AN30	New Bus Stop	54,7	$ 6 100	17%	Short-term	
R68	Pedestrian Pathway	54,5	$ 131	30%	Short-term	Construction of a pedestrian pathway for convenient walking and socialising (also suitable for cycling)
P42	Pocket Public Space	54,2	$ 251 000	6%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play

	PROJECT NAME	SCORE %	ESTIMATED COST	BENEFICIARIES % of future population	TIME FRAME	DESCRIPTION
P45	Pocket Public Space	54,2	$ 254 000	6%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
H5	New Housing Development	54,1	$ 7 540 000	1%	Short-term	Housing development within new proposed mixed use area
R2	Main Multimodal Axis (loop)	53,3	$1 009 000	44%	Short-term	City-wide project: total cost for the loop (R1, R2, R3, R4) presented R2 estimated cost: $ 241 000
P48	Pocket Public Space	53,0	$ 187 000	6%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P76	Pocket Public Space	52,9	$ 77 000	9%	Short-Medium Term	Construction of a small public space with vegetation, places to sit, rest and play
P47	Pocket Public Space	52,1	$ 98 000	5%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P74	Pocket Public Space	52,1	$ 57 000	6%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P46	Pocket Public Space	51,4	$ 180 000	5%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
M44	Hazard Mitigation to Prevent Rockfalls	49,7			Short-term	Not possible to estimate costs (detailed design is needed). Impacted beneficiaries is 0% as only direct beneficiaries were assessed. For a more accurate result, a risk assessment is required to identify indirect population impacted by the project.
R89	Tarmacking the existing Road	49,6	$ 4 800	21%	Short-Medium Term	Pavement of the existing road and upgrading the road to ensure multimodal movements
R12	Green Axis	48,0	$ 58 000	21%	Medium-term	Redesign of the street (widening the pedestrian sidewalks, vegetation, infrastructure)
B6	Renovation of existing Bridge	46,1	$ 617 000	22%	Short-term	Renovation of existing bridge to include infrastructure for pedestrian and cycling lanes
R13	Green Axis	46,1	$ 217 000	28%	Short-term	Redesign of the street (widening the pedestrian sidewalks, vegetation, infrastructure)
S13	Renovation of existing Sports Facility	45,0	$ 93 600	18%	Short-term	Basketball, volleyball and football, and playground (planned)
SW2	New Solid Waste Collection Points	44,6	$ 14 200	18%	Short-term	To be implemented across the city (3 in total planned within all priority areas)
WN9	New Water Supply Pipeline	29,7	$ 294 000	16%	Short-term	City-wide project: cost presented is for the entire project

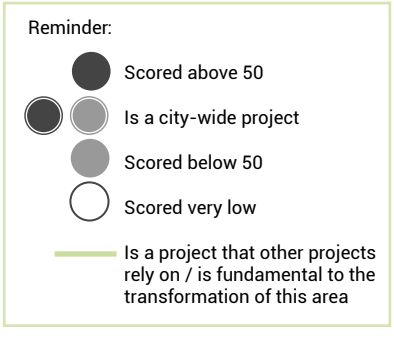


Fig 40. Tajikistan, UN-Habitat, September 2022

3.8. PRIORITY PROJECT AREA TABOBATKHONA

PROJECT AREA TITLE	Priority Area Tabobatkhona
PROJECT AREA LOCATION	Mahalla Tabobatkhona
PROJECT AREA PARTNERS	Khorog Municipality Donors/Financiers/Private Sector Utility Service Providers International Development Agencies Potential External Partners
PROJECT AREA TIMELINE	**Short-term:** 2023-2025 **Medium-term:** 2026-2030 **Long-term:** beyond 2031 * suggested timeline per project outlined below
ESTIMATED BUDGET	USD **$44 000 000** * city-wide projects excluded from total **breakdown of costs per project outlined below
TARGET BENEFICIARY GROUP	**Direct Beneficiaries:** Residents and users of Tabobatkhona Mahalla **Indirect Beneficiaries:** Residents of Khorog Municipality * breakdown of impacted population per project outlined below
SDG ALIGNMENT	

PROBLEM STATEMENT

The design solutions for Priority Area Tabobatkhona target problematic issues that can be found in the contexts of mountainous areas. As such, the design approach and demonstration projects aimed to set an example of how to address and respond to the challenges represented by urban expansion in hazard areas, limited land for development, car dependency, urban fragmentation, insufficient utility infrastructure and inequitable distribution of social facilities.

PROJECT OBJECTIVE

The objective of the transformative area is to create a growth economic node 2 in Tabobatkhona and Barakat. Currently, this node provides a number of employment opportunities in public services provision, however, private sector productivity in the area is low. The demonstration project will boost the emergence of private businesses and attraction of investment opportunities due to proximity to public services, good connectivity, and strategic location near to the entrance to the city from the main road. The connectivity of the node will be supported by the vehicular bridge (Saifullo Abdulo to Sharifobod), which will bring traffic flow to the area and expand its service coverage to peripheral city neighbourhoods. In addition, the construction of the bride will connect the node with the airport and proposed new economic zone, which will create enabling conditions for promoting more sectoral functions within the site A (food production, agricultural services, technologies, and tourism, etc.)

In addition to bringing new functions and services, the area aims to create a liveable and comfortable urban environment for communities both from the surrounding areas and entire city. By allocating a diversity of services targeting different social groups, the area will become a service hub that would cover the deficit in education, healthcare and leisure in the surrounding areas and the city. Doing so will create a more social cohesion through creating equitable service provision.

PROJECT IMPACT

Once the project is implemented it can accommodate 794 people and provide 436 jobs, providing an alternative option for housing and employment for those communities that are residing in the areas prone to hazards and facilitate a more efficient use of land resources within the built-up area. The proposed IT park will create immense business and employment opportunities, supporting the area as a new economic node. The suggested hotels and apartments will attract tourism to the area, which is an important factor in popularizing local culture and production. The demonstration project will provide a school for 800 places and a kindergarten for 200 places and sports playgrounds that will be opened for public- these will cover not only the population of the new neighbourhood but also the demand of the surroundings considering the potential growth.

The solutions on urban vegetation, urban farming, integration of slopes into the urban environment will reconnect this part of the Khorog with its unique nature and landscape, creating an attractive environment for residents and tourists.

Instead of a gated area of underutilized pocket of land, the implemented demonstration project will act as a connection within the city, linking neighbourhoods to employment, public spaces and the surrounding environment.

PROJECT PARTNER

- **Khorog Municipality & National Government**: Main responsible, owner and implementer of the projects' implementation in coordination with potential donors and external partners.
- **Donors/ Financiers/ Private Sector:** Funding entity(ies) would be requested to support the implementation of projects within Priority Area A.
- **NGOs/CSOs:** Potential external partners could be considered to support the projects' implementation throughout the overall process (e.g. capacity building/training, maintenance plan, etc.).

PROJECT LIFE CYCLE

- **Risk Assessment:** to identify and analyse the potential risks that may occur during the implementation of each project as well as to determine the likelihood and potential impact of each risk.
- **Feasibility study:** preliminary exploratory assessment to examine technical, economic, financial, legal and environmental viability of projects.
- **Concept Design:** early phase of the design process to test function, form, linkages, requirements, etc.
- **Detailed Design:** stage where the concept design is refined and a complete precise set of plans are developed. At this stage, the projects are ready for implementation.
- **Construction and Maintenance:** implementation of the projects on the ground and regular maintenance works during projects' life span.
- **Monitoring and Evaluation:** framework that outlines the indicators that are used to track the progress of the projects to ensure whether all objectives are being achieved.

PROJECT FINANCIALS

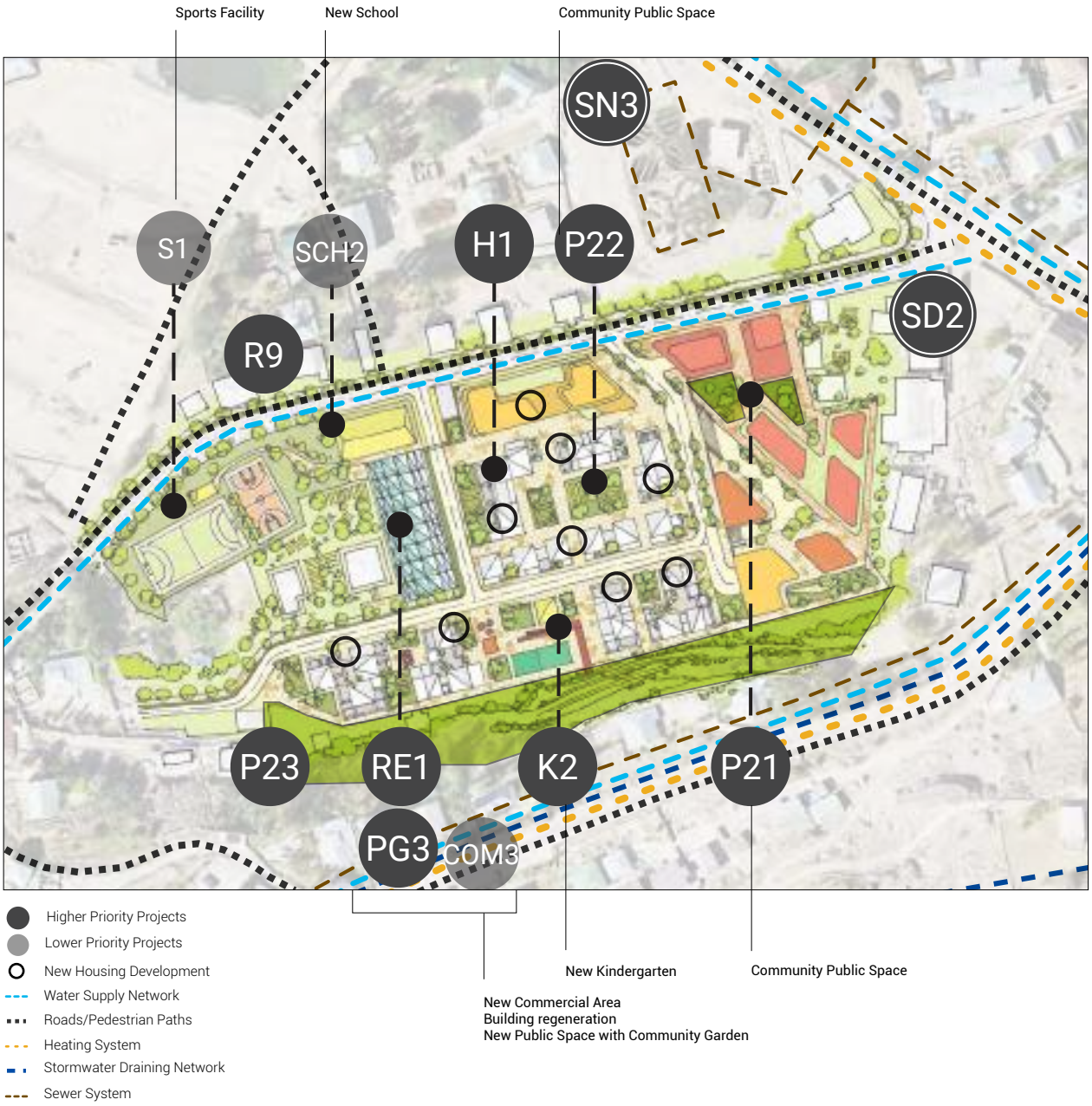
Total Estimated Cost: $44 000 000

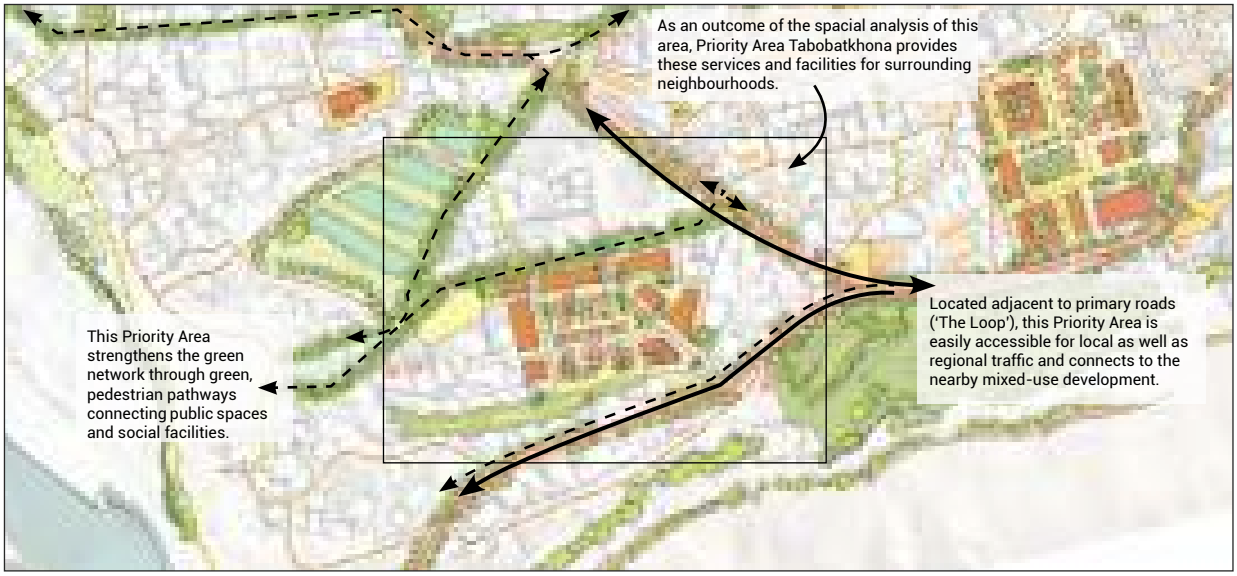
Current Investment Commitments and Type: External fund is needed

Investment Needs: Risk Assessment, Feasibility Study, Concept Design and Detailed Design, Construction and Maintenance Plan, Monitoring and Evaluation

ADDITIONAL SUPPORT NEEDED

Identification of synergies and/or dependencies between projects is critical to ensure a sustainable implementation of the Priority Area. This rationale of interlinkages and proximity between projects is reflected in the scoring process, however a more detailed assessment of budget availability and projects' time frame is needed to ensure the intended impact. Aspiring an impactful and sustainable implementation process, this investment card aims to support the Municipality of Khorog to consider the suggested projects when analysing investment decisions in order to align the budget envelops with investment needed - e.g. smaller projects that could be covered by own source revenues; education and health facilities that could be delivered by Central Government; infrastructure and wider development projects that could be of interest for donors/private sector to invest.


Sports Facility
New School
Community Public Space
SN3
S1
SCH2
H1
P22
SD2
R9
P23
RE1
K2
P21
PG3
COM3
Higher Priority Projects
Lower Priority Projects
New Housing Development
Water Supply Network
Roads/Pedestrian Paths
Heating System
Stormwater Draining Network
Sewer System
New Kindergarten
Community Public Space
New Commercial Area
Building regeneration
New Public Space with Community Garden


As an outcome of the spacial analysis of this area, Priority Area Tabobatkhona provides these services and facilities for surrounding neighbourhoods.
This Priority Area strengthens the green network through green, pedestrian pathways connecting public spaces and social facilities.
Located adjacent to primary roads ('The Loop'), this Priority Area is easily accessible for local as well as regional traffic and connects to the nearby mixed-use development.

	PROJECT NAME	SCORE %	ESTIMATED COST	BENEFICIARIES % of future population	TIME FRAME	DESCRIPTION
P22	Community Public Space	63,5	$ 186 000	20%	Medium-term	Community public space with vegetation, places to rest, sit and play
P21	Community Public Space	63,5	$ 123 000	19%	Medium-term	Community public space with vegetation, places to rest, sit and play
P23	Slope Public Space	61,8	$ 4 840 000	21%	Medium-term	Public space on the slope with vegetation and structures to rest (view points, terraces, etc.)
K2	New Kindergarten	60,1	$ 250 000	19%	Short-term	Construction of the kindergarten within the new development area with an adjacent space for outdoor activities
PG3	Green Public Space with Community Garden	59,8	$ 616 000	20%	Short-term	Green public space, park with community gardening (garden beds for growing vegetables, etc.)
SD2	Extending the existing Stormwater/Drainage Network	56,1	$ 5 272 000	78%	Short-Medium Term	City-wide project: cost presented is for the entire project
SN3	Renovation of the existing Sewer Network	55,2	$ 3 860 000	83%	Short-Medium Term	City-wide project: cost presented is for the entire project
H1	New Housing Development	54,3	$ 32 550 000		Short-Medium Term	Multiple typologies of housing units organised around green spaces and integrated with amenities and retail spaces on the main road
RE1	Building Regeneration	52,8	$ 2 075 000		Short-Medium Term	Multi-purpose facility, which can be used for indoor sports, a market, for events, etc. The building's structure will also be modified to support a greenhouse on the roof for intensive urban agriculture.
R9	Green Axis	53,0	$ 42 000	22%	Short-term	Redesign of the street (widening the pedestrian sidewalks, vegetation, infrastructure)
COM3	New Commercial Area	48,1	$ 1 400 000	20%	Short-Medium Term	Construction of a new commercial area, a part of mixed use development
SCH2	New School Project	47,6	$ 1 630 000	19%	Short-term	Construction of a new school with a adjacent space for sports and outdoor activities
S1	New Sports Facility	46,6	$ 306 500	20%	Short-term	Construction of a sports facility with a range of indoor classes and outdoor spaces for activities

Reminder:

- Scored above 50
- Is a city-wide project
- Scored below 50

Fig 41. Tajikistan, UN-Habitat, September 2022

3.9. PRIORITY PROJECT AREA ANDARSITEZ

PROJECT AREA TITLE	Priority Area Andarsitez
PROJECT AREA LOCATION	Mahalla Andarsitez
PROJECT AREA PARTNERS	Khorog Municipality Donors/Financiers/Private Sector Utility Service Providers International Development Agencies Potential External Partners
PROJECT AREA TIMELINE	**Short-term:** 2023-2025 **Medium-term:** 2026-2030 **Long-term:** beyond 2031 * suggested timeline per project outlined below
ESTIMATED BUDGET	USD **$76 550 000*** city-wide projects excluded from total **breakdown of costs per project outlined below
TARGET BENEFICIARY GROUP	**Direct Beneficiaries:** Residents and users of Andarsitez Mahalla **Indirect Beneficiaries:** Residents of Khorog Municipality * breakdown of impacted population per project outlined below
SDG ALIGNMENT	

PROBLEM STATEMENT

The design solutions for the Priority Area Andarsitez target problematic issues that can be found in the contexts of mountainous areas. As such, the design approach and demonstration projects aimed to set an example of how to address and respond to the challenges represented by urban expansion in hazard areas, limited land for development, car dependency, urban fragmentation, insufficient utility infrastructure and inequitable distribution of social facilities.

PROJECT OBJECTIVE

The objective of this transformative area is to create a growth economic node (number 4), that is covering the area of Andarsitez along the river and a stretch in Gulobod. Currently, the node has largely residential uses, and is an example of mono-functional development leading to fragmentation. A significant increase in commercial uses suggested by the demonstration project will address this issue by showing the diversity of functions one block can accommodate.

This node is located approximately 4 km from the city centre close to the University of Central Asia. The demonstration project builds more linkages to the university area, facilitating better connectivity and development of the public space network.

The project aims to provide housing and employment opportunities to the population that can be accommodated from hazard prone areas and for the city's potential future growth and densification. Priority Area B aims to activate the eastern part of the city by suggesting a variety of multi-purpose blocks that target different social groups through a variety of activities.

The project aims to better link natural and urban areas by providing increased access to the riverfront and surrounding green and public spaces, improving the quality of the environment for users, including local communities and tourists.

PROJECT IMPACT

Once the projects within the demonstrating site are implemented, this area will provide a new centrality for the city and a new point of attraction. The area will provide housing opportunities to accommodate 1500 people and provide 650 employment opportunities. The suggested techno park and multipurpose spaces will provide diverse options for employment (IT, wellbeing, industry, commerce), that will be accessible to both residents of the new neighbourhood and to the entire city, due to the location of public transportation stops and the location of the site near the main transportation loop. The active street frontage created along the main transportation loop will transform the current street into a vibrant activity corridor that links with the other side of the river through a multimodal bridge.

Social facilities such as a school for 800 students and a kindergarten for 200 children will benefit surrounding communities and cover the deficit in social facilities in this area. The revitalized riverbank will connect the parts of the city through a pedestrian promenade. The network of public space will promote walkability in the city and will better make use of Khorog's unique topography through green public spaces (such as a slope park). Doing so will transform this part of Khorog into an attractive environment for residents and tourists.

PROJECT PARTNER

- **Khorog Municipality & National Government**: Main responsible, owner and implementer of the projects' implementation in coordination with potential donors and external partners.
- **Donors/ Financiers/ Private Sector:** Funding entity(ies) would be requested to support the implementation of projects within Priority Area B.
- **NGOs/CSOs:** External partners could be considered to support the projects' implementation throughout the overall process (e.g. capacity building/training, maintenance plan, etc.).

PROJECT LIFE CYCLE

- **Risk Assessment:** to identify and analyse the potential risks that may occur during the implementation of each project as well as to determine the likelihood and potential impact of each risk.
- **Feasibility study:** preliminary exploratory assessment to examine technical, economic, financial, legal and environmental viability of projects.
- **Concept Design:** early phase of the design process to test function, form, linkages, requirements, etc.
- **Detailed Design:** stage where the concept design is refined and a complete precise set of plans are developed. At this stage, the projects are ready for implementation.
- **Construction and Maintenance:** implementation of the projects on the ground and regular maintenance works during projects' life span.
- **Monitoring and Evaluation:** framework that outlines the indicators that are used to track the progress of the projects to ensure whether all objectives are being achieved.

PROJECT FINANCIALS

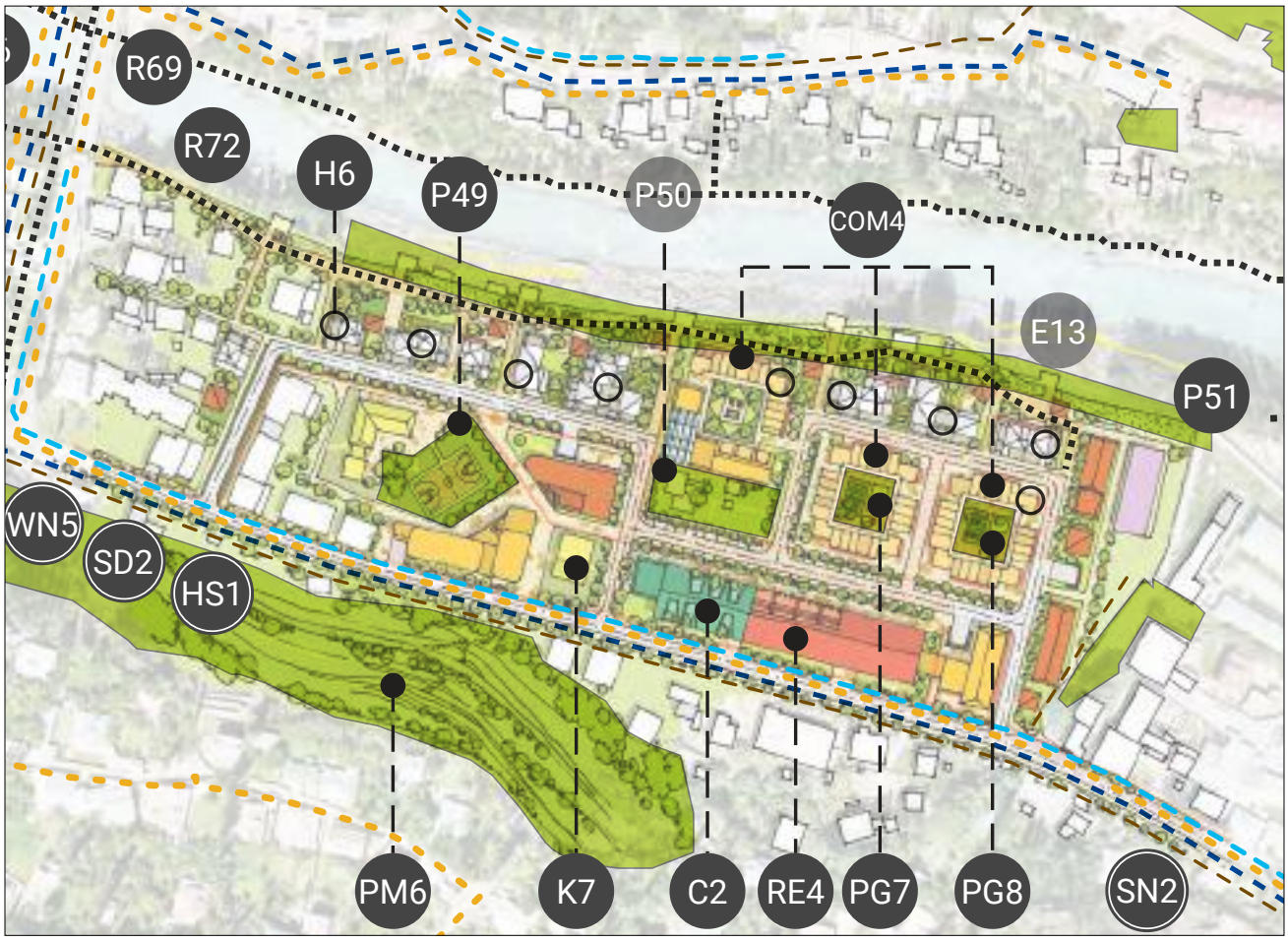
Total Estimated Cost: $76 550 000

Current Investment Commitments and Type: External fund is needed

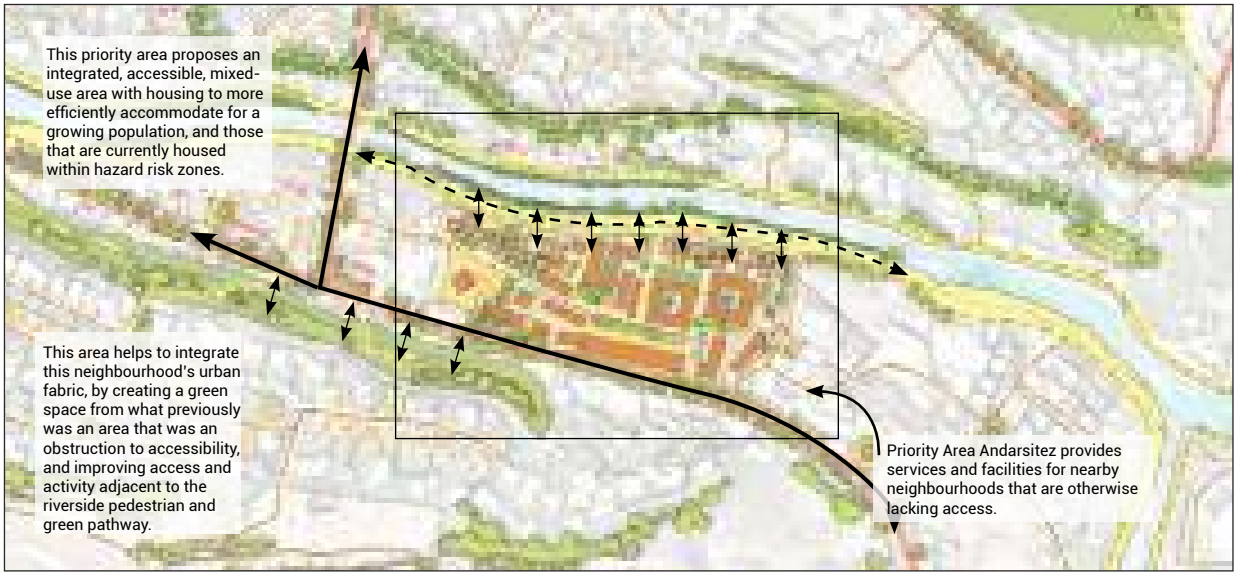
Investment Needs: Risk Assessment, Feasibility Study, Concept Design and Detailed Design, Construction and Maintenance Plan, Monitoring and Evaluation Framework

ADDITIONAL SUPPORT NEEDED

Identification of synergies and/or dependencies between projects is critical to ensure a sustainable implementation of the Priority Area. This rationale of interlinkages and proximity between projects is reflected in the scoring process, however a more detailed assessment of budget availability and projects' time frame is needed to ensure the intended impact. Aspiring an impactful and sustainable implementation process, this investment card aims to support the Municipality of Khorog to consider the suggested projects when analysing investment decisions in order to align the budget envelops with investment needed - e.g. smaller projects that could be covered by own source revenues; education and health facilities that could be delivered by Central Government; infrastructure and wider development projects that could be of interest for donors/private sector to invest.



- Higher Priority Projects
- Lower Priority Projects
- New Housing Development
- Water Supply Network
- Roads/Pedestrian Paths
- Heating System
- Stormwater Draining Network
- Sewer System



	PROJECT NAME	SCORE %	ESTIMATED COST	BENEFICIARIES % of future population	TIME FRAME	DESCRIPTION
C2	Community Centre	65,6	$ 1 606 000	19%	Short-Medium Term	Renovation of an existing building for community gatherings and multi-purpose uses
PG7	Green Public Space with Community Garden	62,1	$ 62 000	20%	Medium-term	Green public space, park with community gardening (garden beds for growing vegetables, etc.)
PM6	Slope Public Space	58,9	$ 11 600 000	8%	Short-Medium Term	Public space on the slope with vegetation and structures to rest (view points, terraces, etc.)
HS1	New Water Heating Pipeline Grid	58,6		100%	Medium-term	City-wide project Not possible to estimate costs for heating projects
WN5	Rehabilitation of the Old Water Pipeline	57,0	$ 2 800 000	68%	Short-term	City-wide project: cost presented is for the entire project
SN2	Extension of Sewer Network	57,0	$ 5 703 000	70%	Short-Medium Term	City-wide project: cost presented is for the entire project
P49	Community Public Space	56,7	$ 465 000	21%	Short-Medium Term	Community public space with vegetation, places to rest, sit and play
R72	Pedestrian Pathway	56,4	$ 8 310	27%	Short-term	Construction of the pedestrian pathway for convenient walking and socialising.
SD2	Extending the existing Stormwater/Drainage Network	56,1	$ 5 273 000	78%	Short-Medium Term	City-wide project: cost presented is for the entire project
H6	New Housing Development	54,5	$ 54 430 000	4%	Short-Medium Term	Multiple typologies of housing units organised around green spaces and integrated with amenities and retail spaces on the main road
P51	Community Public Space	53,9	$ 793 000	12%	Short-Medium Term	Community public space with vegetation, places to rest, sit and play
COM4	New Commercial Area	53,8	$ 2 355 000	12%	Short-term	Construction of a new commercial area, a part of mixed use development
RE4	Building Regeneration	52,8	$ 2 910 000	1%	Short-Medium Term	Renovation of existing structure to accommodate a multifunctional building, technopark (job opportunities and community garden on top.
K7	New Kindergarten	52,0	$ 373 000	12%	Short-term	Construction of the kindergarten within the new development area with an adjacent space for outdoor activities
PG8	Green Public Space with Community Garden	50,8	$ 62 000	13%	Short-Medium Term	Green public space, park with community gardening (garden beds for growing vegetables, etc.)
P50	Community Public Space	48,1	$ 431 000	12%	Short-term	Community public space with vegetation, places to rest, sit and play
E13	River Bank Reinforcement	28,2	$ 1 435 000		Medium-term	Impacted beneficiaries is 0% as only direct beneficiaries were assessed. For a more accurate result, a risk assessment is required to identify indirect population impacted by the project.

Reminder:

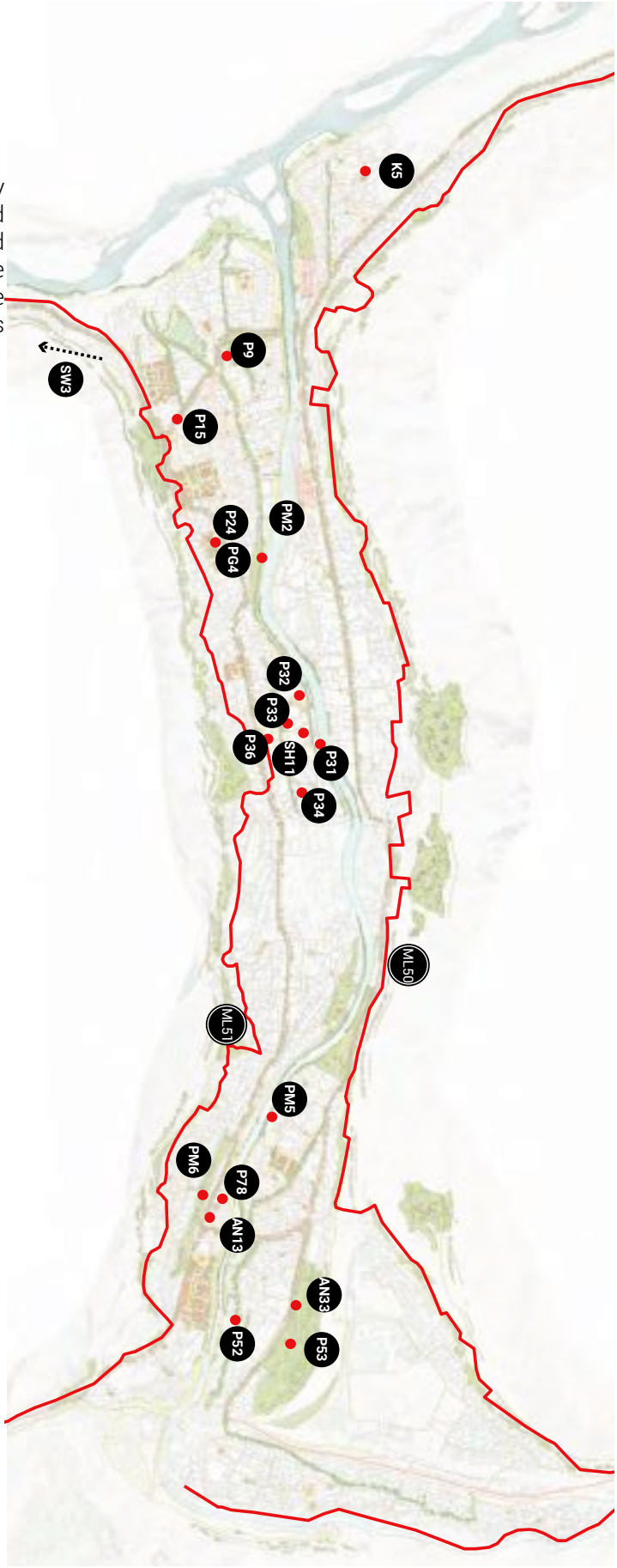
- Scored above 50
- Is a city-wide project
- Scored below 50
- Scored very low
- Is a project that other projects rely on / is fundamental to the transformation of this area

Fig 42. Tajikistan, UN-Habitat, September 2022

3.10.INDIVIDUAL PRIORITY PROJECTS

These projects are considered 'individual' as they fall outside of the 7 Priority Areas, and the detailed design proposals. However, they are not considered less of a priority. In fact, considering the result of the multi-criteria process, these projects all score above 50%. The total cost for these individual projects is $82,000,000.

- Individual Priority Projects

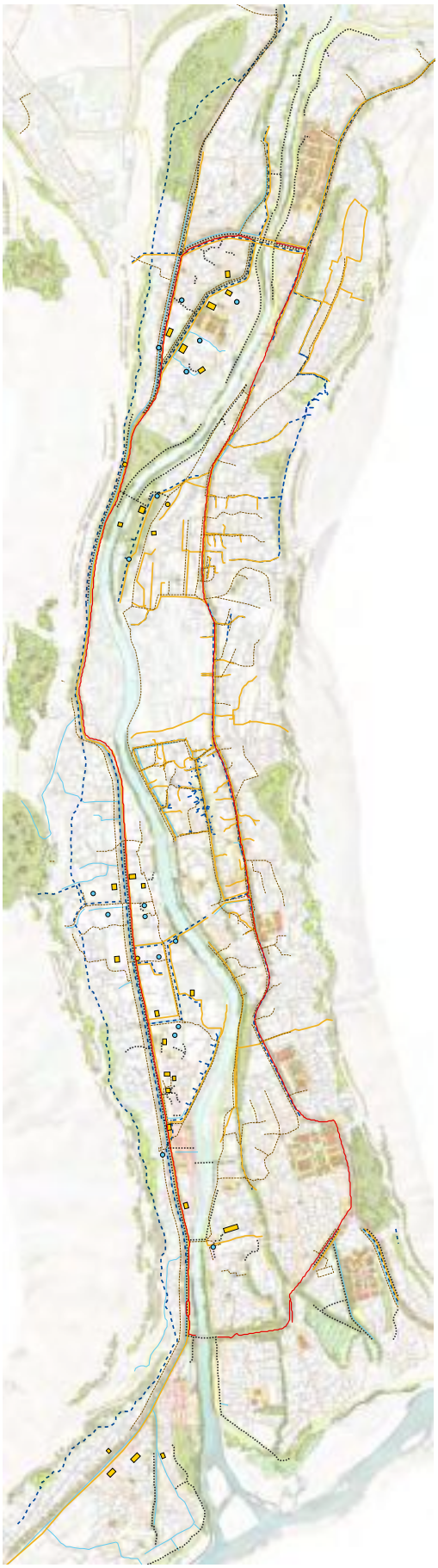


	PROJECT NAME	SCORE %	ESTIMATED COST	BENEFICIARIES % of future population	TIME FRAME	DESCRIPTION
P53	City Park 3	71,7	$11 222 000	15%	Short-Medium Term	Construction of a park with green areas, places to rest and socialise, areas for children, youth and elderly people
SH11	Renovation of School #6	70,8	$624 000	33%	Short-Medium Term	Renovation of the school (technical college) due to poor conditions
SW3	Solid Waste Recycling Separation Facility	67,1	$13 650	100%	Short-Medium Term	New solid waste recycling separation facility. This projects considers that all population of Khorog will be impacted by its implementation.
ML50	Afforestation (tree line) along the northern UGB	65,1	$6 025 000	15%	Short-Medium Term	Plantation of Acacia trees (or similar) along the Urban Growth Boundary
K5	New Kindergarten	64,7	$312 000	4%	Short-Medium Term	Construction of a kindergarten / early childhood development centre that can also function as safe haven
ML51	Afforestation (tree line) along the southern UGB	64,2	$4 300 000	5%	Short-term	Plantation of Acacia trees (or similar) along the Urban Growth Boundary
AN13	New Bus Stop	61,9	$ 6 100	16%	Short-term	
P24	Community Public Space	61,6	$147 600	16%	Short-Medium Term	Community public space with vegetation, places to rest, sit and play
P15	Public Space with a Landmark	61,0	$40 000	14%	Short-term	Construction of the public space with the landmark to create a vibrant environment in Tabobatkhona (square with vegetation and community mural, public art) and regeneration of the current site to integrate the current monument into the urban environment
P52	Public Space with a Landmark	60,8	$156 000	10%	Short-Medium Term	Construction of the public space around with a landmark (public art) to create a vibrant area
PG4	Green Public Space with Community Garden	60,7	$124 000	15%	Short-Medium Term	Green public space, park with community gardening (garden beds for growing vegetables, etc.)
AN33	New Bus Stop	60,0	$ 6 100	12%	Short-term	
PM2	Slope Public Space	59,7	$6 000 000	34%	Short-term	Public space on the slope with vegetation and structures to rest (view points, terraces, etc.)
P9	Slope Public Space	59,7	$900 000	15%	Medium-term	Construction of the public space on the slope of the road elevation, ensuring vegetation as a barrier for safety and structures to rest and socialise
PM5	Park adjacent to the River	53,7	$300 000	22%	Short-Medium Term	Construction of a park with green areas and places to rest and socialise close to the river bank with structures to support the reinforcement of the bank for flood mitigation and prevention of erosion
P33	Pocket Public Space	51,2	$181 000	34%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P36	Pocket Public Space	50,2	$363 000	34%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P32	Pocket Public Space	49,7	$934 000	35%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P31	Pocket Public Space	46,3	$31 000	33%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P78	Pocket Public Space	45,2	$161 000	18%	Short-Medium Term	Construction of a small public space with vegetation, places to sit, rest and play
P34	Pocket Public Space	44,5	$94 000	33%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play

3.11.CITY-WIDE PROJECTS

These projects are mentioned within each Priority Area, however are located across the whole city. Therefore, their implementation must be well planned and aligned with availability of the city budget. City-wide projects can potentially be phased and divided into smaller projects, however further studies and detailed designs need to be developed prior to this. Not all of these projects are ranked above 50%, however, the majority of them are fundamental projects, meaning that most other projects are reliant on their implementation.

- Water Supply Network
- Roads/Pedestrian Paths
- Heating System
- Stormwater Draining Network
- Sewer System
- Sewer System
- Social Facilities
- Rehabilitation of Solid Waste Collection Points



Reminder:

- City-Wide Project that scored above 50
- City-Wide Project that scored below 50
- City-Wide Project that scored very low
- A City-Wide project that other projects rely on / is fundamental to the transformation of the city

	PROJECT NAME	SCORE %	ESTIMATED COST	BENEFICIARIES % of future population	TIME FRAME	DESCRIPTION
R2	Main Multimodal Axis (loop)		$1 710 765	100%	Short-term	City-wide project: (R1, R2, R3, R4) R1 project score: 56,9 estimated cost: $246,600. R2 project score: 53,3 estimated cost: $ 229500. R3 project score: 46,5 estimated cost: $279000. R4 project score: 46,8 estimated cost: $205200. Full Axis relies upon bridge construction to complete the 'loop', cost estimate includes bridge projects: B1 project cost: 393,750 B2 project cost: 308,700
SW3	Rehabilitation of Solid Waste Collection Points	67,1	$13 650	100%		New solid waste recycling separation facility. This projects takes into account its function as serving the whole city.
HS3	Thermal Isolation Soc. Facilities, Adm. Buildings	59,9		89%	Short-Medium Term	The project considers the thermal isolation of 57 (total city-wide) administrative buildings in Khorog. Therefore the number of beneficiaries impacted by the project is almost the entire city's population, which impacted the overall score of the project.
HS1	New Water Heating Pipeline Grid	59,9		86%	Medium-term	New water heating pipeline grid connected to a planned central heating system. Not possible to estimate costs for heating projects.
HS2	Heating Gas Pilot Project for Selected Schools & Hospitals Buildings	58,7		86%	Short-Medium Term	The project considers piloting a heating gas system in 20 (total city-wide) existing schools and hospitals. Therefore the number of beneficiaries impacted by the project is almost the entire city's population, which impacted the overall score of the project.
SW1	Rehabilitation of Solid Waste Collection Points	58,6	$ 72 450	61%	Medium-term	Rehabilitation of existing collection points (due to poor conditions) across the city - cost estimation for all points planned (78 in total planned within the priority areas)
SD1	Rehabilitation of the existing Drainage Calvets	57,3	$ 3 275 000	55%	Short-term	The project considers the rehabilitation of the entire drainage channels (unblocking, surface covering), therefore the number of beneficiaries and the cost presented is for the entire city-wide project.
SN2	Extension of Sewer Network	57,0	$ 5 703 000	71%	Short-term	The project considers the extension of the existing sewer network to serve the deficit areas, therefore the number of beneficiaries and the cost presented are for the entire city-wide project.
WN5	Rehabilitation of the Old Water Pipeline	57,0	$ 2 800 000	64%	Short-term	It is a city-wide project, therefore the number of beneficiaries and the cost presented are for the entire city-wide project.
WN4	Rehabilitation of existing 14km Water Line	56,7	$ 1 367 000	62%	Short-term	It is a city-wide project, therefore the number of beneficiaries and the cost presented are for the entire city-wide project.
SD2	Extending the existing Drainage Network	56,1	$ 5 270 000	55%	Short-term	The project considers the extension of the existing drainage network to serve the deficit areas, therefore the number of beneficiaries and the cost presented is for the entire city-wide project.
SN3	Renovation of the existing Sewer Network	55,2	$ 3 860 000	79%	Short-term	The project considers the renovation of the existing sewer network, therefore the number of beneficiaries and the cost presented are for the entire city-wide project.
WN2	Rehabilitation of Irrigation Channel 1	53,0	$ 972 000	26%	Short-term	It is a city-wide project, therefore the number of beneficiaries and the cost presented are for the entire city-wide project.
WN7	Solarizing the Water Pumps	45,9	$ 147 000	24%	Short-Medium Term	The project considers the rehabilitation of 9 water pumps. It is a city-wide project, therefore the number of beneficiaries and the cost presented are for the entire city-wide project.
SW2	Rehabilitation of Solid Waste Collection Points	44,6	$ 14 000	18%	Short-term	New solid waste collection points to be implemented across the city (20 in total planned within all priority areas)
WN9	New Water Supply Pipeline	29,7	$ 294 000	11%	Short-term	New water supply pipeline planned (but no funds for implementation). It is a city-wide project, therefore the number of beneficiaries and the cost presented are for the entire city-wide project.

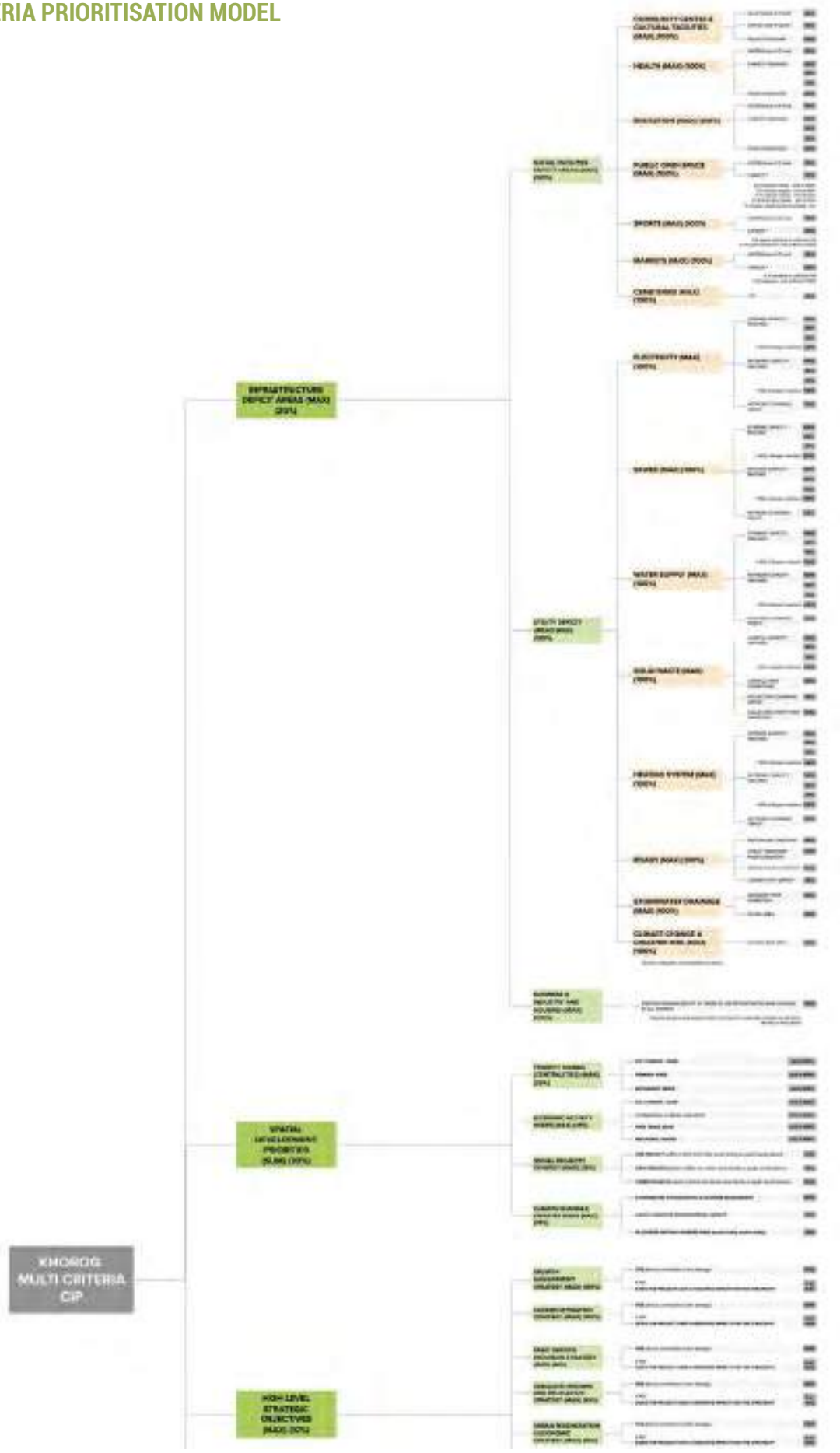
4

ANNEX

4.1. LIST OF FIGURES

4.2. LIST OF TABLES

4.3. MULTI-CRITERIA PRIORITISATION MODEL



Integrated Spatial Plan for Environmental and Socio-Economic Resilience

KHOROG
Tajikistan

Spatially Informed Capital Investment Planning

Priority Areas Investment Cards

May 2023

UN-HABITAT

Habitat Planning

Aga Khan Agency for Habitat

RESILIENT KHOROG 2035

Integrated Spatial Plan for Environmental
and Socio-Economic Resilience
Khorog, Tajikistan

Spatially Informed Capital Investment Planning
Priority Areas Investment Cards

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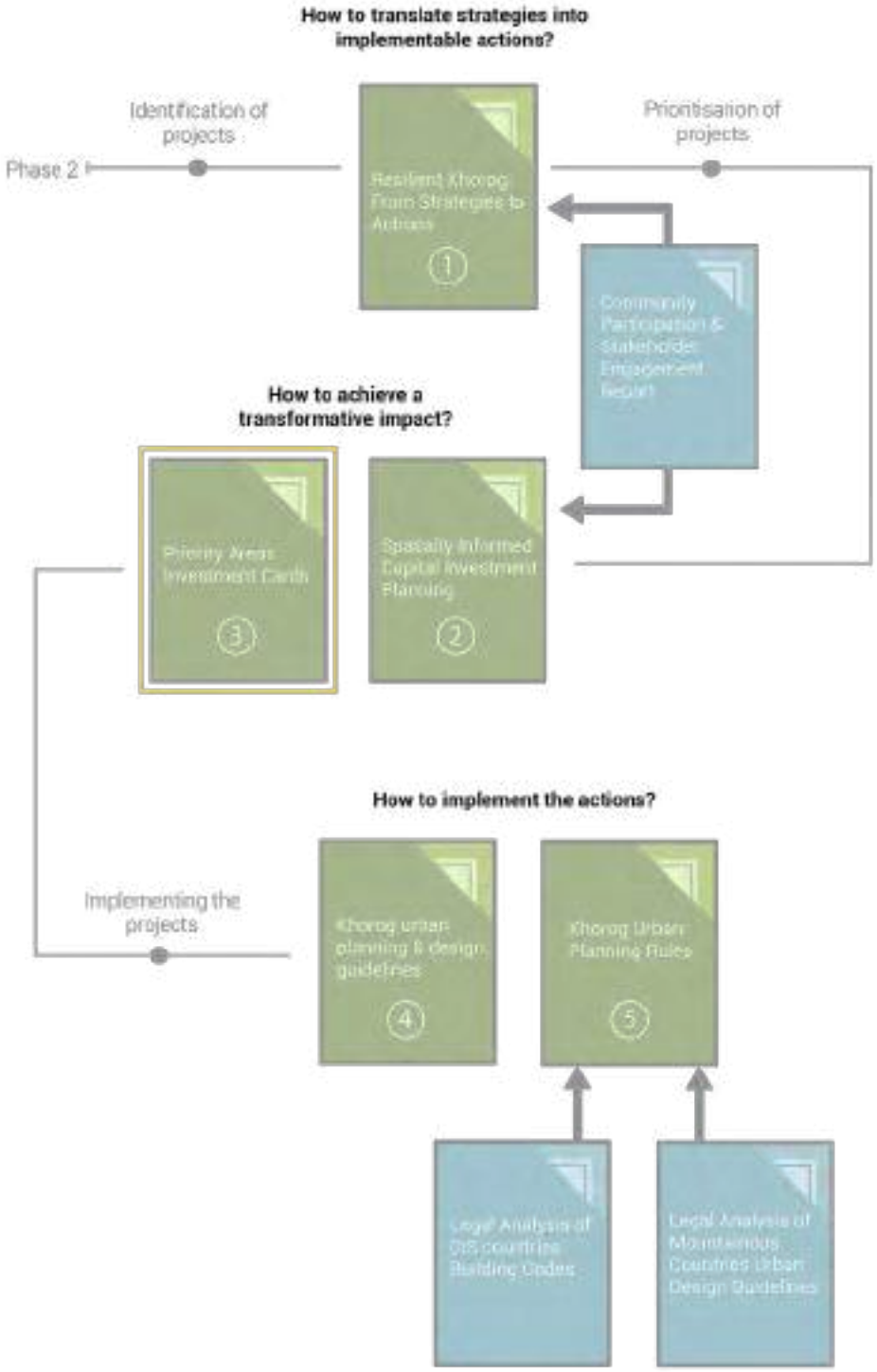


KHOROG

PRIORITY AREAS INVESTMENT CARDS

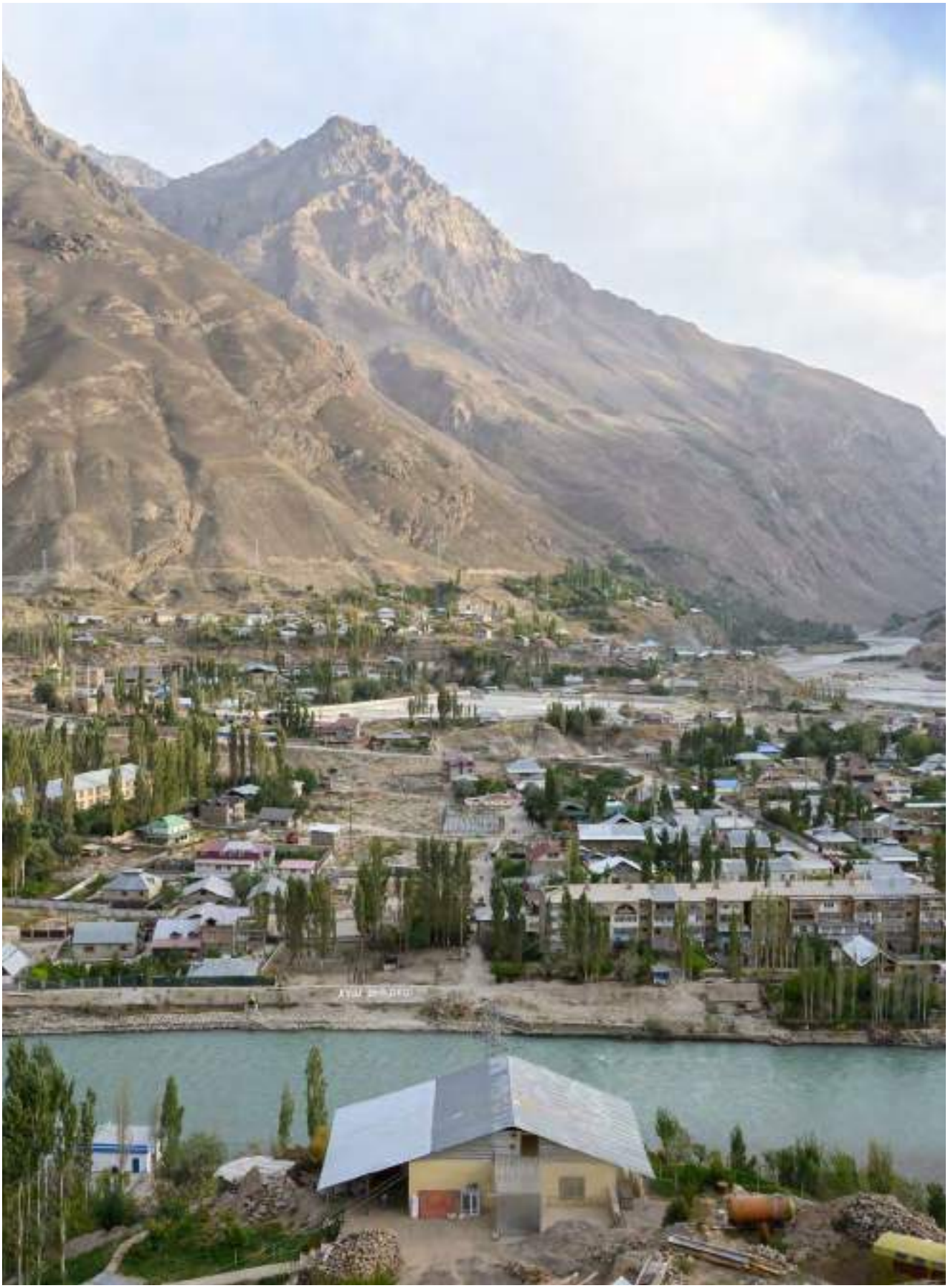


Fig 1. View of Sharifobod and Nivodak Mahallas, UN-Habitat, September 2022

INTRODUCTION

INTEGRATED SPATIAL PLAN FOR ENVIRONMENTAL AND SOCIO-ECONOMIC RESILIENCE

UN-Habitat has partnered with the Aga Khan Agency for Habitat (AKAH) and the government of Tajikistan, through the Aga Khan Development Network (AKDN), to undertake the 'Integrated Spatial Plan for Environmental and Socio-Economic Resilience' in Khorog Tajikistan. UN-Habitat's Urban Planning and Design Lab (Urban Lab), in a collaborative process with other units and branches within the UN-Habitat Planning Finance and Economy Section and the Urban Practices Branch and with AKAH's Habitat Planning teams in Geneva and Tajikistan, aims to provide planning direction to improve resilience and social stability for existing communities and accommodate the increasing populations in Khorog in a sustainable way through:

1) developing strategies, masterplans, interventions, and regulations.
2) knowledge creation, capacity building, and guidelines.

More specifically, the project aims to provide environmental, legal, economic, spatial and infrastructure policies and projections, governance and management, recommendations for transformative projects, and planning and technical capacity building for stakeholders. The UN-Habitat, in concert with AKAH's Planning methods and advanced data collection and analysis, provide planning expertise, drawing on existing methodologies, toolkits, and best practices in a collaborative and integrated way to guide the growth of Khorog.

This project is one of several outcomes from an assessment of resiliency that was undertaken for Khorog in 2017 and 2018 by the Swiss State Secretariat for Economic Affairs (SECO) and Holinger, with partnerships from the international community that include the European Union for resilient infrastructure, the Government of Japan, the IFC and World Bank.

The work of UN-Habitat in collaboration with AKAH is part of The Khorog Urban Resilience Planning and Proof of Concept Initiative, supported by SECO to drive resilient infrastructure investment and access to basic public services, intended to reducing risk, ensure more reliable infrastructure and a safer environment. This will, in turn, improve economic growth and wellbeing. This project has been undertaken in parallel with other initiatives for Khorog, such as the EBRD and SECO funded phase 1 and 2 water infrastructure projects.

AKAH looks to UN-Habitat to support the Revised Town Planning process in a way that can ensure alignment of the town plan to UNDRR resilience principles and best practices. The integrated plan for environmental and socio-economic resilience in Khorog will integrate the disaster risk reduction approaches within the planning processes of identified projects.

REPORT ROLE & ONTEXT

These investment cards are the outcome of a long urban planning process, taking place between 2020 and 2023, through a project collaboration between UN-Habitat's Urban Lab, the Aga Khan Agency for Habitat (AKAH) and the government of Tajikistan.

The aim of this project has been to provide planning direction to improve resilience and social stability for existing communities and accommodate the increasing populations in Khorog in a sustainable way through developing strategies, masterplans, interventions, and regulations, knowledge creation, capacity building, and guidelines.

More specifically, the project aims to provide environmental, legal, economic, spatial and infrastructure policies and projections, governance and management, recommendations for transformative projects, and planning and technical capacity building for stakeholders.

CURRENT STATUS OF INFRASTRUCTURE

The following overview of infrastructure in Khorog provides a direct link and justification for the projects identified and prioritised in the following investment cards.

Being located in a relatively isolated mountainous region, highly exposed to frequent and diverse types of natural hazards, Khorog faces several challenges when it comes to environmental, socio-economic and infrastructure resilience. During the first phase of the project it has been identified that in various parts of the city, **both people and the urban fabric are at risk from hazards.** Depending on the intensity, type and frequency of the hazards that occur in each of these respective areas, urban expansion limitation, mitigation, conservation and/or disaster response coordination strategies will likely be necessary. Areas such as Sharifobod, the North of Saifullo Abdulo, Khufak, North Kichordev, Northwest Khorugi Bolo, Imomobod, Northern Valdosh Gulmamad and Chukht-Khorog, and Western Gulobod, have all been identified as those with either a high population or land area at risk, or as experiencing multiple hazards at a frequent rate or high intensity. Considering the population density distribution against the areas affected by natural hazards renders evident that the hazard area forms a natural boundary to the urban extension. This demonstrates the risk to existing structures in these border areas and that city expansion in these areas will exacerbate existing threats.

One critical challenge identified in Khorog is the **insufficiency of the current water and sewerage infrastructure** for the existing population and its heavily unbalanced distribution across the city. The nature of utilities provision is interrelated. Without maintenance, water channels can leak and increase the risk of ground water flooding, which in turn, impacts areas that lack access to the sewerage network and rely on septic tanks. Tem, Tabobatkhona, Barakat, Voldosh Gulmamad and Chukht-Khorug were identified as priority areas for interventions to address this. Overflowing dump sites in the city, some of which are informal or consist of open pits, cause unsanitary conditions. The city landfill also lacks infrastructure to limit pollution from leaching into the nearby river and water system. The lack of a waste management system means that refuse is not regularly collected and recycling is practiced in the city. Another critical challenge is the high reliance on informal water access, leaving consumption uncontrolled. Scarcity of employment opportunities make the introduction of utility bills challenging, however, water is regularly over-used. Moreover, the low quality of water pipes and channels requires intervention to reduce leaks,

and ensure they can withstand the low temperatures and earthquakes. An integrated, city-wide approach, that integrates provision of all services is necessary to ensure the entire city is accommodated with household water supply and irrigation, consistent, year-round electricity provision, waste removal, and sewerage networks, the latter two of which are essential to protect the city's water sources from pollution.

A lack of connectivity has been identified in the city, which has created car dependency that negatively affects the natural and socio-economic environment. The lack of pedestrian linkages and poor quality of pedestrian infrastructure, particularly pedestrian bridges, makes walking across the city challenging. This exacerbates car-dependency. Two bridges in the city centre fall within a military zone, meaning that they are not publicly accessible. East of this point, there are no pedestrian bridges, leaving weak connectivity between the north and south sides of the city in the eastern periphery. This has an impact on resident access to employment and public services, and can hinder emergency responses. The lack of urban permeability driven by fragmentation, isolates neighbourhoods and results in poor accessibility. Despite the good public transport coverage, unregularised stops and an unclear schedule makes the public transport system unreliable. The lack of integrated pedestrian network significantly contributes to car dependency, further reducing walkability in the city. As was revealed during the Capacity Needs Assessment, road quality is a critical issue that also affects the regional connectivity within GBAO region. Finally, regulations to protect the riverside from construction have not been enforced, and construction in the area has reduced accessibility to the river. There is, therefore, limited public use of the river and almost no visual connection to the river from within the city. The river's impact on the environment and on the identity of the city, as a landmark for navigation, potential pedestrian link and an opportunity for public space has been directly reduced by this construction.

When it comes to the distribution and provision of social facilities **there is low levels of access to fundamental public services** in certain areas of Khorog. Tem has limited access to health facilities, Nivodak, Dashti Bolo and Valdosh Gulmamad do not have access to any sports facility, and kindergartens are lacking in the eastern part of the city. Sharifibod, Nivodak, Gulobod, Andarsitez, Dashti Bolo, Valdosh Gulmamad and Chukht Khorog face the most critical shortages of public service provision. While new service centres are being constructed, this is often a response to the pressure of high demand and capacities can become stretched. For example, AKAH constructed a sport facility in Andarsitez, which has become the only public space in the area and is often overcrowded as a result. Several facilities are under high demand in Saifullo Abdulo, Tabobatkhona and Khorugi Bolo. Facilities with insufficient capacity to accommodate the high population density in their vicinity will be stressed further as the population grows. Some facilities are located within hazard zones. Moreover, the current facility distribution and the lack of multifunctional or flexible operational modes of the buildings do not align with the hazard assessment nor a strategy of hazard adaptation which result in scarce facilities that can support hazard responses (for example storage or emergency accommodation).

Building on the key challenges identified, strategic recommendations are developed into implementable actions and compiled into a consolidated spatial plan that would shift the urbanisation pattern towards a more sustainable development track, preventing urban expansion in hazard areas and ensuring safe and healthy places for living. These projects and plans then undergo a Spatial Capital Investment Planning Process.

SPATIAL CAPITAL INVESTMENT PLANNING

These investment cards are the outcome of the Spatial Capital Investment Planning (CIP) process (see full report "Spatially Informed Capital Investment Planning in Khorog" on overall methodology and approach), which is one of the final steps in the project, and links proposed projects to sustainable urban transformation. Decisions on what, where, how, and when projects get financed and implemented have a critical long-lasting impact on the liveability of cities. Considering the limited resources that cities usually have for capital investment, the CIP helps to improve the efficiency of municipal governments' spending and ensure the achievement of the city's priorities and the SDGs.

It integrates the strategies of different departments and helps guide an integrated municipal strategy, prioritising projects based on the established criteria. Investment needs far exceed budget availability. Prioritisation is, therefore, critical to fit capital needs into a municipal budget and align them with the city's vision.

In the context of increased hazard vulnerability and rapid population growth of developing cities, such as Khorog, infrastructure development is necessary to safeguard and improve the quality of life for residents. The process of CIP sets out the programme of infrastructure delivery and puts into monetary terms the method and timeline of achieving the goals set about in the legislated spatial plan.

The CIP provides the nexus where spatial plans, capital projects, and municipal budgets are integrated to provide a clear roadmap for the implementation of the development strategy.

It is important to note, however, that these Investment Cards provide costs based on existing projects within the city, to provide a suggestion for budgeting requirements for key components of each project. They do not take into account final designs, nor labour or forecasting future costs if the project is not implemented for a number of years. In addition, the investment cards provide an estimate for the beneficiaries of each project. The beneficiaries are calculated as a percentage of the whole city population, taking into account the population that there will be considering the increase in residents accommodated by the proposed mixed-use development nodes. However, project beneficiaries do not take into account unpredicted, major shifts in population influx.

Finally, investment cards are a useful way to begin the process of service provider procurement, project design and investment, but they do not include risk assessments or monitoring and evaluation.

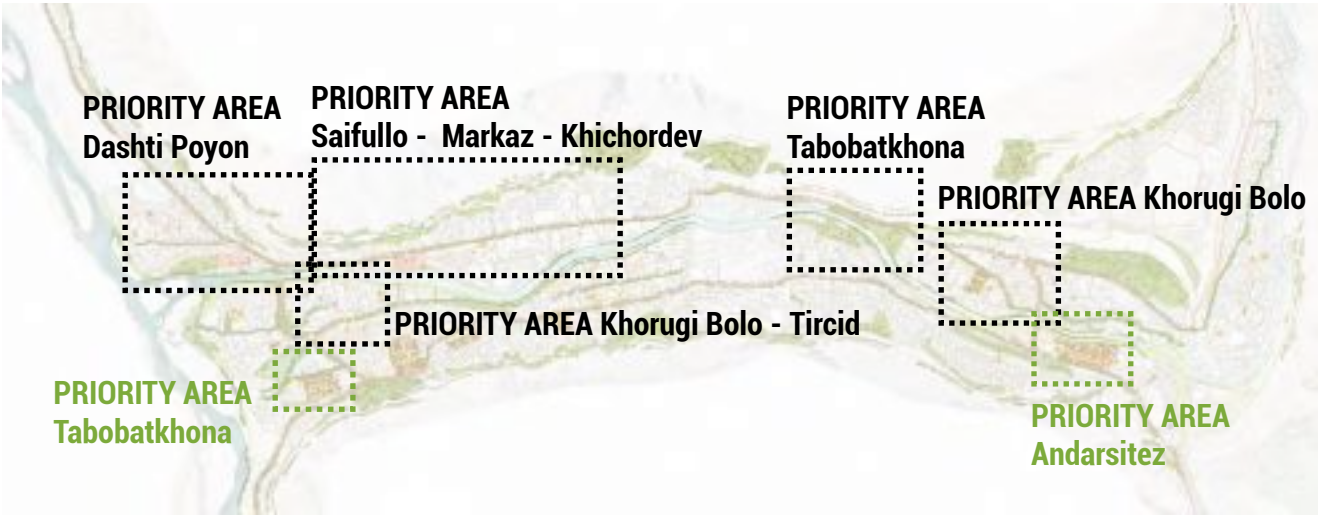


Fig 2. Locations of priority areas in Khorog. There is no heirarchy of priority areas, only of projects.

HOW TO READ THIS CARD

The Spatial Capital Investment Planning process identifies, prioritises, and estimates a city's investment needs over a 10 year horizon, given existing infrastructure and services gaps and projected growth.

These investment cards are grouped by priority area (as shown in the map above), which is defined through the grouping of projects. Urban Design detail has been provided for Priority Areas Tabobatkhona and Andarsitez, which is elaborated further in the Khorog Urban Design Guidelines report.

Each priority area includes a series of projects that have been evaluated - the score for each project is the outcome of a multi-criteria analysis. All projects are coded for reference and have been grouped by functions (for example, community facilities, public spaces, roads, transport etc.) so that project partners are able to trace each project back through the Spatial Capital Investment Planning process and analysis.

Project Score

Project reference code & name

A1 Renovation of Existing Bus Station..... 70,8

Should include an area for parking taxis/vehicles to collect and leave passengers and for stationary busses, bus shelters for all 5 bus routes and pedestrian pathway improvements, tarmacking and planting.

Project description

Projects that are scored lower than 50% are considered less of a priority and categorised with a grey project code, as in the example shown here.

E14 River Bank Reinforce- 46,4

Projects that are the least priority, or rely on many other projects within the area to be completed in order to be effective, are shown as in the example below.

AN42 New Bus 35,6

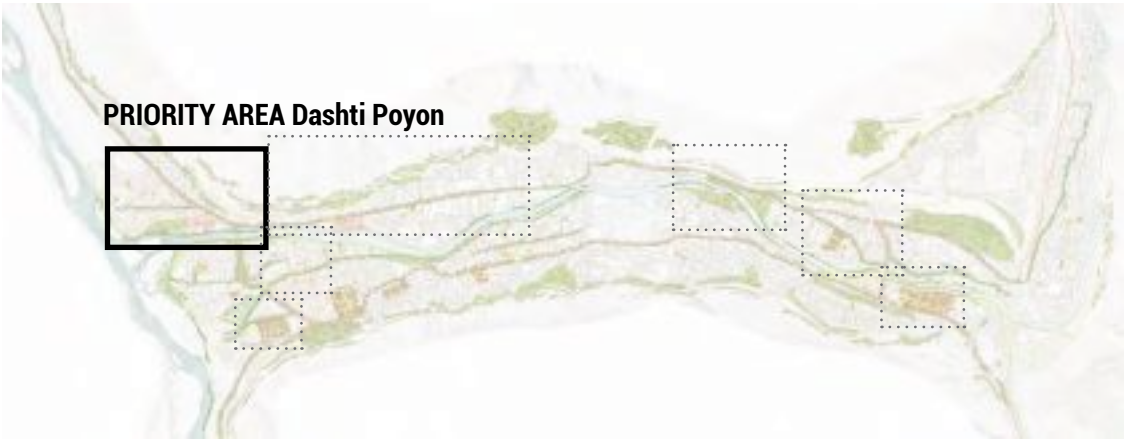
Projects that have a catalytic and essential role within the priority area are shown as in the below example with a green line. Projects within the priority area rely on this key project, due to it's broader impact. An example of this is a hazard mitigation measure - projects that are located within the area protected by the hazard mitigation measure are dependent on it.

COM1 Regeneration of existing Commercial Area ——— 42,6

Finally, project codes highlighted with a white circle, are those that stretch beyond the boundary of the priority area. These are city-wide projects and are detailed further at the end of this document. These wider scale projects are also included in the list for each priority area, to show how they contribute to the transformative impact of the area. However, the cost of these city-wide projects are not included in the cost estimate for the whole priority area.

SN3 Renovation of Existing Sewer Network 55,2

Fig 3. Khorog, UN-Habitat, September 2022



PROJECT AREA NAME	Priority Area Dashti Poyon
PROJECT AREA LOCATION	Mahalla Dashti Poyon
PROJECT AREA PARTNERS	Khorog Municipality Donors/Financiers/Private Sector Utility Service Providers International Development Agencies Potential External Partners
PROJECT AREA TIMELINE	**Short-term:** 2023-2025 **Medium-term:** 2026-2030 **Long-term:** beyond 2031 * suggested timeline per project outlined below
ESTIMATED BUDGET	USD **$20,939,174.01** * city-wide projects excluded from total **breakdown of costs per project outlined
TARGET BENEFICIARY GROUP	**Direct Beneficiaries:** Residents and users of Dashti Poyon Mahalla **Indirect Beneficiaries:** Residents of Khorog Municipality * breakdown of impacted population per project outlined below
SDG ALIGNMENT	

PROBLEM STATEMENT

The design solutions for the Priority Area Dashti Poyon target problematic issues linked with connectivity and accessibility to adequate services. Being an extension of the city centre, it is developing as a new administrative and commercial node, with Military and Government Offices, Development Organisations and Headquarters of Private Sector companies, restaurants, a new market facility, central bus station, etc. While there is a high concentration of activities and mobility of people, adequate access to infrastructure and services is still a critical issue in this area.

PROJECT OBJECTIVE

The objective of this transformative area is, therefore, to regenerate the existing market area and reinforce the development of a growth economic node in Dashti Poyon by promoting the implementation of green public spaces, new social facilities (such as a new Health Facility) and commercial areas while improving pedestrian connectivity and accessibility to public transport. Renovation of existing, and extension of infrastructure networks such as sewer, drainage and heating will address one of the key issues identified in this area.

PROJECT IMPACT

The regeneration of the market area will create a new centrality while improving pedestrian and public transport connectivity. The public transportation stops and the location of the site near the main transportation axis make economic activities beneficial to all the residents of Khorog. The proposed regeneration area contributes to rebalancing the city's functioning by creating a new hotspot with improved accessibility to social facilities, employment, leisure and infrastructure options.

PROJECT PARTNER

- **Khorog Municipality & National Government**: Main responsible, owner and implementer of the projects' implementation in coordination with potential donors and external partners.
- **Donors/ Financiers/ Private Sector:** Funding entity(ies) would be requested to support the implementation of projects within Priority Area 1.
- **NGOs/CSOs:** Potential external partners could be considered to support the projects' implementation throughout the overall process (e.g. capacity building/training, maintenance plan, etc.).

PROJECT LIFE CYCLE

- **Risk Assessment:** to identify and analyse the potential risks that may occur during the implementation of each project as well as to determine the likelihood and potential impact of each risk.
- **Feasibility study:** preliminary exploratory assessment to examine technical, economic, financial, legal and environmental viability of projects.
- **Concept Design:** early phase of the design process to test function, form, linkages, requirements, etc.
- **Detailed Design:** stage where the concept design is refined and a complete precise set of plans are developed. At this stage, the projects are ready for implementation.
- **Construction and Maintenance:** implementation of the projects on the ground and regular maintenance works during projects' life span.
- **Monitoring and Evaluation:** framework that outlines the indicators that are used to track the progress of the projects to ensure whether all objectives are being achieved.

PROJECT FINANCIALS

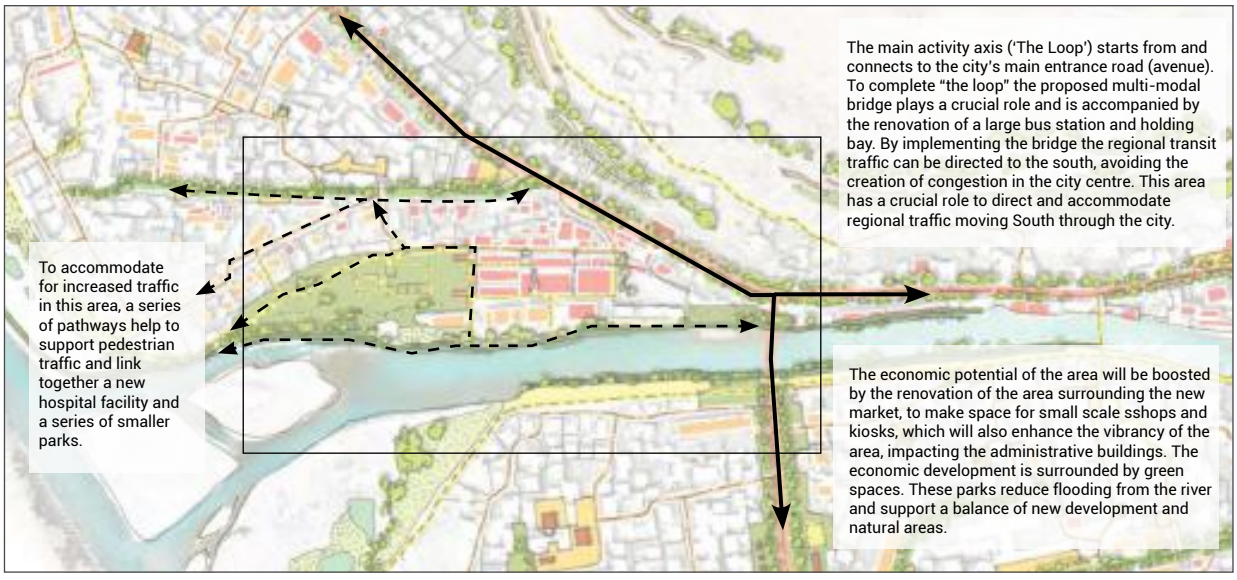
Total Estimated Cost: $20,939,174.01
Current Investment Commitments and Type: External funding is needed
Investment Needs: Risk Assessment, Feasibility Study, Concept Design and Detailed Design, Construction and Maintenance Plan, Monitoring and Evaluation

ADDITIONAL SUPPORT NEEDED

Identification of synergies and/or dependencies between projects is critical to ensure a sustainable implementation of the Priority Area. This rationale of interlinkages and proximity between projects is reflected in the scoring process, however a more detailed assessment of budget availability and projects' time frame is needed to ensure the intended impact.

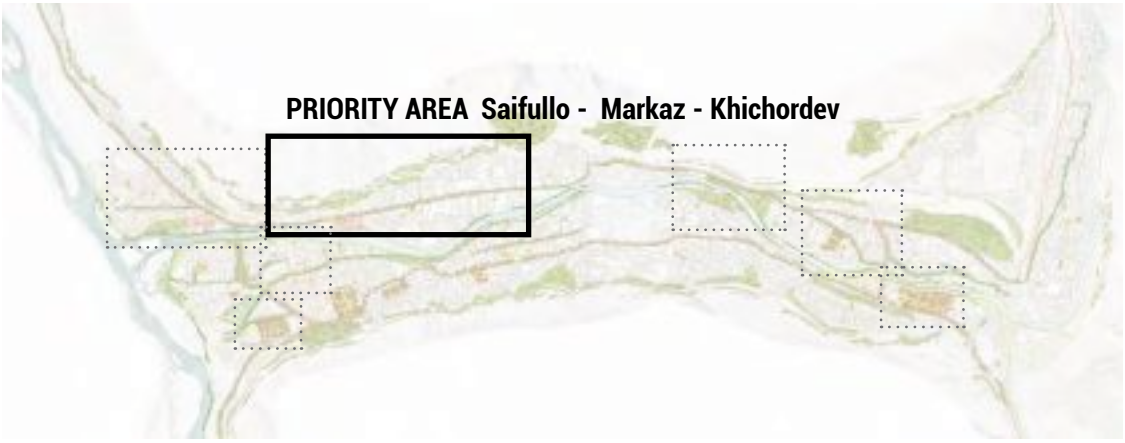
Aspiring for an impactful and sustainable implementation process, this investment card aims to support the Municipality of Khorog to consider the suggested projects when analysing investment decisions in order to align the budget envelops with investment needed - e.g. smaller projects that could be covered by own source revenues; education and health facilities that could be delivered by Central Government; infrastructure and wider development projects that could be of interest for donors/private sectors to invest.


Wetland Park
Thermal Isolation of Building
Pocket Public Spaces
Hazard Mitigation Projects
HS1
HS3
AN42
M1
M2
HS3
P5
P58
WN2
M3
P6
R5
SD2
SW2
WN7
HL4
SN3
A1
P1
COM 1
SD1
R1
R15
PM1
P2
R92
R46
E14
B1
City-Wide Projects
Catalyst Projects
Higher Priority Projects
Lower Priority Projects
Water Supply Network
Roads/Pedestrian Paths
Heating System
Stormwater Draining Network
Sewer System
Social Facilities
Bus Stops
New Solid Waste Collection Points
Public Spaces
Regeneration of existing Commercial Area
Multimodal Bridge
Main Multimodal Axis 'The Loop'


The main activity axis ('The Loop') starts from and connects to the city's main entrance road (avenue). To complete "the loop" the proposed multi-modal bridge plays a crucial role and is accompanied by the renovation of a large bus station and holding bay. By implementing the bridge the regional transit traffic can be directed to the south, avoiding the creation of congestion in the city centre. This area has a crucial role to direct and accommodate regional traffic moving South through the city.
To accommodate for increased traffic in this area, a series of pathways help to support pedestrian traffic and link together a new hospital facility and a series of smaller parks.
The economic potential of the area will be boosted by the renovation of the area surrounding the new market, to make space for small scale sshops and kiosks, which will also enhance the vibrancy of the area, impacting the administrative buildings. The economic development is surrounded by green spaces. These parks reduce flooding from the river and support a balance of new development and natural areas.

	PROJECT NAME	SCORE %	ESTIMATED COST	BENEFICIARIES % of future population	TIME FRAME	DESCRIPTION
A1	Renovation of Existing Bus Station	70,8	$ 47 000	100%	Short-term	Should include an area for parking taxis/vehicles to collect and leave passengers and for stationary busses, bus shelters for all 5 bus routes and pedestrian pathway improvements, tarmacking and planting.
HS3	Thermal Isolation Soc. Facilities, Adm. Buildings	59,9		100%	Medium-term	City-wide project: 57 social facilities and admin buildings across the city. It is not possible to estimate costs for heating projects.
HS1	New Water Heating Pipeline Grid	59,9		100%	Short-Medium Term	City-wide project: connected to a planned central heating system. It is not possible to estimate costs for heating projects.
SD1	Rehabilitation of Existing Drainage Calvets	57,3	$ 3 275 000	71%	Short-term	City-wide project: cost presented is for the entire project
R1	Main Multimodal Axis (loop)	56,9	$1 009 000	56%	Short-term	City-wide project: total cost for the loop (R1, R2, R3, R4) presented. R1 estimated cost: $259 000. The loop is complete with the bridge projects.
SD2	Extending Existing Drainage Network	56,1	$ 5 300 000	78%	Short-Medium Term	City-wide project: cost presented is for the entire project
SN3	Renovation of Existing Sewer Network	55,2	$ 3 800 000	83%	Short-Medium Term	City-wide project: the project considers the renovation of the existing sewer network; number of beneficiaries and cost presented is for the entire city-wide project.
P1	Multi-functional Public Space	54,5	$ 2 400 000	8%	Short-term	Construction of a public space adjacent to the Market and the wetland park (sports, places to sit and to rest, play, etc.)
P2	Multi-functional Public Space	53,7	$ 557 000	13%	Short-term	Construction of the public space adjacent to the Market and the main access to Dashti Poyon with a renovated bus station and vegetation
WN2	Rehabilitation of Irrigation Channel 1	53,0	$ 970 000	25%	Medium-term	City-wide project: cost presented is for the entire project
PM1	Wetland Park Connected to Market	52,6	$ 6 000 000	8%	Medium-term	Construction of the public space with elevated sidewalks, "sponge" elements" for flood mitigation, and include a place for animal market
B1	New Multimodal Bridge	52,4	$ 472 500	19%	Short-term	Construction of a new muti-modal bridge to complete the proposed transport loop as a backbone of mobility in the city. The bridge will accommodate vehicular, pedestrian and bicycle movements.
P6	Pocket Public Space	51,8	$ 312 000	5%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play.
M1	Hazard Mitigation to Prevent Rockfalls	51,8			Short-term	Not possible to estimate costs (detailed design is needed). Impacted beneficiaries not able to be assessed as a risk assessment is required to identify indirect population impacted by the project.
P58	Pocket Public Space	50,5	$ 240 000	5%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P5	Pocket Public Space	49,8	$ 67 000	3%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
M2	Hazard Mitigation to Prevent Rockfalls	49,6			Short-term	Not possible to estimate costs (detailed design is needed). Impacted beneficiaries not able to be assessed as a risk assessment is required to identify indirect population impacted by the project.
R46	Pedestrian Pathway	48,7	$ 5 800	19%	Short-term	Construction of a pedestrian pathway for convenient walking and socialising (also suitable for cycling)
M3	Hazard Mitigation to Prevent Rockfalls	48,4			Short-term	Not possible to estimate costs (detailed design is needed). Impacted beneficiaries not able to be assessed as a risk assessment is required to identify indirect population impacted by the project.
HL4	New Health Facility	46,7	$ 1 560 000	7%	Short-term	A proposed facility based on the deficit in the area. Catalytic role in the transformation of the PA1
E14	River Bank Reinforcement	46,4	$ 460 000		Short-Medium Term	Impacted beneficiaries is 0% as only direct beneficiaries were assessed. For a more accurate result, a risk assessment is required to identify indirect population impacted by the project.
WN7	Solarizing the Water Pumps	45,9	$ 147 000	21%	Short-Medium Term	
SW2	New Solid Waste Collection Points	44,6	$ 14 000	18%	Short-term	To be implemented across the city (20 in total planned within all priority areas)
COM1	Regeneration of existing Commercial Area	42,6	$ 8 750 000	100%	Short-term	Upgrade of the market, design of the kiosks & internal public space with activities
R92	Tarmacking the existing Pedestrian Pathway	40,5	$ 5 300	8%	Short-term	Upgrading the existing pathway to ensure convenient and safe walking, cycling, and socialising conditions
R5	Green Axis	40,5	$ 110 000	8%	Short-term	Redesign of the street (widening the pedestrian sidewalks, vegetation, infrastructure)
AN42	New Bus Stop	35,6	$ 6 100	7%	Short-term	

Fig 4. Khorog, UN-Habitat, September 2022



PROJECT AREA NAME	Priority Area Saifullo - Markaz - Khichordev
PROJECT AREA LOCATION	Mahalla Saifullo Abdulo Mahalla Markaz Mahalla Khichordev
PROJECT AREA PARTNERS	Khorog Municipality Donors/Financiers/Private Sector Utility Service Providers International Development Agencies Potential External Partners
PROJECT AREA TIMELINE	**Short-term:** 2023-2025 **Medium-term:** 2026-2030 **Long-term:** beyond 2031 * suggested timeline per project outlined below
ESTIMATED BUDGET	USD **$7,682,000** * city-wide projects excluded from total **breakdown of costs per project outlined
TARGET BENEFICIARY GROUP	**Direct Beneficiaries:** Residents and users of Saifullo Abdulo, Markaz & Khichorderv Mahallas **Indirect Beneficiaries:** Residents of Khorog Municipality * breakdown of impacted population per project outlined below
SDG ALIGNMENT	

PROBLEM STATEMENT

This Priority Area is fundamental to the city's sustainable development. It is located along the central mobility access of the city, 'The Loop', and provides the central hub of activity. This area has a number of social, cultural and administrative buildings, however there are challenges associated with deteriorating infrastructure (including roads, post-office, library, basic services), and a potential danger of congestion with the city's growth. Cycle and pedestrian paths are currently not continuous through the site, and secondary roads connecting to 'The Loop' are often of poor quality. In addition, dis-organised parking leads to chaotic and sometimes dangerous traffic, and a lack of formal bus stops adds to the congestion in this central area. Apart from Chorbog, there are limited smaller parks in this area to serve local communities. Finally, although this is a thoroughfare from East to West through the city, there is constricted North-South movement, due to the lack of a pedestrian bridge connected with this central hub of activity.

PROJECT OBJECTIVE

The objective for Priority Area Saifullo-Markaz-Khichordev, is the improved efficiency of movement through this area (for pedestrians, cars, buses and cyclists). The goal for the projects within this area is to maintain its current vibrancy, whilst improving the quality and permeability of the street network.

PROJECT IMPACT

The impact of the projects in this area will reduce congestion, improve the reliability of the bus service, improve the safety of, and increase pedestrian and cycling activity. The impact of these projects will, therefore, not only affect those within this Priority Area, but, due to it's significance as a main hub of activity for the whole city, will impact daily commuter routes for surrounding neighbourhoods, as well as regional transport routes, for traffic travelling through the city centre. Finally, maintenance is necessary at this stage, as it will secure the popularity, safety and vibrancy of this area for the future population growth.

PROJECT PARTNER

- **Khorog Municipality & National Government**: Main responsible, owner and implementer of the projects' implementation in coordination with potential donors and external partners.
- **Donors/ Financiers/ Private Sector:** Funding entity(ies) would be requested to support the implementation of projects within Priority Area 2.

PROJECT LIFE CYCLE

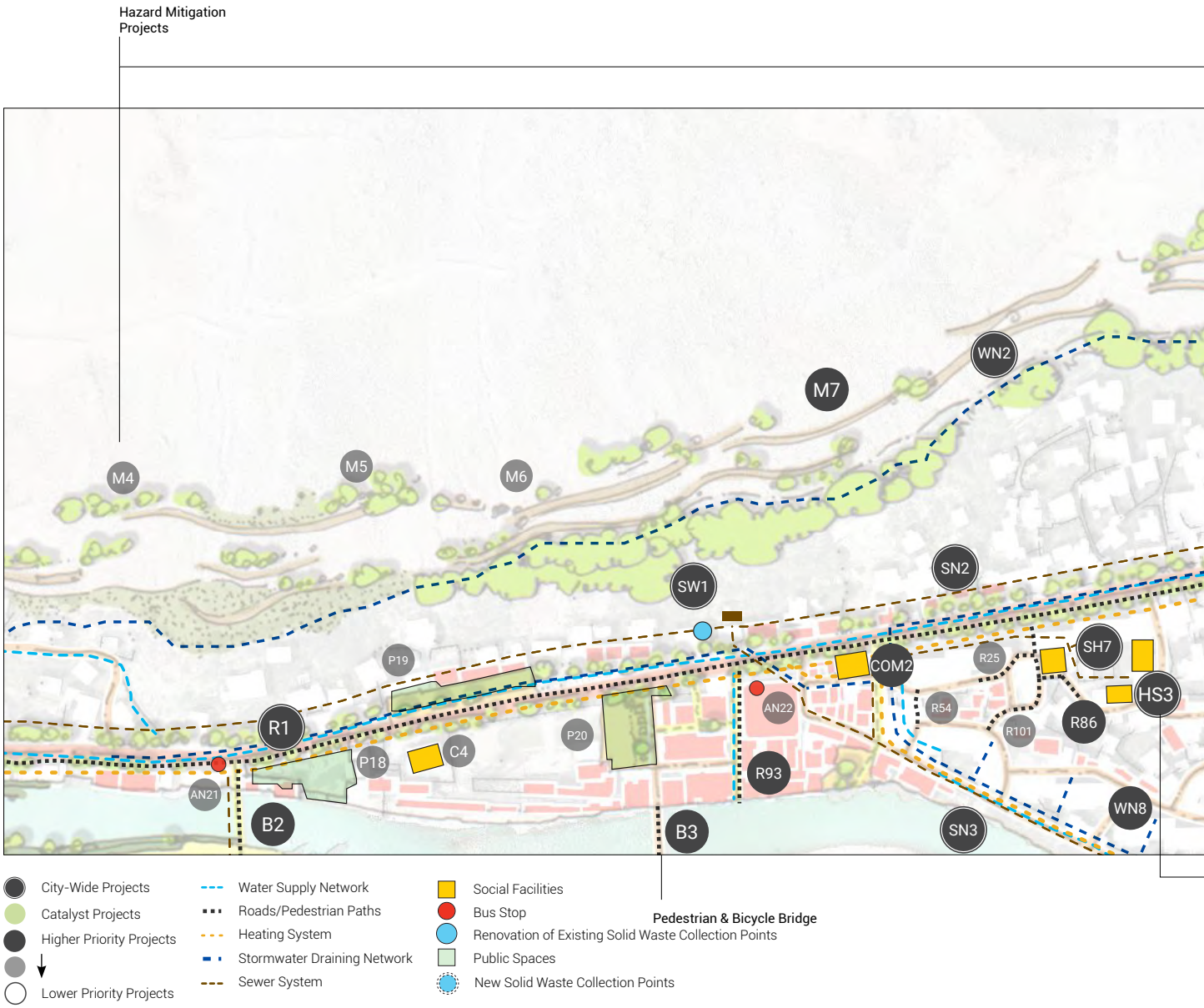
- **Risk Assessment:** to identify and analyse the potential risks that may occur during the implementation of each project as well as to determine the likelihood and potential impact of each risk.
- **Feasibility study:** preliminary exploratory assessment to examine technical, economic, financial, legal and environmental viability of projects.
- **Concept Design:** early phase of the design process to test function, form, linkages, requirements, etc.
- **Detailed Design:** stage where the concept design is refined and a complete precise set of plans are developed. At this stage, the projects are ready for implementation.
- **Construction and Maintenance:** implementation of the projects on the ground and regular maintenance works during projects' life span.
- **Monitoring and Evaluation:** framework that outlines the indicators that are used to track the progress of the projects to ensure whether all objectives are being achieved.

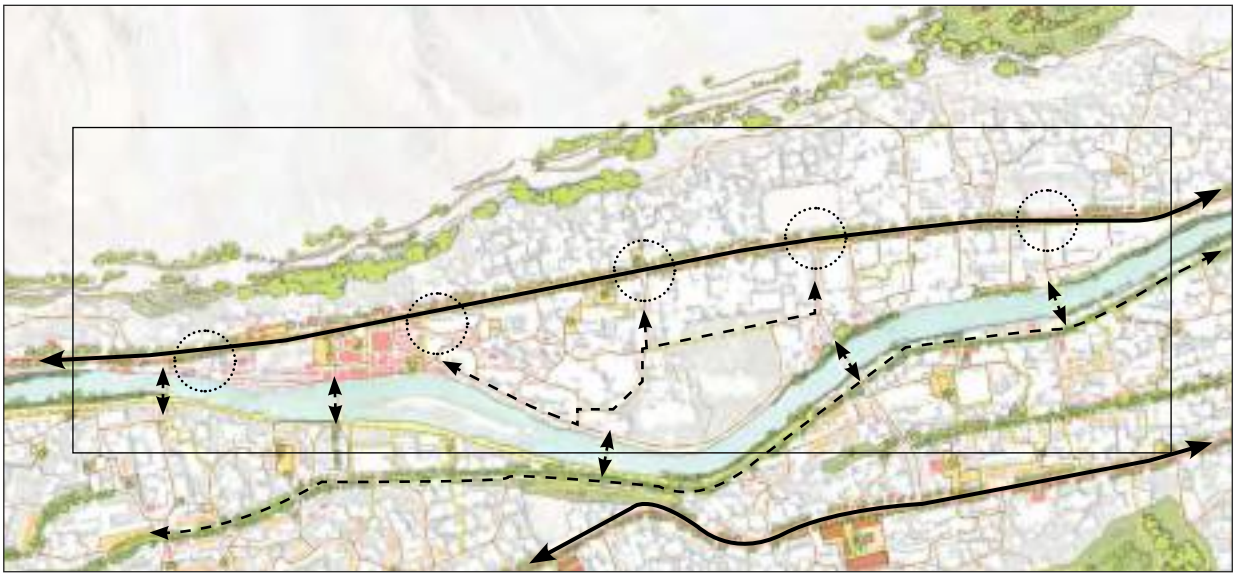
PROJECT FINANCIALS

Total Estimated Cost: $7,682,000
Current Investment Commitments and Type: External fund is needed
Investment Needs: Risk Assesssment, Feasibility Study, Concept Design and Detailed Design, Construction and Maintenance Plan, Monitoring and Evaluation

ADDITIONAL SUPPORT NEEDED

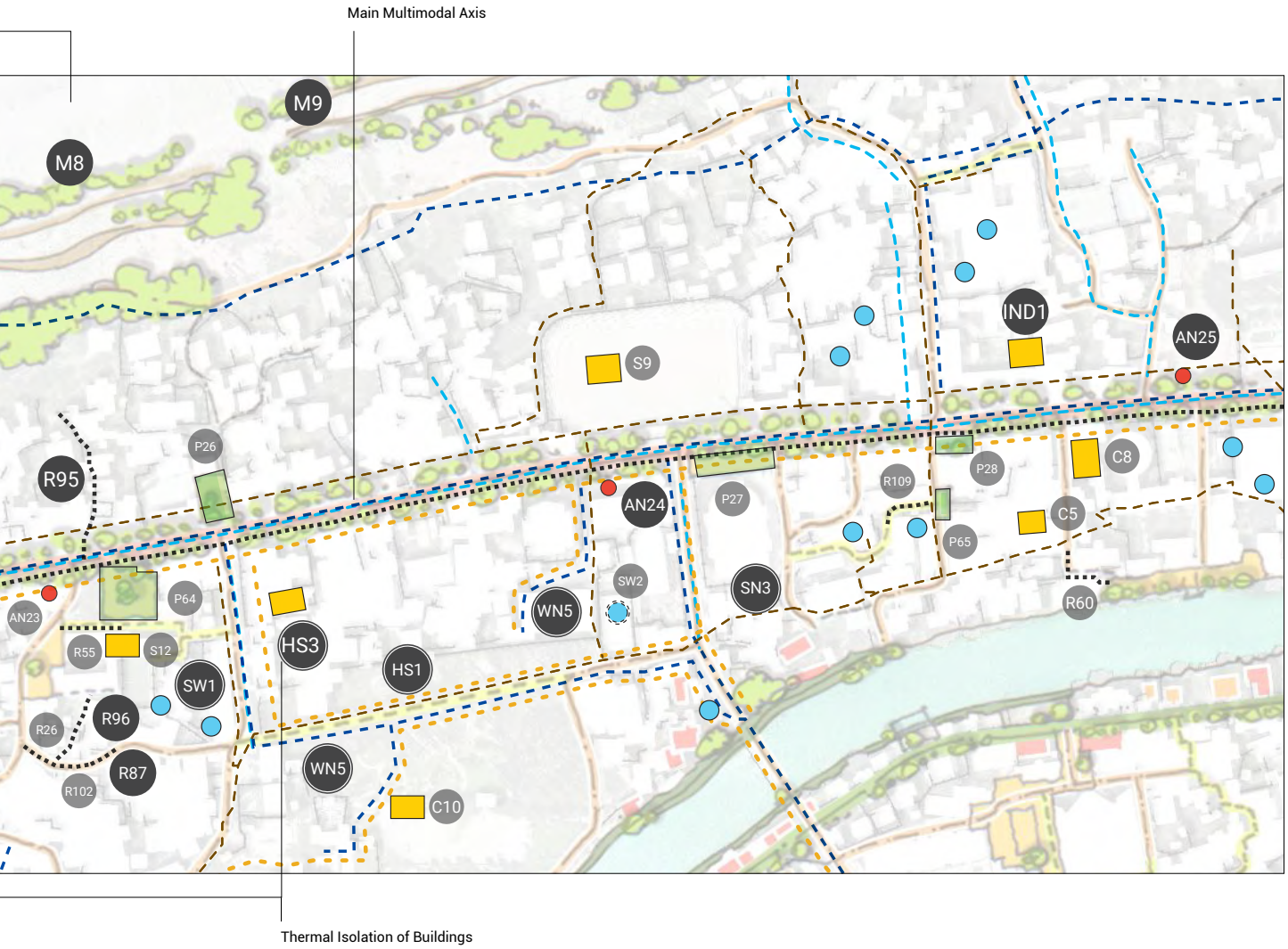
Identification of synergies and/or dependencies between projects is critical to ensure a sustainable implementation of the Priority Area. This rationale of interlinkages and proximity between projects is reflected in the scoring process, however a more detailed assessment of budget availability and projects' time frame is needed to ensure the intended impact. Aspiring an impactful and sustainable implementation process, this investment card aims to support the Municipality of Khorog to consider the suggested projects when analysing investment decisions in order to align the budget envelops with investment needed - e.g. smaller projects that could be covered by own source revenues; education and health facilities that could be delivered by Central Government; infrastructure and wider development projects that could be of interest for donors/private sector to invest.





New pedestrian and multi-modal transport connections (through, for example, bridges and road improvements) help to both increase access to this main axis, as well as efficiently funnel traffic away from it.

'The Loop', the main central axis of transport and activity, is enhanced through clusters of economic activities and is strengthened by a balance of new social facilities (such as community centres) and public spaces.



Reminder:

- Scored above 50
- Is a city-wide project
- Scored below 50
- Scored very low
- Is a project that other projects rely on / is fundamental to the transformation of this area

	PROJECT NAME	SCORE %	ESTIMATED COST	BENEFICIARIES % of future population	TIME FRAME	DESCRIPTION
SH7	Adaptation of the Health Facility as Safe Haven	63,0	$ 550 000	22%	Short-term	Adaptation of the existing Health Facility as Safe Haven
HS3	Thermal Isolation Soc. Facilities, Adm. Buildings	59,9		100%	Short-Medium Term	The project considers the thermal isolation of 57 (total city-wide) administrative buildings in Khorog. Not possible to estimate costs for heating projects
HS1	New Water Heating Pipeline Grid	59,9		100%	Short-Medium Term	City-wide project: connected to a planned central heating system Not possible to estimate costs for heating projects
COM2	New Commercial Area	59,5	$ 1 200 000	26%	Short-term	Reconstruction of the marketplace, including rehabilitation of existing structures, construction of the new stalls, adjacent public spaces and internal courtyard
B3	Pedestrian Bridge	58,9	$ 200 000	27%	Short-term	The regeneration of the bridge to include infrastructure for adequate pedestrian movements - currently being constructed by AKAH.
R87	Tarmacking existing Road	58,5	$ 2 200	20%	Short-term	Pavement of the existing road and overall upgrading to ensure multimodal movements (driving, cycling, pedestrian)
R96	Tarmacking existing Pedestrian Pathway	58,3	$ 2 500	26%	Short-term	Upgrading the existing pathway to ensure convenient and safe walking, cycling, and socialising conditions
R1	Main Multimodal Axis (loop)	56,9	$1 009 000	56%	Short-term	City-wide project: total cost for the loop (R1, R2, R3, R4) presented R1 estimated cost: $259 000
SW1	Rehabilitation of Solid Waste Collection Points	58,6	$ 72 450	61%	Medium-term	Rehabilitation of existing collection points (due to poor conditions) across the city - cost estimation for all points planned (70 in total planned within the priority areas)
R95	Tarmacking existing Pedestrian Pathway	57,7	$ 4 600	24%	Short-term	Upgrading the existing pathway to ensure adequate and safe walking, cycling, and socialising conditions
R86	Tarmacking existing Road	57,6	$ 10 200	21%	Short-term	Pavement of the existing road and overall upgrading to ensure multimodal movements (driving, cycling, pedestrian)
R93	Tarmacking existing Pedestrian Pathway	57,4	$ 4 500	27%	Short-term	Upgrading the existing pathway to ensure adequate and safe walking, cycling, and socialising conditions
SD1	Rehabilitation of the existing Drainage Calvets	57,3	$ 3 275 000	71%	Short-Medium Term	City-wide project: cost presented is for the entire project
WN5	Rehabilitation of the old Water Pipeline	57,0	$ 2 800 000	68%	Short-Medium Term	City-wide project: cost presented is for the entire project
SN2	Extension of Sewer Network	57,0	$ 5 703 000	70%	Medium-term	City-wide project: cost presented is for the entire project
B2	Pedestrian Bridge	56,5	$ 170 000	29%	Short-term	The regeneration of the bridge to include infrastructure for adequate pedestrian movements.
SD2	Extending the existing Drainage Network	56,1	$ 5 250 000	78%	Short-term	City-wide project: cost presented is for the entire project
SN3	Renovation of the existing Sewer Network	55,2	$ 3 860 000	83%	Short-Medium Term	City-wide project: cost presented is for the entire project
AN25	New Bus Stop	55,0	$ 6 100	27%	Short-term	
WN2	Rehabilitation of Irrigation Channel 1	53,0	$ 970 000	25%	Short-term	City-wide project: cost presented is for the entire project
IND1	Renovation of existing Post-office Building	52,5	$ 393 000	26%	Short-term	Renovation of the existing building to create a technopark
M8	Hazard Mitigation to Prevent Rockfalls	52,5			Medium-term	Not possible to estimate costs (detailed design is needed). Impacted beneficiaries not able to be assessed as a risk assessment is required to identify indirect population impacted by the project.
AN24	New Bus Stop	51,6	$ 6 100	24%	Short-term	
M9	Hazard Mitigation to Prevent Rockfalls	51,3			Medium-term	Not possible to estimate costs (detailed design is needed). Impacted beneficiaries not able to be assessed as a risk assessment is required to identify indirect population impacted by the project.
M7	Hazard Mitigation to Prevent Rockfalls	50,9			Medium-term	Not possible to estimate costs (detailed design is needed). Impacted beneficiaries not able to be assessed as a risk assessment is required to identify indirect population impacted by the project.

	PROJECT NAME	SCORE %	ESTIMATED COST	BENEFICIARIES % of future population	TIME FRAME	DESCRIPTION
M6	Hazard Mitigation to Prevent Rockfalls	49,1			Medium-term	Not possible to estimate costs (detailed design is needed). Impacted beneficiaries not able to be assessed as a risk assessment is required to identify indirect population impacted by the project.
M4	Hazard Mitigation to Prevent Rockfalls	48,4			Medium-term	Not possible to estimate costs (detailed design is needed). Impacted beneficiaries not able to be assessed as a risk assessment is required to identify indirect population impacted by the project.
M5	Hazard Mitigation to Prevent Rockfalls	48,4			Medium-term	Not possible to estimate costs (detailed design is needed). Impacted beneficiaries not able to be assessed as a risk assessment is required to identify indirect population impacted by the project.
AN23	New Bus Stop	48,3	$ 6 100	24%	Short-term	
S12	Renovation of existing Sports Facility	48,0	$ 79 000	23%	Short-term	Basketball, volleyball, football, running/athletics) - School open playground
C4	Renovation of existing Library	47,8	$ 590 000	22%	Medium-term	
R60	Pedestrian Pathway	47,7	$ 2 440	25%	Medium-term	Construction of a pedestrian pathway for adequate walking and socialising (also suitable for cycling)
C5	Renovation of existing Library	45,8	$ 212 000	25%	Medium-term	
C8	Renovation & expansion of Music/Art School	45,2	$ 490 000	26%	Medium-term	Renovation and expansion capacity of the existing building
C10	Renovation of existing Theater - convert into a Museum	44,9	$ 212 000	21%	Medium-term	Renovation of the existing theater building to be converted into a museum
SW2	New Solid Waste Collection Points	44,6	$ 14 000	18%	Short-term	To be implemented across the city (3 in total planned within all priority areas)
S9	Renovation of existing Sports Facility	43,7	$ 711 000	25%	Short-term	Basketball, volleyball, football, running/athletics) - Central Stadium
R55	Pedestrian Pathway	42,9	$ 1 960	23%	Medium-term	Construction of a pedestrian pathway for convenient walking and socialising (also suitable for cycling)
R54	Pedestrian Pathway	42,2	$ 1 370	19%	Medium-term	Construction of a pedestrian pathway for adequate walking and socialising (also suitable for cycling)
P64	Pocket Public Space	41,6	$ 332 000	5%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
AN22	New Bus Stop	40,9	$ 6 100	25%	Medium-term	
AN21	New Bus Stop	39,1	$ 6 100	28%	Medium-term	
P27	Pocket Public Space	38,6	$ 293 000	6%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P65	Pocket Public Space	38,0	$ 34 000	3%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P28	Pocket Public Space	37,3	$ 70 000	4%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P26	Pocket Public Space	36,2	$ 164 000	5%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P20	Pocket Public Space	30,8	$ 717 000	5%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P19	Pocket Public Space	29,7	$ 490 000	4%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P18	Pocket Public Space	28,9	$ 616 000	3%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play

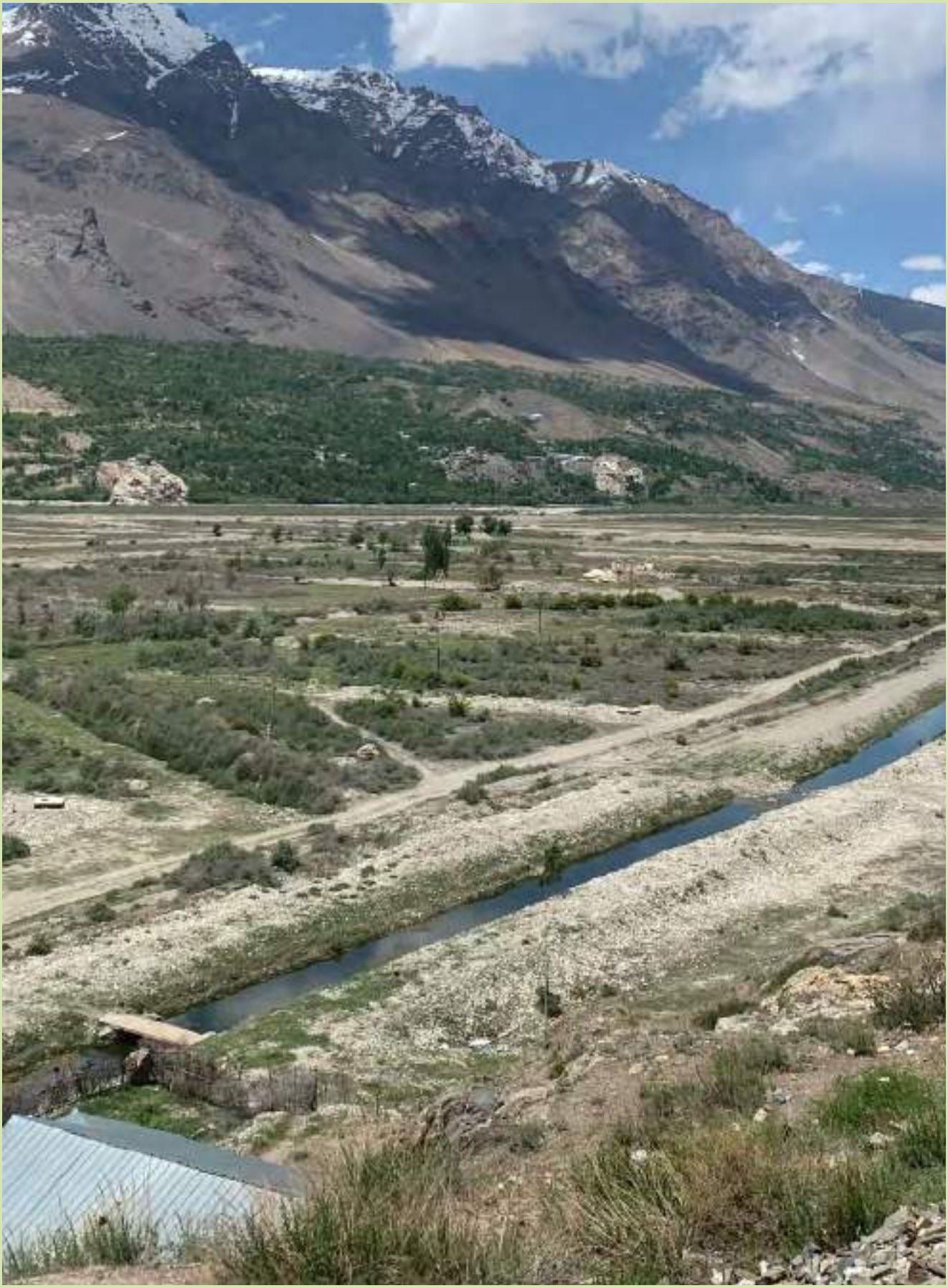
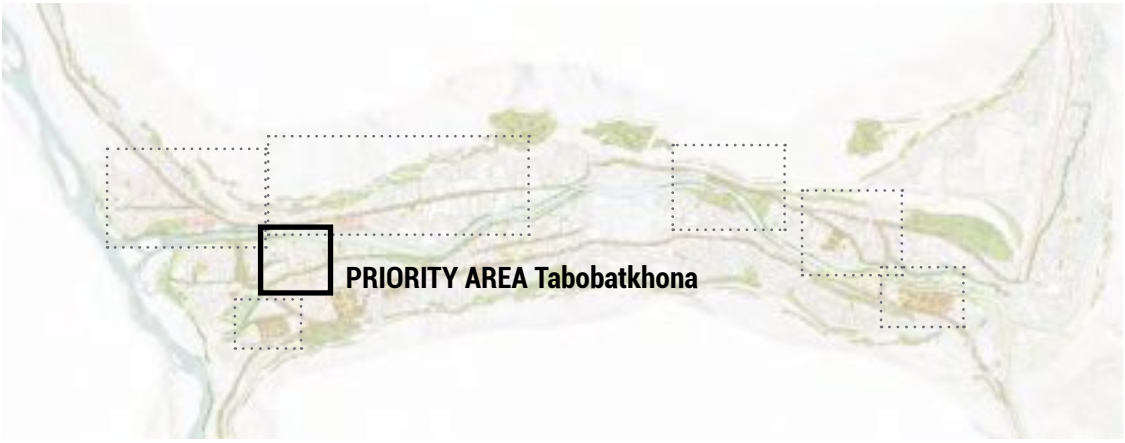


Fig 5. Khorog, UN-Habitat, September 2022



PROJECT AREA NAME	Priority Area Tabobatkhona
PROJECT AREA LOCATION	Mahalla Tabobatkhona
PROJECT AREA PARTNERS	Khorog Municipality Donors/Financiers/Private Sector Utility Service Providers International Development Agencies Potential External Partners
PROJECT AREA TIMELINE	**Short-term:** 2023-2025 **Medium-term:** 2026-2030 **Long-term:** beyond 2031 * suggested timeline per project outlined below
ESTIMATED BUDGET	USD **$7,682,000** * city-wide projects excluded from total **breakdown of costs per project outlined below
TARGET BENEFICIARY GROUP	**Direct Beneficiaries:** Residents and users of Tabobatkhona Mahalla **Indirect Beneficiaries:** Residents of Khorog Municipality * breakdown of impacted population per project outlined below
SDG ALIGNMENT	

PROBLEM STATEMENT

This Priority Area is disconnected from the city centre, due in some ways by its location adjacent to the river from above, and without sufficient permeability and connectivity to 'The Loop' below. The regional hospital located within this area functions at full capacity as is the largest in the region and with outdated basic services, and some congestion challenges, this area is at the intersection of a number of challenges. This Priority Area also has a poor quality of the natural and urban environment.

PROJECT OBJECTIVE

The primary objective for this Priority Area is to improve the quality of services provided (including as a priority, the regional hospital, with a proposed adjacent facility). A network of pedestrian and cycle-friendly pathways are also proposed to promote accessibility and reduce car-use through this area. These pathways connect a series of small parks that aim to improve the quality of the environment. One key improved intersection aims to both provide a public space as well as a traffic calming measure. Finally, a series of city-wide basic service improvements, and some small extensions of the existing networks will support the functioning of this Priority Area.

PROJECT IMPACT

This area will function much more efficiently for the purpose of the hospital, both in terms of accessibility and basic services. This will enhance Khorog's role as a regional centre. Improved mobility pathways and North-South accessibility across the Priority Area, will not only reduce congestion and road safety, it will also improve the permeability of the site and integrate it better with the rest of the city.

PROJECT PARTNER

- **Khorog Municipality & National Government**: Main responsible, owner and implementer of the projects' implementation in coordination with potential donors and external partners.
- **Donors/ Financiers/ Private Sector:** Funding entity(ies) would be requested to support the implementation of projects within Priority Area 3.
- **NGOs/CSOs:** Potential external partners could be considered to support the projects' implementation throughout the overall process (e.g. capacity building/training, maintenance plan, etc.).

PROJECT LIFE CYCLE

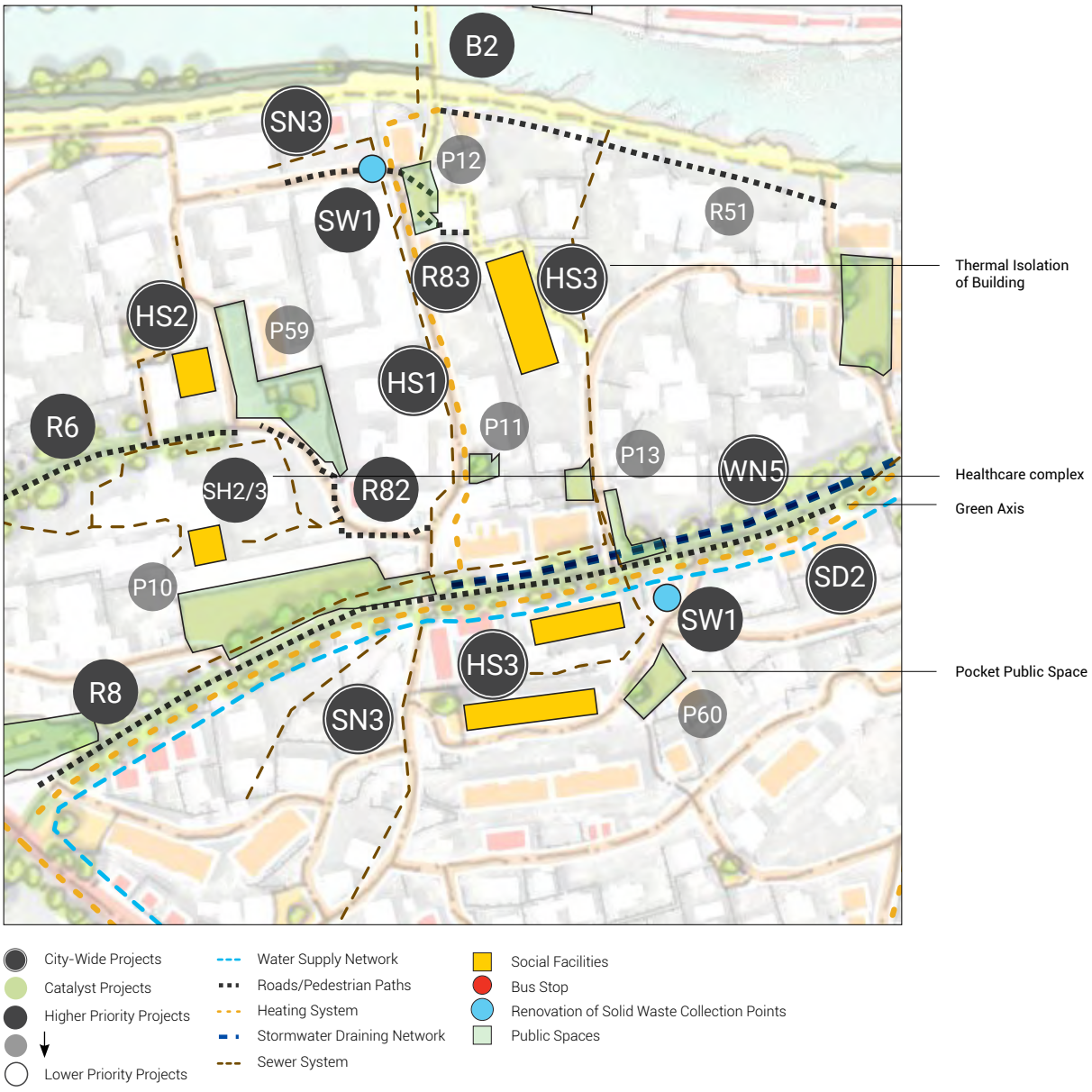
- **Risk Assessment:** to identify and analyse the potential risks that may occur during the implementation of each project as well as to determine the likelihood and potential impact of each risk.
- **Feasibility study:** preliminary exploratory assessment to examine technical, economic, financial, legal and environmental viability of projects.
- **Concept Design:** early phase of the design process to test function, form, linkages, requirements, etc.
- **Detailed Design:** stage where the concept design is refined and a complete precise set of plans are developed. At this stage, the projects are ready for implementation.
- **Construction and Maintenance:** implementation of the projects on the ground and regular maintenance works during projects' life span.
- **Monitoring and Evaluation:** framework that outlines the indicators that are used to track the progress of the projects to ensure whether all objectives are being achieved.

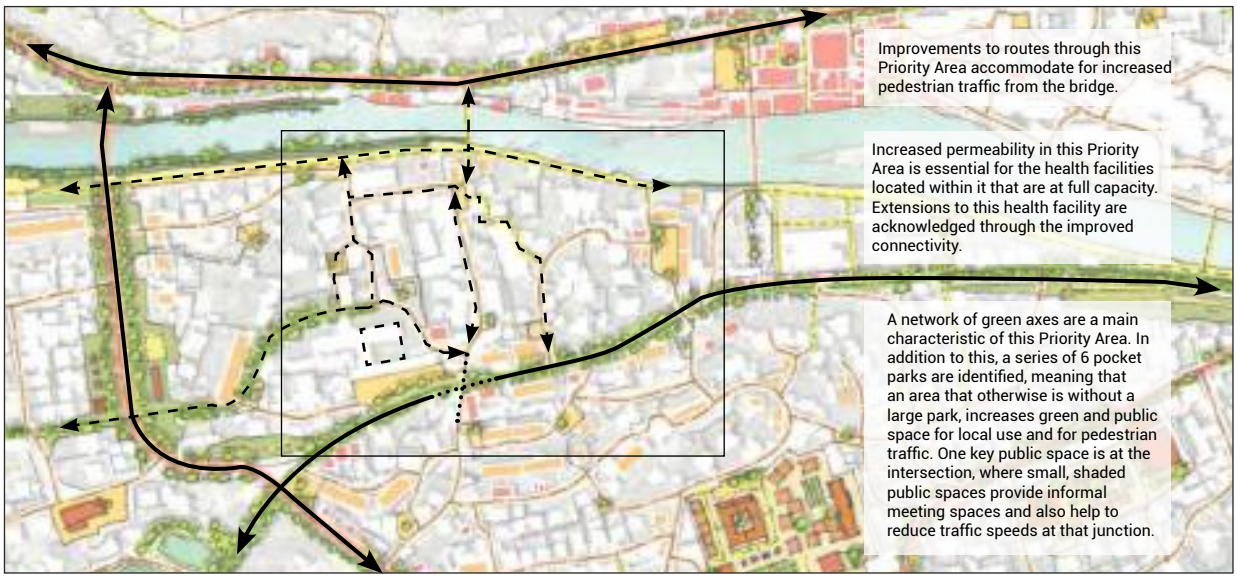
PROJECT FINANCIALS

Total Estimated Cost: $7,682,000
Current Investment Commitments and Type: External fund is needed
Investment Needs: Risk Assessment, Feasibility Study, Concept Design and Detailed Design, Construction and Maintenance Plan, Monitoring and Evaluation

ADDITIONAL SUPPORT NEEDED

Identification of synergies and/or dependencies between projects is critical to ensure a sustainable implementation of the Priority Area. This rationale of interlinkages and proximity between projects is reflected in the scoring process, however a more detailed assessment of budget availability and projects' time frame is needed to ensure the intended impact. Aspiring an impactful and sustainable implementation process, this investment card aims to support the Municipality of Khorog to consider the suggested projects when analysing investment decisions in order to align the budget envelops with investment needed - e.g. smaller projects that could be covered by own source revenues; education and health facilities that could be delivered by Central Government; infrastructure and wider development projects that could be of interest for donors/private sector to invest.


B2
SN3
P12
SW1
R51
R83
HS3
Thermal Isolation of Building
HS2
P59
HS1
R6
P11
P13
WN5
Healthcare complex
SH2/3
R82
Green Axis
P10
SD2
SW1
HS3
Pocket Public Space
R8
SN3
P60
City-Wide Projects
Catalyst Projects
Higher Priority Projects
Lower Priority Projects
Water Supply Network
Roads/Pedestrian Paths
Heating System
Stormwater Draining Network
Sewer System
Social Facilities
Bus Stop
Renovation of Solid Waste Collection Points
Public Spaces


Improvements to routes through this Priority Area accommodate for increased pedestrian traffic from the bridge.
Increased permeability in this Priority Area is essential for the health facilities located within it that are at full capacity. Extensions to this health facility are acknowledged through the improved connectivity.
A network of green axes are a main characteristic of this Priority Area. In addition to this, a series of 6 pocket parks are identified, meaning that an area that otherwise is without a large park, increases green and public space for local use and for pedestrian traffic. One key public space is at the intersection, where small, shaded public spaces provide informal meeting spaces and also help to reduce traffic speeds at that junction.

	PROJECT NAME	SCORE %	ESTIMATED COST	BENEFICIARIES % of future population	TIME FRAME	DESCRIPTION
SH2	Retrofitting Regional Hospital	70,7	$ 3 745 000	100%	Short-term	Renovation (expansion) due to overcapacity: even though the number of beneficiaries calculated based on the 15 min accessibility, the hospital serves the entire city and beyond
SH3	Centre for Disabilities - next to Reg. Hospital	68,5	$ 1 716 000	100%	Short-Medium Term	Expansion capacity of the Regional Hospital due to it's regional significance, which should also function as a safe haven
HS3	Thermal Isolation Soc. Facilities, Adm. Buildings	59,9		100%	Short-Medium Term	The project considers the thermal isolation of 57 (total city-wide) administrative buildings in Khorog. City-wide project. Not possible to estimate costs for heating projects
HS1	New Water Heating Pipeline Grid	59,9		100%	Medium-term	City-wide project: connected to a planned central heating system Not possible to estimate costs for heating projects
HS2	Heating Gas Pilot Project for Selected Schools & Hospitals Buildings	58,7		90%	Short-Medium Term	City-wide project Not possible to estimate costs for heating projects
SW1	Rehabilitation of Solid Waste Collection Points	58,6	$ 72 450	61%	Short-term	Rehabilitation of existing collection points (due to poor conditions) across the city - cost estimation for all points planned (23 in total planned within the priority areas)
WN5	Rehabilitation of the old Water Pipeline	57,0	$ 2 800 000	68%	Short-term	City-wide project: cost presented is for the entire project
B2	Pedestrian Bridge	56,5		29%	Short-term	Estimated costs included in Priority Area 2
SD2	Extending the existing Drainage Network	56,1	$ 5 270 000	78%	Short-term	City-wide project: cost presented is for the entire project
R8	Green Axis	55,8	$ 210 000	50%	Short-term	Redesign of the street (widening the pedestrian sidewalks, vegetation, infrastructure)
R83	Tarmacking existing Road	55,6	$ 2 200	29%	Short-term	Pavement of the existing road and overall upgrading to ensure multimodal movements (driving, cycling, pedestrian)
SN3	Renovation of the existing Sewer Network	55,2	$ 3 860 000	83%	Short-term	City-wide project: cost presented is for the entire project
R6	Green Axis	55,1	$ 67 000	23%	Short-term	Redesign of the street (widening the pedestrian sidewalks, vegetation, infrastructure)
R82	Tarmacking existing Road	54,6	$ 8 890	26%	Short-term	Pavement of the existing road and overall upgrading to ensure multimodal movements (driving, cycling, pedestrian)
R51	Pedestrian Pathway	46,5	$ 3 900	32%	Short-term	Construction of a pedestrian pathway for convenient walking and socialising (also suitable for cycling)
P11	Pocket Public Space	45,5	$ 59 000	8%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P13	Pocket Public Space	45,4	$ 140 000	8%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P60	Pocket Public Space	45,6	$ 121 000	8%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P10	Pocket Public Space	44,6	$ 1 000 000	8%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P59	Pocket Public Space	43,4	$ 574 000	7%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P12	Pocket Public Space	41,4	$ 150 000	5%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play

Reminder:

- Scored above 50
- Is a city-wide project
- Scored below 50
- Scored very low
- Is a project that other projects rely on / is fundamental to the transformation of this area

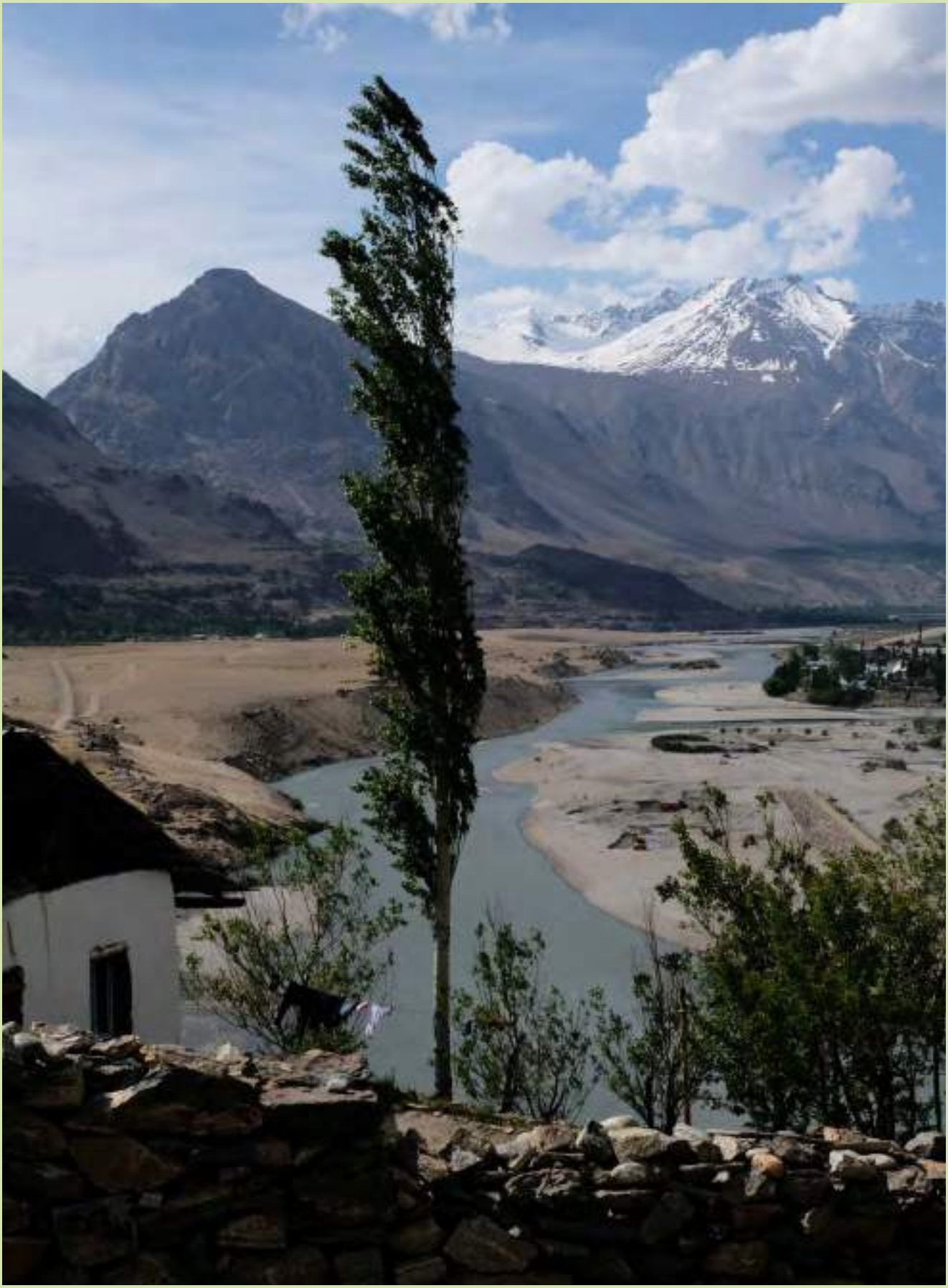


Fig 6. Khorog, UN-Habitat, September 2022

PROJECT AREA NAME	Priority Area Khorugi Bolo - Tircid
PROJECT AREA LOCATION	Mahalla Khorugi Bolo Mahalla Tircid
PROJECT AREA PARTNERS	Khorog Municipality Donors/Financiers/Private Sector Utility Service Providers International Development Agencies Potential External Partners
PROJECT AREA TIMELINE	**Short-term:** 2023-2025 **Medium-term:** 2026-2030 **Long-term:** beyond 2031 * suggested timeline per project outlined below
ESTIMATED BUDGET	USD **$21,000 000** * city-wide projects excluded from total **breakdown of costs per project outlined
TARGET BENEFICIARY GROUP	**Direct Beneficiaries:** Residents and users of Khorugi Bolo and Tircid Mahallas **Indirect Beneficiaries:** Residents of Khorog Municipality * breakdown of impacted population per project outlined below
SDG ALIGNMENT	

PROBLEM STATEMENT

Priority Area Khorugi Bolo - Tircid is located characterised by the large City Parks and a number of structures that are no longer functional. This means that there is a potential for delivering social services. This priority area is located in close proximity to the mountain slope, meaning that the main multi-modal axis, the key route through the city, is at risk of hazards, which would have wider consequences on accessibility for the rest of the city. There is also a lack of pedestrian infrastructure in this area, meaning that there is low pedestrian accessibility through this central point.

PROJECT OBJECTIVE

The objective of this Priority Area is to revitalise under-utilised land as well as non-functional structures within this area and regenerate them for the use of small-scale economic purposes such as a farmers market. In addition, the proposals for this area aim to improve the North-South connectivity of the city, through the renovation of community facilities and the pedestrian bridge.

PROJECT IMPACT

Improving the safety and resilience of this area is key to these city objectives for the city as a whole, due to the strategic location of this Priority Area. In addition, proposals for this area will create a new recreational and cultural centre.

PROJECT PARTNER

- **Khorog Municipality & National Government**: Main responsible, owner and implementer of the projects' implementation in coordination with potential donors and external partners.
- **Donors/ Financiers/ Private Sector:** Funding entity(ies) would be requested to support the implementation of projects within Priority Area 4.
- **NGOs/CSOs:** Potential external partners could be considered to support the projects' implementation throughout the overall process (e.g. capacity building/training, maintenance plan, etc.).

PROJECT LIFE CYCLE

- **Risk Assessment:** to identify and analyse the potential risks that may occur during the implementation of each project as well as to determine the likelihood and potential impact of each risk.
- **Feasibility study:** preliminary exploratory assessment to examine technical, economic, financial, legal and environmental viability of projects.
- **Concept Design:** early phase of the design process to test function, form, linkages, requirements, etc. **Detailed Design:** stage where the concept design is refined and a complete precise set of plans are developed. At this stage, the projects are ready for implementation.
- **Construction and Maintenance:** implementation of the projects on the ground and regular maintenance works during projects' life span.
- **Monitoring and Evaluation:** framework that outlines the indicators that are used to track the progress of the projects to ensure whether all objectives are being achieved.

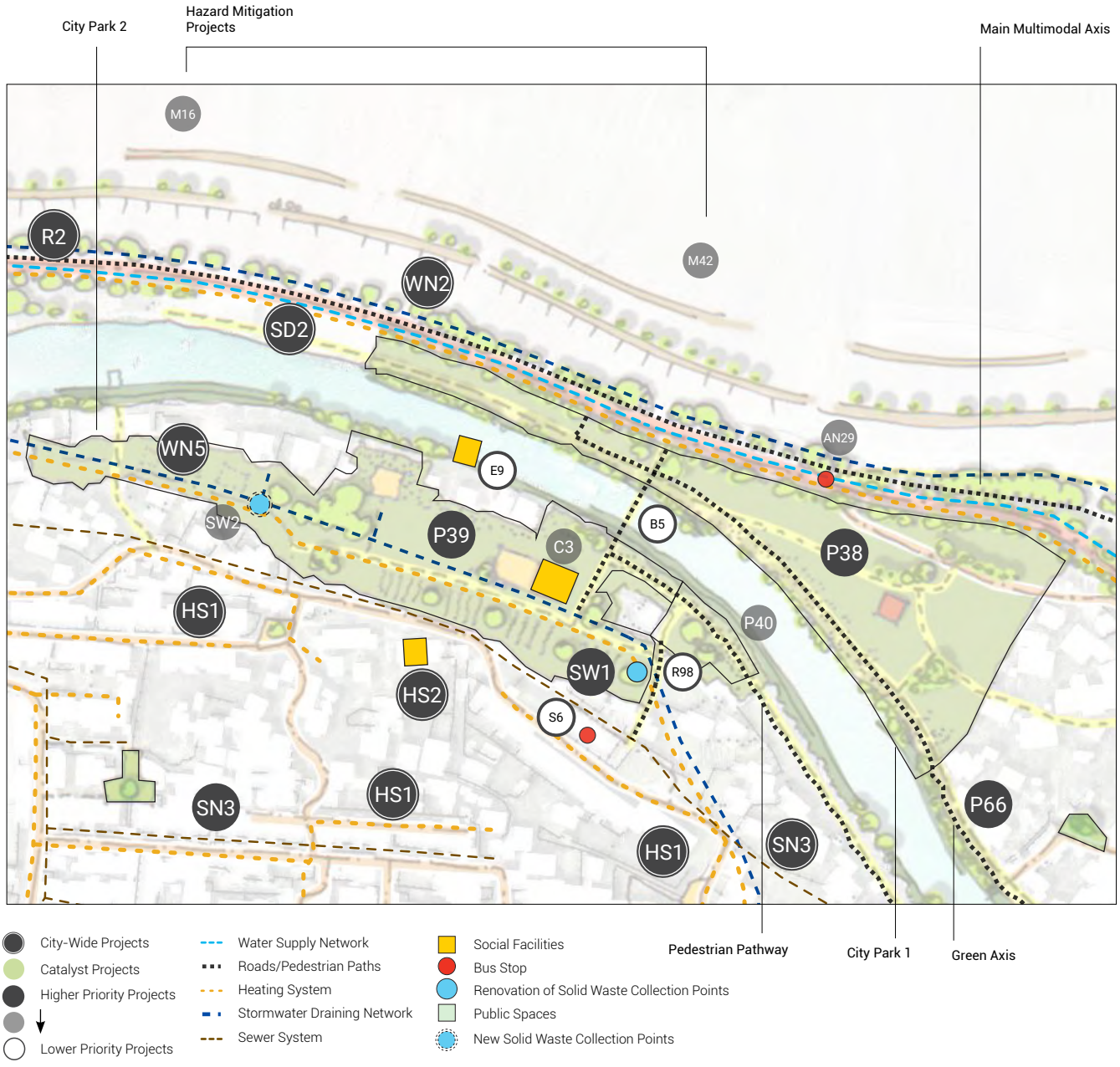
PROJECT FINANCIALS

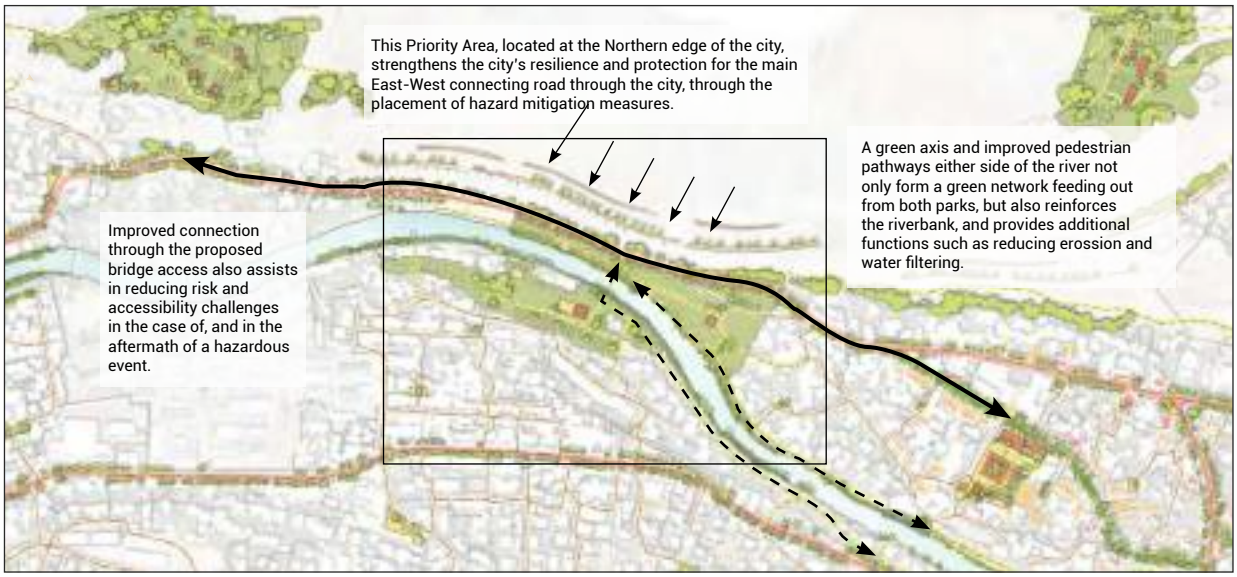
Total Estimated Cost: $21,000 000
Current Investment Commitments and Type: External fund is needed

Investment Needs: Risk Assessment, Feasibility Study, Concept Design and Detailed Design, Construction and Maintenance Plan, Monitoring and Evaluation

ADDITIONAL SUPPORT NEEDED

Identification of synergies and/or dependencies between projects is critical to ensure a sustainable implementation of the Priority Area. This rationale of interlinkages and proximity between projects is reflected in the scoring process, however a more detailed assessment of budget availability and projects' time frame is needed to ensure the intended impact. Aspiring an impactful and sustainable implementation process, this investment card aims to support the Municipality of Khorog to consider the suggested projects when analysing investment decisions in order to align the budget envelops with investment needed - e.g. smaller projects that could be covered by own source revenues; education and health facilities that could be delivered by Central Government; infrastructure and wider development projects that could be of interest for donors/private sector to invest.


City Park 2
Hazard Mitigation Projects
Main Multimodal Axis
M16
R2
WN2
M42
SD2
WN5
AN29
E9
SW2
P39
C3
B5
P38
HS1
P40
SW1
R98
HS2
S6
SN3
HS1
HS1
SN3
P66
Pedestrian Pathway
City Park 1
Green Axis
City-Wide Projects
Catalyst Projects
Higher Priority Projects
Lower Priority Projects
Water Supply Network
Roads/Pedestrian Paths
Heating System
Stormwater Draining Network
Sewer System
Social Facilities
Bus Stop
Renovation of Solid Waste Collection Points
Public Spaces
New Solid Waste Collection Points


This Priority Area, located at the Northern edge of the city, strengthens the city's resilience and protection for the main East-West connecting road through the city, through the placement of hazard mitigation measures.
Improved connection through the proposed bridge access also assists in reducing risk and accessibility challenges in the case of, and in the aftermath of a hazardous event.
A green axis and improved pedestrian pathways either side of the river not only form a green network feeding out from both parks, but also reinforces the riverbank, and provides additional functions such as reducing erossion and water filtering.

	PROJECT NAME	SCORE %	ESTIMATED COST	BENEFICIARIES % of future population	TIME FRAME	DESCRIPTION
HS1	New Water Heating Pipeline Grid	59,9		100%	Medium-term	City-wide project: connected to a planned central heating system Not possible to estimate costs for heating projects
HS2	Heating Gas Pilot Project for Selected Schools & Hospitals Buildings	58,7		90%	Short-Medium Term	City-wide project Not possible to estimate costs for heating projects
SW1	Rehabilitation of Solid Waste Collection Points	58,6	$ 72 450	61%	Short-term	Rehabilitation of existing collection points (due to poor conditions) across the city - cost estimation for all points planned (23 in total planned within all priority areas)
WN5	Rehabilitation of the Old Water Pipeline	57,0	$ 2 800 000	68%	Short-term	City-wide project: cost presented is for the entire project
SD2	Extending the existing Drainage Network	56,1	$ 5 273 000	78%	Short-term	City-wide project: cost presented is for the entire project
R66	Pedestrian Pathway	55,4	$ 17 500	33%	Short-term	Construction of a pedestrian pathway for convenient walking and socialising (also suitable for cycling)
SN3	Renovation of the existing Sewer Network	55,2	$ 3 860 000	83%	Short-term	City-wide project: cost presented is for the entire project
R2	Main Multimodal Axis (loop)	53,3	$1 009 000	44%	Short-term	City-wide project: total cost for the loop (R1, R2, R3, R4) presented R2 estimated cost: $ 241 000
WN2	Rehabilitation of Irrigation	53,0	$ 972 000	25%	Short-term	City-wide project: cost presented is for the entire project
P38	City Park 1	51,3	$ 9 145 000	15%	Short-term	Construction of a park with green areas, community gardening, places to rest and socialise, areas for children, youth and elderly people
P39	City Park 2	50,6	$ 8 490 000	11%	Short-term	Construction of a park with green areas, places to rest and socialise, areas for children, youth and elderly people
AN29	New Bus Stop	49,7	$ 6 100	11%	Short-term	
M16	Hazard Mitigation to Prevent Rockfalls	48,4			Short-term	Not possible to estimate costs (detailed design is needed). Impacted beneficiaries is 0% as only direct beneficiaries were assessed. For a more accurate result, a risk assessment is required to identify indirect population impacted by the project.
M42	Hazard Mitigation to Prevent Rockfalls	48,4			Short-term	
P40	Public Space with a Landmark	48,0	$ 789 000	20%	Short-term	Construction of the public space around existing Jamoatkhana to integrate it into the urban environment, creating a vibrant area
SW2	New Solid Waste Collection Points	44,6	$ 14 200	18%	Short-term	To be implemented across the city (3 in total planned within all priority areas)
C3	Renovation of existing Community Centre	42,7	$ 1 372 000	11%	Short-term	Renovation of the existing building to accommodate library and Jamoatkhona
R98	Tarmacking the existing Pedestrian Pathway	34,7	$ 1 600	11%	Short-term	Upgrading the existing pathway to ensure convenient and safe walking, cycling, and socialising conditions
B5	Pedestrian Bridge	32,7	$ 615 000	10%	Short-term	Construction of the pedestrian bridge connecting the two city park areas to improve connectivity and accessibility
S6	Renovation of existing Sports Facility	31,1	$ 154 000	13%	Short-term	Basketball, volleyball and football
E9	River Bank Reinforcement	29,2	$ 342 000		Short-term	Impacted beneficiaries is 0% as only direct beneficiaries were assessed. For a more accurate result, a risk assessment is required to identify indirect population impacted by the project.

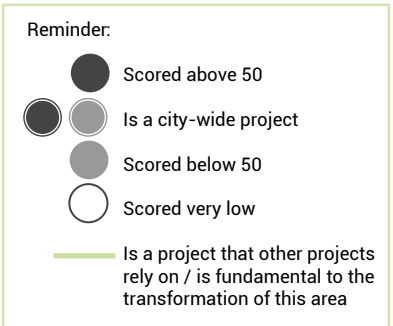


Fig 7. Khorog, UN-Habitat, September 2022

PROJECT AREA NAME	Priority Area Khorugi Bolo
PROJECT AREA LOCATION	Mahalla Khorugi Bolo
PROJECT AREA PARTNERS	Khorog Municipality Donors/Financiers/Private Sector Utility Service Providers International Development Agencies Potential External Partners
PROJECT AREA TIMELINE	**Short-term:** 2023-2025 **Medium-term:** 2026-2030 **Long-term:** beyond 2031 * suggested timeline per project outlined below
ESTIMATED BUDGET	USD **$13 700 000** * city-wide projects excluded from total **breakdown of costs per project outlined below
TARGET BENEFICIARY GROUP	**Direct Beneficiaries:** Residents and users of Khorugi Bolo Mahalla **Indirect Beneficiaries:** Residents of Khorog Municipality * breakdown of impacted population per project outlined below
SDG ALIGNMENT	

PROBLEM STATEMENT

The design solutions for the Priority Area Khorugi Bolo target problematic issues linked with connectivity and accessibility to adequate services, as well as poor conditions of existing services, such as kindergartens. The existing truck depot is a key opportunity in order to provide services for the North of the city. While there is a high concentration of activities and mobility of people, adequate access and connectivity to infrastructure and services is still a critical issue in this area.

PROJECT OBJECTIVE

The objective of this transformative area is therefore to create a new multi-functional node in the northeast side of the city with improved education, health and recreational facilities while developing the existing under-utilised land with proposed mixed-use development. By redesigning the existing bridge to accommodate pedestrian and cycle infrastructure, the connectivity between the northern and southern parts of the city will be enhanced.

PROJECT IMPACT

The regeneration of this area will create a new functional hub with improved accessibility to a diversity of services. New connecting streets and improved pedestrian pathways will increase the permeability of the site and provide better accessibility to the key services while enhancing the vibrancy of the area.

PROJECT PARTNER

- **Khorog Municipality & National Government**: Main responsible, owner and implementer of the projects' implementation in coordination with potential donors and external partners.
- **Donors/ Financiers/ Private Sector:** Funding entity(ies) would be requested to support the implementation of projects within Priority Area 5.
- **NGOs/CSOs:** Potential external partners could be considered to support the projects' implementation throughout the overall process (e.g. capacity building/training, maintenance plan, etc.).

PROJECT LIFE CYCLE

- **Risk Assessment:** to identify and analyse the potential risks that may occur during the implementation of each project as well as to determine the likelihood and potential impact of each risk.
- **Feasibility study:** preliminary exploratory assessment to examine technical, economic, financial, legal and environmental viability of projects.
- **Concept Design:** early phase of the design process to test function, form, linkages, requirements, etc.
- **Detailed Design:** stage where the concept design is refined and a complete precise set of plans are developed. At this stage, the projects are ready for implementation.
- **Construction and Maintenance:** implementation of the projects on the ground and regular maintenance works during projects' life span.
- **Monitoring and Evaluation:** framework that outlines the indicators that are used to track the progress of the projects to ensure whether all objectives are being achieved.

PROJECT FINANCIALS

Total Estimated Cost: $13 700 000

Current Investment Commitments and Type: External fund is needed

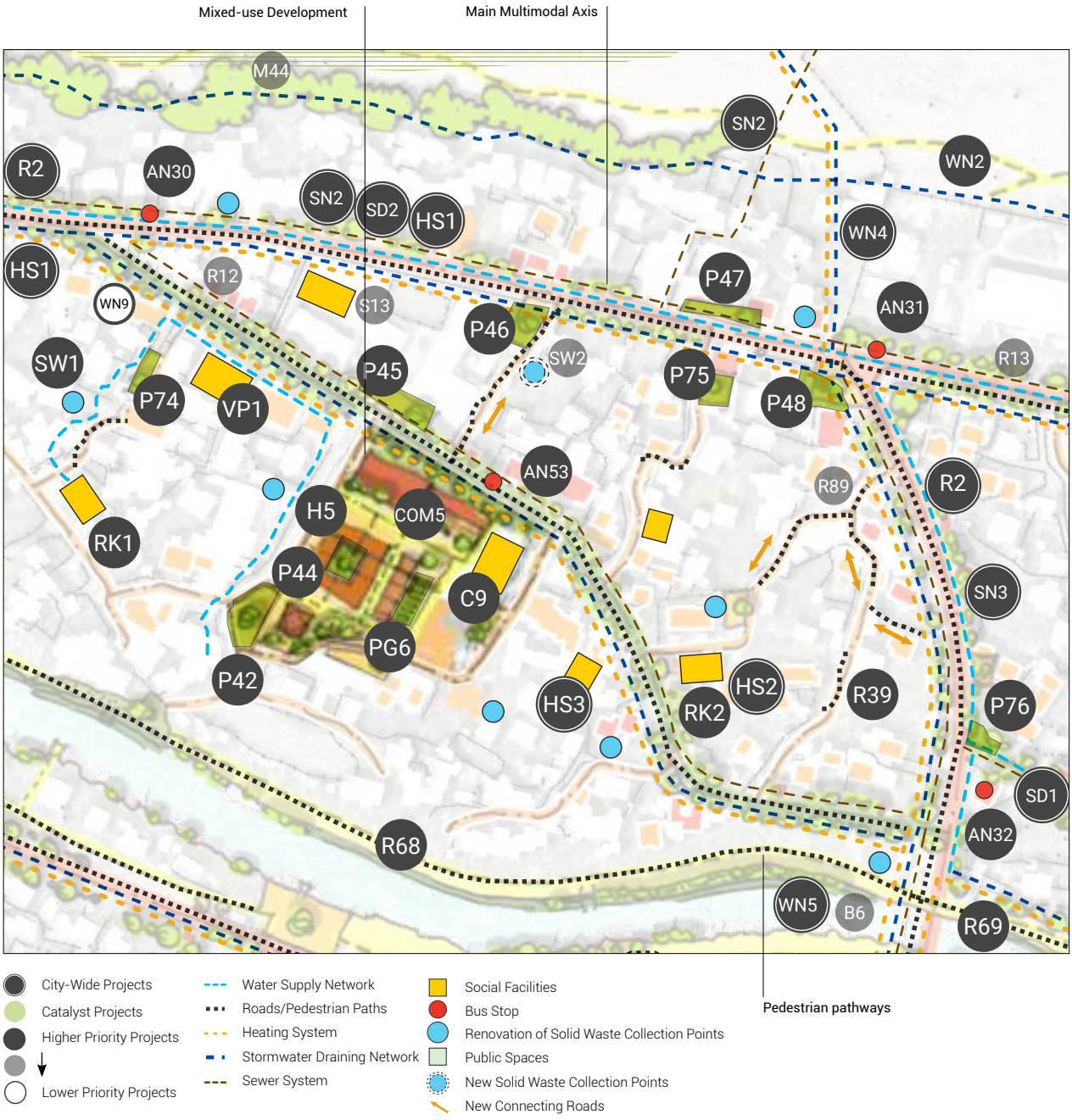
Investment Needs: Risk Assessment, Feasibility Study, Concept Design and Detailed Design, Construction and Maintenance Plan, Monitoring and Evaluation

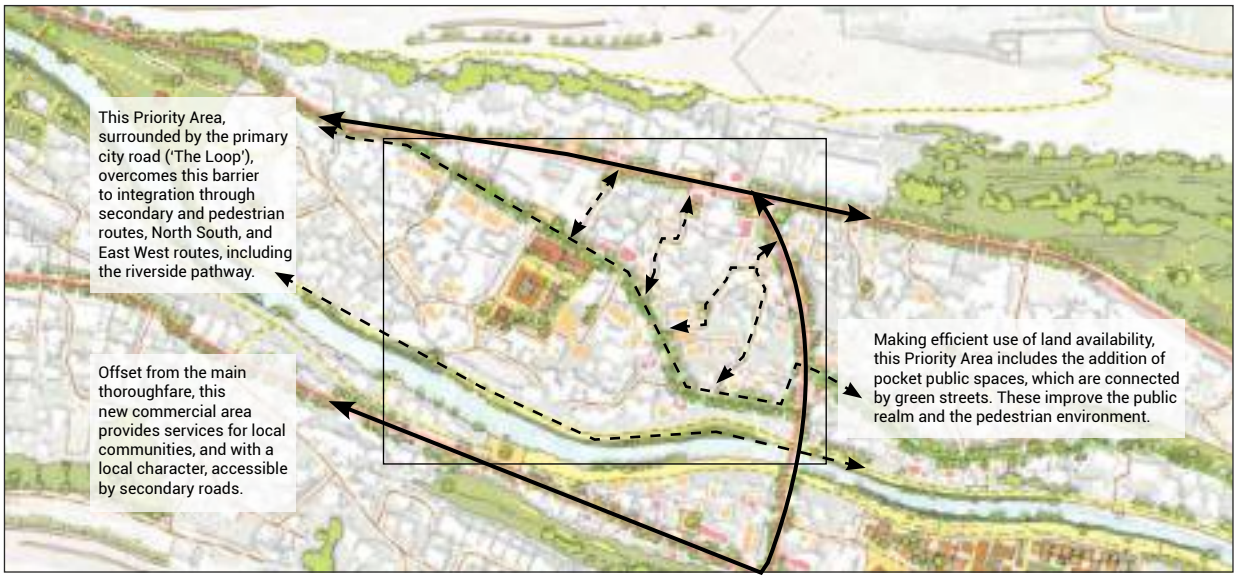
ADDITIONAL SUPPORT NEEDED

Identification of synergies and/or dependencies between projects is critical to ensure a sustainable implementation of the Priority Area. This rationale of interlinkages and proximity between projects is reflected in the scoring process, however a more detailed assessment of budget availability and projects' time frame is needed to ensure the intended impact. Aspiring an impactful and sustainable implementation process, this investment card aims to support the Municipality of Khorog to consider the suggested projects when analysing investment decisions in order to align the budget envelops with investment needed - e.g. smaller projects that could be covered by own source revenues; education and health facilities that could be delivered by Central Government; infrastructure and wider development projects that could be of interest for donors/private sector to invest.

ADDITIONAL SUPPORT NEEDED

Identification of synergies and/or dependencies between projects is critical to ensure a sustainable implementation of the Priority Area. This rationale of interlinkages and proximity between projects is reflected in the scoring process, however a more detailed assessment of budget availability and projects' time frame is needed to ensure the intended impact. Aspiring an impactful and sustainable implementation process, this investment card aims to support the Municipality of Khorog to consider the suggested projects when analysing investment decisions in order to align the budget envelops with investment needed - e.g. smaller projects that could be covered by own source revenues; education and health facilities that could be delivered by Central Government; infrastructure and wider development projects that could be of interest for donors/private sector to invest.


Mixed-use Development
Main Multimodal Axis
M44
R2
AN30
SN2
SD2
HS1
HS1
R12
WN9
S13
SW1
P74
VP1
P45
P46
SW2
P47
AN31
WN2
WN4
SN2
P75
P48
R13
AN53
R89
R2
H5
COM5
RK1
P44
C9
SN3
PG6
P42
HS3
RK2
HS2
R39
P76
SD1
AN32
R68
WN5
B6
R69
City-Wide Projects
Catalyst Projects
Higher Priority Projects
Lower Priority Projects
Water Supply Network
Roads/Pedestrian Paths
Heating System
Stormwater Draining Network
Sewer System
Social Facilities
Bus Stop
Renovation of Solid Waste Collection Points
Public Spaces
New Solid Waste Collection Points
New Connecting Roads
Pedestrian pathways


This Priority Area, surrounded by the primary city road ('The Loop'), overcomes this barrier to integration through secondary and pedestrian routes, North South, and East West routes, including the riverside pathway.
Offset from the main thoroughfare, this new commercial area provides services for local communities, and with a local character, accessible by secondary roads.
Making efficient use of land availability, this Priority Area includes the addition of pocket public spaces, which are connected by green streets. These improve the public realm and the pedestrian environment.

	PROJECT NAME	SCORE %	ESTIMATED COST	BENEFICIARIES % of future population	TIME FRAME	DESCRIPTION
C9	Renovation of existing Music/Art Centre	66,3	$ 312 000	19%	Short-term	Renovation of the existing building due to poor conditions
P44	Community Public Space	64,6	$ 165 000	17%	Short-term	Community public space with vegetation, places to rest, sit and play
AN53	New Bus Stop	64,4	$ 6 100	19%	Short-term	
PG6	Green Public Space with Community Garden	64,1	$ 75, 000	17%	Short-Medium Term	Green public space, park with community gardening (garden beds for growing vegetables, etc.)
RK2	Renovation of Kindergarten 4	64,0	$ 1 188 000	20%	Short-Medium Term	Renovation due to poor conditions
RK1	Renovation of Kindergarten 3	63,3	$ 454 000	15%	Short-term	Renovation due to poor conditions
AN32	New Bus Stop	61,5	$ 6 100	21%	Short-term	
AN31	New Bus Stop	61,2	$ 6 100	20%	Short-Medium Term	
VP1	Medical College (Hospital 6)	60,1	$ 914 000	18%	Medium-term	Expansion of the existing building due to overcapacity
HS3	Thermal Isolation Soc. Facilities, Adm. Buildings	59,9		100%	Short-Medium Term	City-wide project: The project considers the thermal isolation of 57 (total city-wide) administrative buildings in Khorog. Not possible to estimate costs for heating projects.
HS1	New Water Heating Pipeline Grid	59,9		100%	Medium-term	City-wide project: connected to a planned coal central heating system Not possible to estimate costs for heating projects
COM5	New Commercial Area	59,5	$ 1 030 000	19%	Short-term	Construction of a new commercial area, a part of mixed use development
HS2	Heating Gas Pilot Project for Selected Schools & Hospitals Buildings	58,7		90%	Short-Medium Term	City-wide project Not possible to estimate costs for heating projects
SW1	Rehabilitation of Solid Waste Collection Points	58,6	$ 72 450	61%	Short-term	Rehabilitation of existing collection points (due to poor conditions) across the city - cost estimation for all points planned (23 in total planned within all priority areas)
SD1	Rehabilitation of the existing Drainage Calvets	57,3	$ 3 275 000	71%	Short-term	City-wide project: cost presented is for the entire project
WN5	Rehabilitation of the Old Water Pipeline	57,0	$ 2 800 000	68%	Short-term	City-wide project: cost presented is for the entire project
SN2	Extension of Sewer Network	57,0	$ 5 703 000	70%	Short-term	City-wide project: cost presented is for the entire project
R69	Pedestrian Pathway	56,7	$ 9 800	26%	Short-term	Construction of a pedestrian pathway for convenient walking and socialising (also suitable for cycling)
WN4	Rehabilitation of existing 14km Water Line	56,7	$ 1 367 000	63%	Short-term	City-wide project: cost presented is for the entire project
SD2	Extending the existing Stormwater/Drainage Network	56,1	$ 5 272 000	78%	Short-term	City-wide project: cost presented is for the entire project
P75	Pocket Public Space	55,8	$ 97 000	9%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
SN3	Renovation of the existing Sewer Network	55,2	$ 3 860 000	83%	Short-Medium Term	City-wide project: cost presented is for the entire project
AN30	New Bus Stop	54,7	$ 6 100	17%	Short-term	
R68	Pedestrian Pathway	54,5	$ 131	30%	Short-term	Construction of a pedestrian pathway for convenient walking and socialising (also suitable for cycling)
P42	Pocket Public Space	54,2	$ 251 000	6%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play

	PROJECT NAME	SCORE %	ESTIMATED COST	BENEFICIARIES % of future population	TIME FRAME	DESCRIPTION
P45	Pocket Public Space	54,2	$ 254 000	6%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
H5	New Housing Development	54,1	$ 7 540 000	1%	Short-term	Housing development within new proposed mixed use area
R2	Main Multimodal Axis (loop)	53,3	$1 009 000	44%	Short-term	City-wide project: total cost for the loop (R1, R2, R3, R4) presented R2 estimated cost: $ 241 000
P48	Pocket Public Space	53,0	$ 187 000	6%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P76	Pocket Public Space	52,9	$ 77 000	9%	Short-Medium Term	Construction of a small public space with vegetation, places to sit, rest and play
P47	Pocket Public Space	52,1	$ 98 000	5%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P74	Pocket Public Space	52,1	$ 57 000	6%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P46	Pocket Public Space	51,4	$ 180 000	5%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
M44	Hazard Mitigation to Prevent Rockfalls	49,7			Short-term	Not possible to estimate costs (detailed design is needed). Impacted beneficiaries is 0% as only direct beneficiaries were assessed. For a more accurate result, a risk assessment is required to identify indirect population impacted by the project.
R89	Tarmacking the existing Road	49,6	$ 4 800	21%	Short-Medium Term	Pavement of the existing road and upgrading the road to ensure multimodal movements
R12	Green Axis	48,0	$ 58 000	21%	Medium-term	Redesign of the street (widening the pedestrian sidewalks, vegetation, infrastructure)
B6	Renovation of existing Bridge	46,1	$ 617 000	22%	Short-term	Renovation of existing bridge to include infrastructure for pedestrian and cycling lanes
R13	Green Axis	46,1	$ 217 000	28%	Short-term	Redesign of the street (widening the pedestrian sidewalks, vegetation, infrastructure)
S13	Renovation of existing Sports Facility	45,0	$ 93 600	18%	Short-term	Basketball, volleyball and football, and playground (planned)
SW2	New Solid Waste Collection Points	44,6	$ 14 200	18%	Short-term	To be implemented across the city (3 in total planned within all priority areas)
WN9	New Water Supply Pipeline	29,7	$ 294 000	16%	Short-term	City-wide project: cost presented is for the entire project

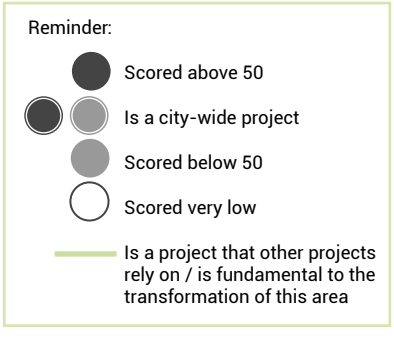


Fig 8. Tajikistan, UN-Habitat, September 2022

PROJECT AREA TITLE	Priority Area Tabobatkhona
PROJECT AREA LOCATION	Mahalla Tabobatkhona
PROJECT AREA PARTNERS	Khorog Municipality Donors/Financiers/Private Sector Utility Service Providers International Development Agencies Potential External Partners
PROJECT AREA TIMELINE	**Short-term:** 2023-2025 **Medium-term:** 2026-2030 **Long-term:** beyond 2031 * suggested timeline per project outlined below
ESTIMATED BUDGET	USD **$44 000 000** * city-wide projects excluded from total **breakdown of costs per project outlined
TARGET BENEFICIARY GROUP	**Direct Beneficiaries:** Residents and users of Tabobatkhona Mahalla **Indirect Beneficiaries:** Residents of Khorog Municipality * breakdown of impacted population per project outlined below
SDG ALIGNMENT	

PROBLEM STATEMENT

The design solutions for **Priority Area Tabobatkhona** target problematic issues that can be found in the contexts of mountainous areas. As such, the design approach and demonstration projects aimed to set an example of how to address and respond to the challenges represented by urban expansion in hazard areas, limited land for development, car dependency, urban fragmentation, insufficient utility infrastructure and inequitable distribution of social facilities.

PROJECT OBJECTIVE

The objective of the transformative area is to create a growth economic node 2 in Tabobatkhona and Barakat. Currently, this node provides a number of employment opportunities in public services provision, however, private sector productivity in the area is low. The demonstration project will boost the emergence of private businesses and attraction of investment opportunities due to proximity to public services, good connectivity, and strategic location near to the entrance to the city from the main road. The connectivity of the node will be supported by the vehicular bridge (Saifullo Abdulo to Sharifobod), which will bring traffic flow to the area and expand its service coverage to peripheral city neighbourhoods. In addition, the construction of the bride will connect the node with the airport and proposed new economic zone, which will create enabling conditions for promoting more sectoral functions within the site A (food production, agricultural services, technologies, and tourism, etc.)

In addition to bringing new functions and services, the area aims to create a liveable and comfortable urban environment for communities both from the surrounding areas and entire city. By allocating a diversity of services targeting different social groups, the area will become a service hub that would cover the deficit in education, healthcare and leisure in the surrounding areas and the city. Doing so will create a more social cohesion through creating equitable service provision.

PROJECT IMPACT

Once the project is implemented it can accommodate 794 people and provide 436 jobs, providing an alternative option for housing and employment for those communities that are residing in the areas prone to hazards and facilitate a more efficient use of land resources within the built-up area.

The proposed IT park will create immense business and employment opportunities, supporting the area as a new economic node. The suggested hotels and apartments will attract tourism to the area, which is an important factor in popularizing local culture and production. The demonstration project will provide a school for 800 places and a kindergarten for 200 places and sports playgrounds that will be opened for public- these will cover not only the population of the new neighbourhood but also the demand of the surroundings considering the potential growth.

The solutions on urban vegetation, urban farming, integration of slopes into the urban environment will reconnect this part of the Khorog with its unique nature and landscape, creating an attractive environment for residents and tourists.

Instead of a gated area of underutilized pocket of land, the implemented demonstration project will act as a connection within the city, linking neighbourhoods to employment, public spaces and the surrounding environment.

PROJECT PARTNER

- **Khorog Municipality & National Government**: Main responsible, owner and implementer of the projects' implementation in coordination with potential donors and external partners.
- **Donors/ Financiers/ Private Sector:** Funding entity(ies) would be requested to support the implementation of projects within Priority Area A.
- **NGOs/CSOs:** Potential external partners could be considered to support the projects' implementation throughout the overall process (e.g. capacity building/training, maintenance plan, etc.).

PROJECT LIFE CYCLE

- **Risk Assessment:** to identify and analyse the potential risks that may occur during the implementation of each project as well as to determine the likelihood and potential impact of each risk.

- **Feasibility study:** preliminary exploratory assessment to examine technical, economic, financial, legal and environmental viability of projects.

- **Concept Design:** early phase of the design process to test function, form, linkages, requirements, etc.

- **Detailed Design:** stage where the concept design is refined and a complete precise set of plans are developed. At this stage, the projects are ready for implementation.
- **Construction and Maintenance:** implementation of the projects on the ground and regular maintenance works during projects' life span.
- **Monitoring and Evaluation:** framework that outlines the indicators that are used to track the progress of the projects to ensure whether all objectives are being achieved.

PROJECT FINANCIALS

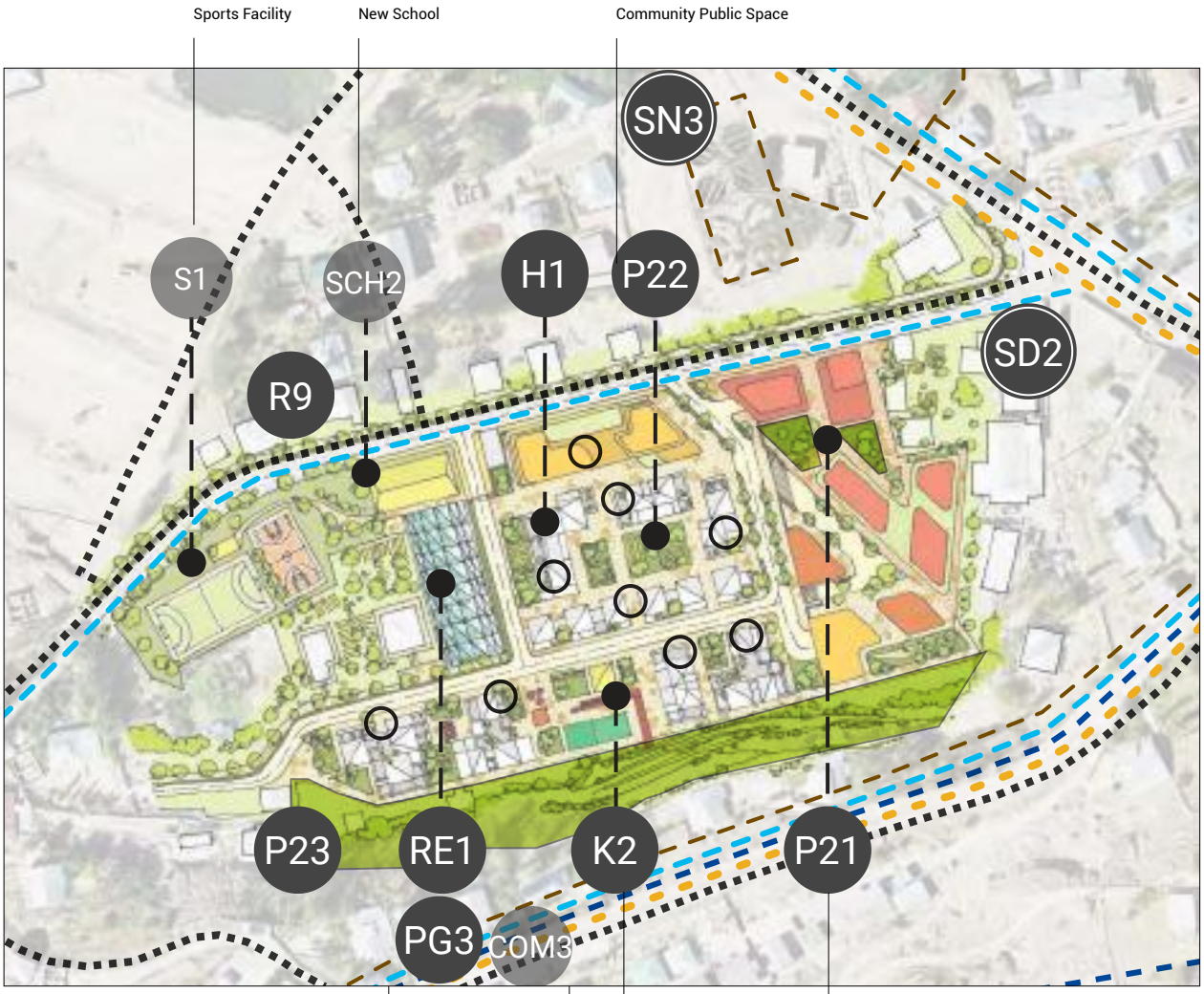
Total Estimated Cost: $44 000 000

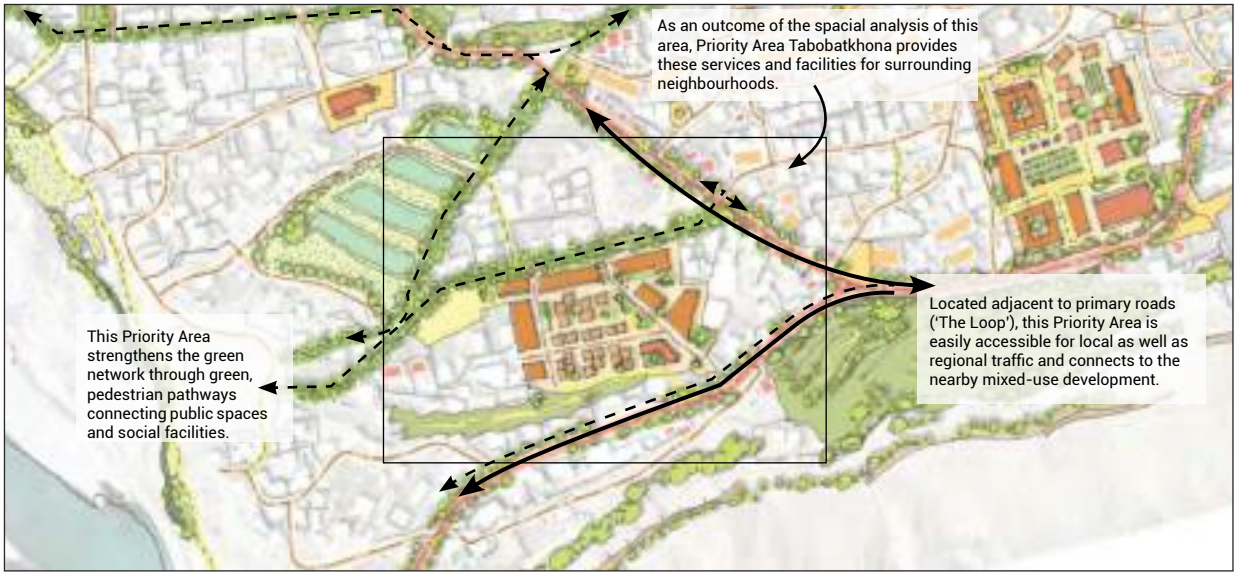
Current Investment Commitments and Type: External fund is needed

Investment Needs: Risk Assessment, Feasibility Study, Concept Design and Detailed Design, Construction and Maintenance Plan, Monitoring and Evaluation

ADDITIONAL SUPPORT NEEDED

Identification of synergies and/or dependencies between projects is critical to ensure a sustainable implementation of the Priority Area. This rationale of interlinkages and proximity between projects is reflected in the scoring process, however a more detailed assessment of budget availability and projects' time frame is needed to ensure the intended impact. Aspiring an impactful and sustainable implementation process, this investment card aims to support the Municipality of Khorog to consider the suggested projects when analysing investment decisions in order to align the budget envelops with investment needed - e.g. smaller projects that could be covered by own source revenues; education and health facilities that could be delivered by Central Government; infrastructure and wider development projects that could be of interest for donors/private sector to invest.


Sports Facility
New School
Community Public Space
SN3
S1
SCH2
H1
P22
SD2
R9
P23
RE1
K2
P21
PG3
COM3
Higher Priority Projects
Lower Priority Projects
New Housing Development
Water Supply Network
Roads/Pedestrian Paths
Heating System
Stormwater Draining Network
Sewer System
New Kindergarten
Community Public Space
New Commercial Area
Building regeneration
New Public Space with Community Garden


As an outcome of the spacial analysis of this area, Priority Area Tabobatkhona provides these services and facilities for surrounding neighbourhoods.
This Priority Area strengthens the green network through green, pedestrian pathways connecting public spaces and social facilities.
Located adjacent to primary roads ('The Loop'), this Priority Area is easily accessible for local as well as regional traffic and connects to the nearby mixed-use development.

	PROJECT NAME	SCORE %	ESTIMATED COST	BENEFICIARIES % of future population	TIME FRAME	DESCRIPTION
P22	Community Public Space	63,5	$ 186 000	20%	Medium-term	Community public space with vegetation, places to rest, sit and play
P21	Community Public Space	63,5	$ 123 000	19%	Medium-term	Community public space with vegetation, places to rest, sit and play
P23	Slope Public Space	61,8	$ 4 840 000	21%	Medium-term	Public space on the slope with vegetation and structures to rest (view points, terraces, etc.)
K2	New Kindergarten	60,1	$ 250 000	19%	Short-term	Construction of the kindergarten within the new development area with an adjacent space for outdoor activities
PG3	Green Public Space with Community Garden	59,8	$ 616 000	20%	Short-term	Green public space, park with community gardening (garden beds for growing vegetables, etc.)
SD2	Extending the existing Stormwater/Drainage Network	56,1	$ 5 272 000	78%	Short-Medium Term	City-wide project: cost presented is for the entire project
SN3	Renovation of the existing Sewer Network	55,2	$ 3 860 000	83%	Short-Medium Term	City-wide project: cost presented is for the entire project
H1	New Housing Development	54,3	$ 32 550 000		Short-Medium Term	Multiple typologies of housing units organised around green spaces and integrated with amenities and retail spaces on the main road
RE1	Building Regeneration	52,8	$ 2 075 000		Short-Medium Term	Multi-purpose facility, which can be used for indoor sports, a market, for events, etc. The building's structure will also be modified to support a greenhouse on the roof for intensive urban agriculture.
R9	Green Axis	53,0	$ 42 000	22%	Short-term	Redesign of the street (widening the pedestrian sidewalks, vegetation, infrastructure)
COM3	New Commercial Area	48,1	$ 1 400 000	20%	Short-Medium Term	Construction of a new commercial area, a part of mixed use development
SCH2	New School Project	47,6	$ 1 630 000	19%	Short-term	Construction of a new school with a adjacent space for sports and outdoor activities
S1	New Sports Facility	46,6	$ 306 500	20%	Short-term	Construction of a sports facility with a range of indoor classes and outdoor spaces for activities

Reminder:

- Scored above 50
- Is a city-wide project
- Scored below 50

Fig 9. Tajikistan, UN-Habitat, September 2022

PROJECT AREA TITLE	Priority Area Andarsitez
PROJECT AREA LOCATION	Mahalla Andarsitez
PROJECT AREA PARTNERS	Khorog Municipality Donors/Financiers/Private Sector Utility Service Providers International Development Agencies Potential External Partners
PROJECT AREA TIMELINE	**Short-term:** 2023-2025 **Medium-term:** 2026-2030 **Long-term:** beyond 2031 * suggested timeline per project outlined below
ESTIMATED BUDGET	USD **$76 550 000*** city-wide projects excluded from total **breakdown of costs per project outlined below
TARGET BENEFICIARY GROUP	**Direct Beneficiaries:** Residents and users of Andarsitez Mahalla **Indirect Beneficiaries:** Residents of Khorog Municipality * breakdown of impacted population per project outlined below
SDG ALIGNMENT	

PROBLEM STATEMENT

The design solutions for the Priority Area Andarsitez target problematic issues that can be found in the contexts of mountainous areas. As such, the design approach and demonstration projects aimed to set an example of how to address and respond to the challenges represented by urban expansion in hazard areas, limited land for development, car dependency, urban fragmentation, insufficient utility infrastructure and inequitable distribution of social facilities.

PROJECT OBJECTIVE

The objective of this transformative area is to create a growth economic node (number 4), that is covering the area of Andarsitez along the river and a stretch in Gulobod. Currently, the node has largely residential uses, and is an example of mono-functional development leading to fragmentation. A significant increase in commercial uses suggested by the demonstration project will address this issue by showing the diversity of functions one block can accommodate.

This node is located approximately 4 km from the city centre close to the University of Central Asia. The demonstration project builds more linkages to the university area, facilitating better connectivity and development of the public space network.

The project aims to provide housing and employment opportunities to the population that can be accommodated from hazard prone areas and for the city's potential future growth and densification. Priority Area B aims to activate the eastern part of the city by suggesting a variety of multi-purpose blocks that target different social groups through a variety of activities.

The project aims to better link natural and urban areas by providing increased access to the riverfront and surrounding green and public spaces, improving the quality of the environment for users, including local communities and tourists.

PROJECT IMPACT

Once the projects within the demonstrating site are implemented, this area will provide a new centrality for the city and a new point of attraction. The area will provide housing opportunities to accommodate 1500 people and provide 650 employment opportunities.

The suggested techno park and multipurpose spaces will provide diverse options for employment (IT, wellbeing, industry, commerce), that will be accessible to both residents of the new neighbourhood and to the entire city, due to the location of public transportation stops and the location of the site near the main transportation loop. The active street frontage created along the main transportation loop will transform the current street into a vibrant activity corridor that links with the other side of the river through a multimodal bridge.

Social facilities such as a school for 800 students and a kindergarten for 200 children will benefit surrounding communities and cover the deficit in social facilities in this area. The revitalized riverbank will connect the parts of the city through a pedestrian promenade. The network of public space will promote walkability in the city and will better make use of Khorog's unique topography through green public spaces (such as a slope park). Doing so will transform this part of Khorog into an attractive environment for residents and tourists.

PROJECT PARTNER

- **Khorog Municipality & National Government**: Main responsible, owner and implementer of the projects' implementation in coordination with potential donors and external partners.
- **Donors/ Financiers/ Private Sector:** Funding entity(ies) would be requested to support the implementation of projects within Priority Area B.
- **NGOs/CSOs:** External partners could be considered to support the projects' implementation throughout the overall process (e.g. capacity building/training, maintenance plan, etc.).

PROJECT LIFE CYCLE

- **Risk Assessment:** to identify and analyse the potential risks that may occur during the implementation of each project as well as to determine the likelihood and potential impact of each risk.
- **Feasibility study:** preliminary exploratory assessment to examine technical, economic, financial, legal and environmental viability of projects.
- **Concept Design:** early phase of the design process to test function, form, linkages, requirements, etc.
- **Detailed Design:** stage where the concept design is refined and a complete precise set of plans are developed. At this stage, the projects are ready for implementation.

- **Construction and Maintenance:** implementation of the projects on the ground and regular maintenance works during projects' life span.
- **Monitoring and Evaluation:** framework that outlines the indicators that are used to track the progress of the projects to ensure whether all objectives are being achieved.

PROJECT FINANCIALS

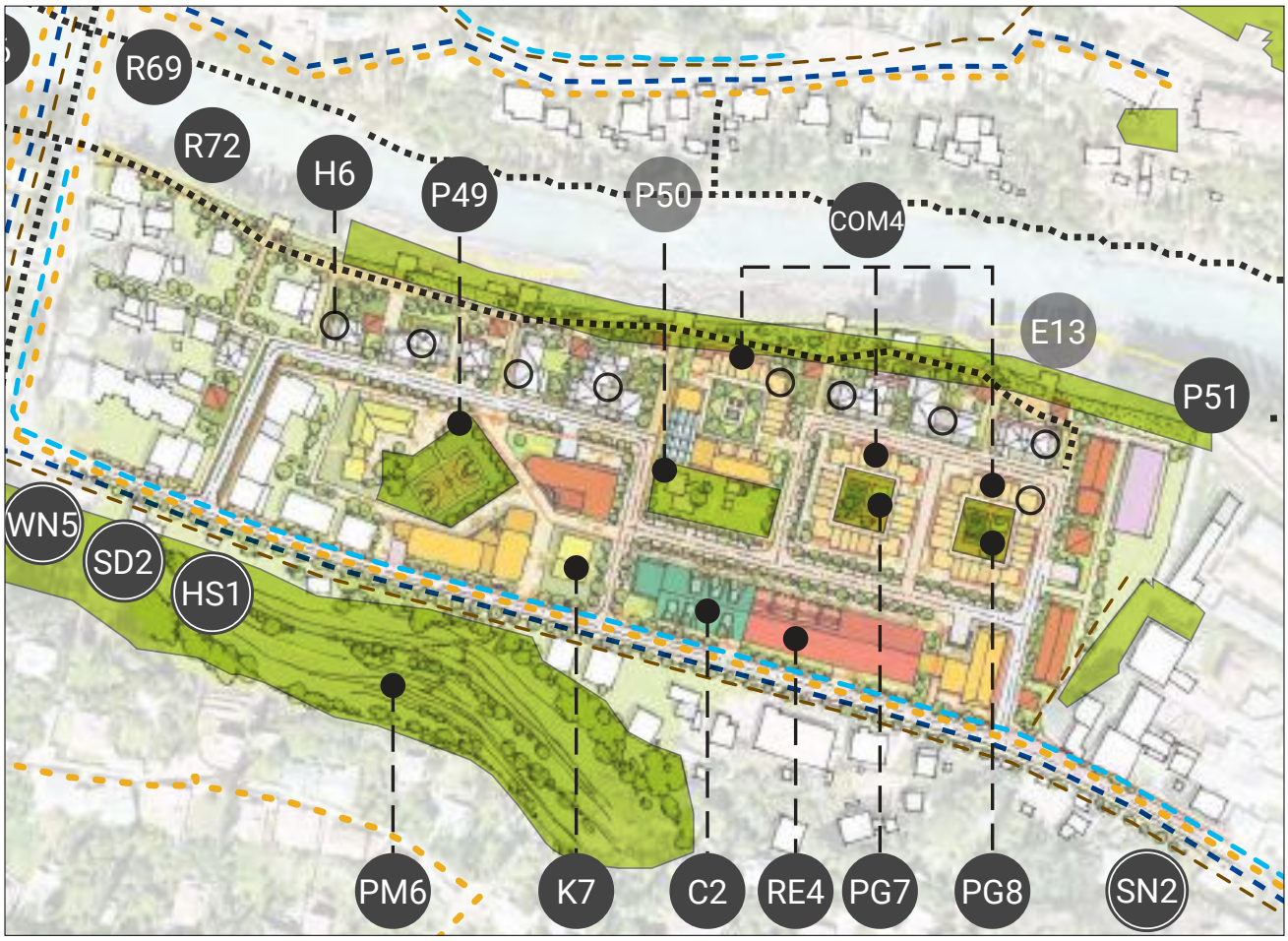
Total Estimated Cost: $76 550 000

Current Investment Commitments and Type: External fund is needed

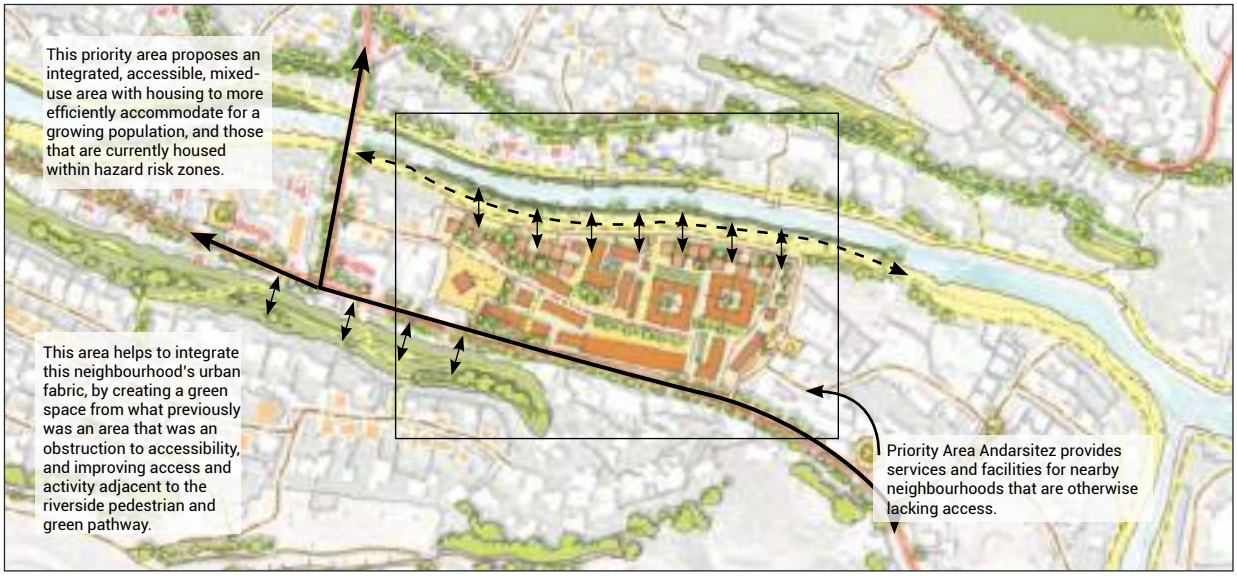
Investment Needs: Risk Assessment, Feasibility Study, Concept Design and Detailed Design, Construction and Maintenance Plan, Monitoring and Evaluation Framework, Monitoring and Evaluation

ADDITIONAL SUPPORT NEEDED

Identification of synergies and/or dependencies between projects is critical to ensure a sustainable implementation of the Priority Area. This rationale of interlinkages and proximity between projects is reflected in the scoring process, however a more detailed assessment of budget availability and projects' time frame is needed to ensure the intended impact. Aspiring an impactful and sustainable implementation process, this investment card aims to support the Municipality of Khorog to consider the suggested projects when analysing investment decisions in order to align the budget envelops with investment needed - e.g. smaller projects that could be covered by own source revenues; education and health facilities that could be delivered by Central Government; infrastructure and wider development projects that could be of interest for donors/private sector to invest.



- Higher Priority Projects
- Lower Priority Projects
- New Housing Development
- Water Supply Network
- Roads/Pedestrian Paths
- Heating System
- Stormwater Draining Network
- Sewer System



	PROJECT NAME	SCORE %	ESTIMATED COST	BENEFICIARIES % of future population	TIME FRAME	DESCRIPTION
C2	Community Centre	65,6	$ 1 606 000	19%	Short-Medium Term	Renovation of an existing building for community gatherings and multi-purpose uses
PG7	Green Public Space with Community Garden	62,1	$ 62 000	20%	Medium-term	Green public space, park with community gardening (garden beds for growing vegetables, etc.)
PM6	Slope Public Space	58,9	$ 11 600 000	8%	Short-Medium Term	Public space on the slope with vegetation and structures to rest (view points, terraces, etc.)
HS1	New Water Heating Pipeline Grid	58,6		100%	Medium-term	City-wide project Not possible to estimate costs for heating projects
WN5	Rehabilitation of the Old Water Pipeline	57,0	$ 2 800 000	68%	Short-term	City-wide project: cost presented is for the entire project
SN2	Extension of Sewer Network	57,0	$ 5 703 000	70%	Short-Medium Term	City-wide project: cost presented is for the entire project
P49	Community Public Space	56,7	$ 465 000	21%	Short-Medium Term	Community public space with vegetation, places to rest, sit and play
R72	Pedestrian Pathway	56,4	$ 8 310	27%	Short-term	Construction of the pedestrian pathway for convenient walking and socialising.
SD2	Extending the existing Stormwater/Drainage Network	56,1	$ 5 273 000	78%	Short-Medium Term	City-wide project: cost presented is for the entire project
H6	New Housing Development	54,5	$ 54 430 000	4%	Short-Medium Term	Multiple typologies of housing units organised around green spaces and integrated with amenities and retail spaces on the main road
P51	Community Public Space	53,9	$ 793 000	12%	Short-Medium Term	Community public space with vegetation, places to rest, sit and play
COM4	New Commercial Area	53,8	$ 2 355 000	12%	Short-term	Construction of a new commercial area, a part of mixed use development
RE4	Building Regeneration	52,8	$ 2 910 000	1%	Short-Medium Term	Renovation of existing structure to accommodate a multifunctional building, technopark (job opportunities and community garden on top.
K7	New Kindergarten	52,0	$ 373 000	12%	Short-term	Construction of the kindergarten within the new development area with an adjacent space for outdoor activities
PG8	Green Public Space with Community Garden	50,8	$ 62 000	13%	Short-Medium Term	Green public space, park with community gardening (garden beds for growing vegetables, etc.)
P50	Community Public Space	48,1	$ 431 000	12%	Short-term	Community public space with vegetation, places to rest, sit and play
E13	River Bank Reinforcement	28,2	$ 1 435 000		Medium-term	Impacted beneficiaries is 0% as only direct beneficiaries were assessed. For a more accurate result, a risk assessment is required to identify indirect population impacted by the project.

Reminder:

- Scored above 50
- Is a city-wide project
- Scored below 50
- Scored very low
- Is a project that other projects rely on / is fundamental to the transformation of this area

Fig 11. Tajikistan, UN-Habitat, September 2022

INDIVIDUAL PROJECTS

These projects are considered 'individual' as they fall outside of the 7 Priority Areas, and the detailed design proposals. However, they are not considered less of a priority. In fact, considering the result of the multi-criteria process, these projects all score above 50%. The total cost for these individual projects is $82,000,000.

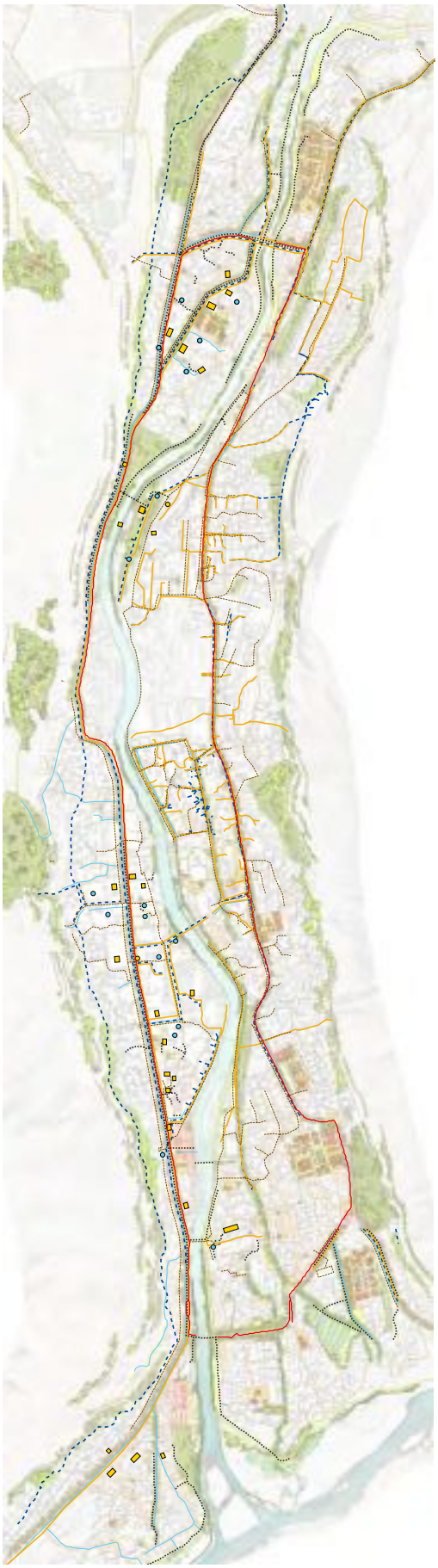
- Individual Priority Projects

	PROJECT NAME	SCORE %	ESTIMATED COST	BENEFICIARIES % of future population	TIME FRAME	DESCRIPTION
P53	City Park 3	71,7	$11 222 000	15%	Short-Medium Term	Construction of a park with green areas, places to rest and socialise, areas for children, youth and elderly people
SH11	Renovation of School #6	70,8	$624 000	33%	Short-Medium Term	Renovation of the school (technical college) due to poor conditions
SW3	Solid Waste Recycling Separation Facility	67,1	$13 650	100%	Short-Medium Term	New solid waste recycling separation facility. This projects considers that all population of Khorog will be impacted by its implementation.
ML50	Afforestation (tree line) along the northern UGB	65,1	$6 025 000	15%	Short-Medium Term	Plantation of Acacia trees (or similar) along the Urban Growth Boundary
K5	New Kindergarten	64,7	$312 000	4%	Short-Medium Term	Construction of a kindergarten / early childhood development centre that can also function as safe haven
ML51	Afforestation (tree line) along the southern UGB	64,2	$4 300 000	5%	Short-term	Plantation of Acacia trees (or similar) along the Urban Growth Boundary
AN13	New Bus Stop	61,9	$ 6 100	16%	Short-term	
P24	Community Public Space	61,6	$147 600	16%	Short-Medium Term	Community public space with vegetation, places to rest, sit and play
P15	Public Space with a Landmark	61,0	$40 000	14%	Short-term	Construction of the public space with the landmark to create a vibrant environment in Tabobatkhona (square with vegetation and community mural, public art) and regeneration of the current site to integrate the current monument into the urban environment
P52	Public Space with a Landmark	60,8	$156 000	10%	Short-Medium Term	Construction of the public space around with a landmark (public art) to create a vibrant area
PG4	Green Public Space with Community Garden	60,7	$124 000	15%	Short-Medium Term	Green public space, park with community gardening (garden beds for growing vegetables, etc.)
AN33	New Bus Stop	60,0	$ 6 100	12%	Short-term	
PM2	Slope Public Space	59,7	$6 000 000	34%	Short-term	Public space on the slope with vegetation and structures to rest (view points, terraces, etc.)
P9	Slope Public Space	59,7	$900 000	15%	Medium-term	Construction of the public space on the slope of the road elevation, ensuring vegetation as a barrier for safety and structures to rest and socialise
PM5	Park adjacent to the River	53,7	$300 000	22%	Short-Medium Term	Construction of a park with green areas and places to rest and socialise close to the river bank with structures to support the reinforcement of the bank for flood mitigation and prevention of erosion
P33	Pocket Public Space	51,2	$181 000	34%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P36	Pocket Public Space	50,2	$363 000	34%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P32	Pocket Public Space	49,7	$934 000	35%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P31	Pocket Public Space	46,3	$31 000	33%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play
P78	Pocket Public Space	45,2	$161 000	18%	Short-Medium Term	Construction of a small public space with vegetation, places to sit, rest and play
P34	Pocket Public Space	44,5	$94 000	33%	Short-term	Construction of a small public space with vegetation, places to sit, rest and play

CITY-WIDE PROJECTS

These projects are mentioned within each Priority Area, however are located across the whole city. Therefore, their implementation must be well planned and aligned with availability of the city budget. City-wide projects can potentially be phased and divided into smaller projects, however further studies and detailed designs need to be developed prior to this. Not all of these projects are ranked above 50%, however, the majority of them are fundamental projects, meaning that most other projects are reliant on their implementation.

- Water Supply Network
- Roads/Pedestrian Paths
- Heating System
- Stormwater Draining Network
- Sewer System
- Sewer System
- Social Facilities
- Rehabilitation of Solid Waste Collection Points



Reminder:

- City-Wide Project that scored above 50
- City-Wide Project that scored below 50
- City-Wide Project that scored very low
- A City-Wide project that other projects rely on / is fundamental to the transformation of the city

	PROJECT NAME	SCORE %	ESTIMATED COST	BENEFICIARIES % of future population	TIME FRAME	DESCRIPTION
R2	Main Multimodal Axis (loop)		$1 710 765	100%	Short-term	City-wide project: (R1, R2, R3, R4) R1 project score: 56,9 estimated cost: $246,600. R2 project score: 53,3 estimated cost: $ 229500. R3 project score: 46,5 estimated cost: $279000. R4 project score: 46,8 estimated cost: $205200. Full Axis relies upon bridge construction to complete the 'loop', cost estimate includes bridge projects: B1 project cost: 393,750 B2 project cost: 308,700
SW3	Rehabilitation of Solid Waste Collection Points	67,1	$13 650	100%		New solid waste recycling separation facility. This projects takes into account its function as serving the whole city.
HS3	Thermal Isolation Soc. Facilities, Adm. Buildings	59,9		89%	Short-Medium Term	The project considers the thermal isolation of 57 (total city-wide) administrative buildings in Khorog. Therefore the number of beneficiaries impacted by the project is almost the entire city's population, which impacted the overall score of the project.
HS1	New Water Heating Pipeline Grid	59,9		86%	Medium-term	New water heating pipeline grid connected to a planned central heating system. Not possible to estimate costs for heating projects.
HS2	Heating Gas Pilot Project for Selected Schools & Hospitals Buildings	58,7		86%	Short-Medium Term	The project considers piloting a heating gas system in 20 (total city-wide) existing schools and hospitals. Therefore the number of beneficiaries impacted by the project is almost the entire city's population, which impacted the overall score of the project.
SW1	Rehabilitation of Solid Waste Collection Points	58,6	$ 72 450	61%	Medium-term	Rehabilitation of existing collection points (due to poor conditions) across the city - cost estimation for all points planned (78 in total planned within the priority areas)
SD1	Rehabilitation of the existing Drainage Calvets	57,3	$ 3 275 000	55%	Short-term	The project considers the rehabilitation of the entire drainage channels (unblocking, surface covering), therefore the number of beneficiaries and the cost presented is for the entire city-wide
SN2	Extension of Sewer Network	57,0	$ 5 703 000	71%	Short-term	The project considers the extension of the existing sewer network to serve the deficit areas, therefore the number of beneficiaries and the cost presented are for the entire city-wide project.
WN5	Rehabilitation of the Old Water Pipeline	57,0	$ 2 800 000	64%	Short-term	It is a city-wide project, therefore the number of beneficiaries and the cost presented are for the entire city-wide project.
WN4	Rehabilitation of existing 14km Water Line	56,7	$ 1 367 000	62%	Short-term	It is a city-wide project, therefore the number of beneficiaries and the cost presented are for the entire city-wide project.
SD2	Extending the existing Drainage Network	56,1	$ 5 270 000	55%	Short-term	The project considers the extension of the existing drainage network to serve the deficit areas, therefore the number of beneficiaries and the cost presented is for the entire city-wide project.
SN3	Renovation of the existing Sewer Network	55,2	$ 3 860 000	79%	Short-term	The project considers the renovation of the existing sewer network, therefore the number of beneficiaries and the cost presented are for the entire city-wide project.
WN2	Rehabilitation of Irrigation Channel 1	53,0	$ 972 000	26%	Short-term	It is a city-wide project, therefore the number of beneficiaries and the cost presented are for the entire city-wide project.
WN7	Solarizing the Water Pumps	45,9	$ 147 000	24%	Short-Medium Term	The project considers the rehabilitation of 9 water pumps. It is a city-wide project, therefore the number of beneficiaries and the cost presented are for the entire city-wide project.
SW2	Rehabilitation of Solid Waste Collection Points	44,6	$ 14 000	18%	Short-term	New solid waste collection points to be implemented across the city (20 in total planned within all priority areas)
WN9	New Water Supply Pipeline	29,7	$ 294 000	11%	Short-term	New water supply pipeline planned (but no funds for implementation). It is a city-wide project, therefore the number of beneficiaries and the cost presented are for the entire city-wide project.

Integrated Spatial Plan for Environmental and Socio-Economic Resilience

Khorog
Urban Planning & Design Guidelines

May 2023

UN-HABITAT

Habitat Planning

A Programme of the Aga Khan Agency for Habitat

Aga Khan Agency for Habitat

RESILIENT KHOROG 2035

Integrated Spatial Plan for Environmental
and Socio-Economic Resilience
Khorog, Tajikistan

Khorog Urban Planning & Design Guidelines

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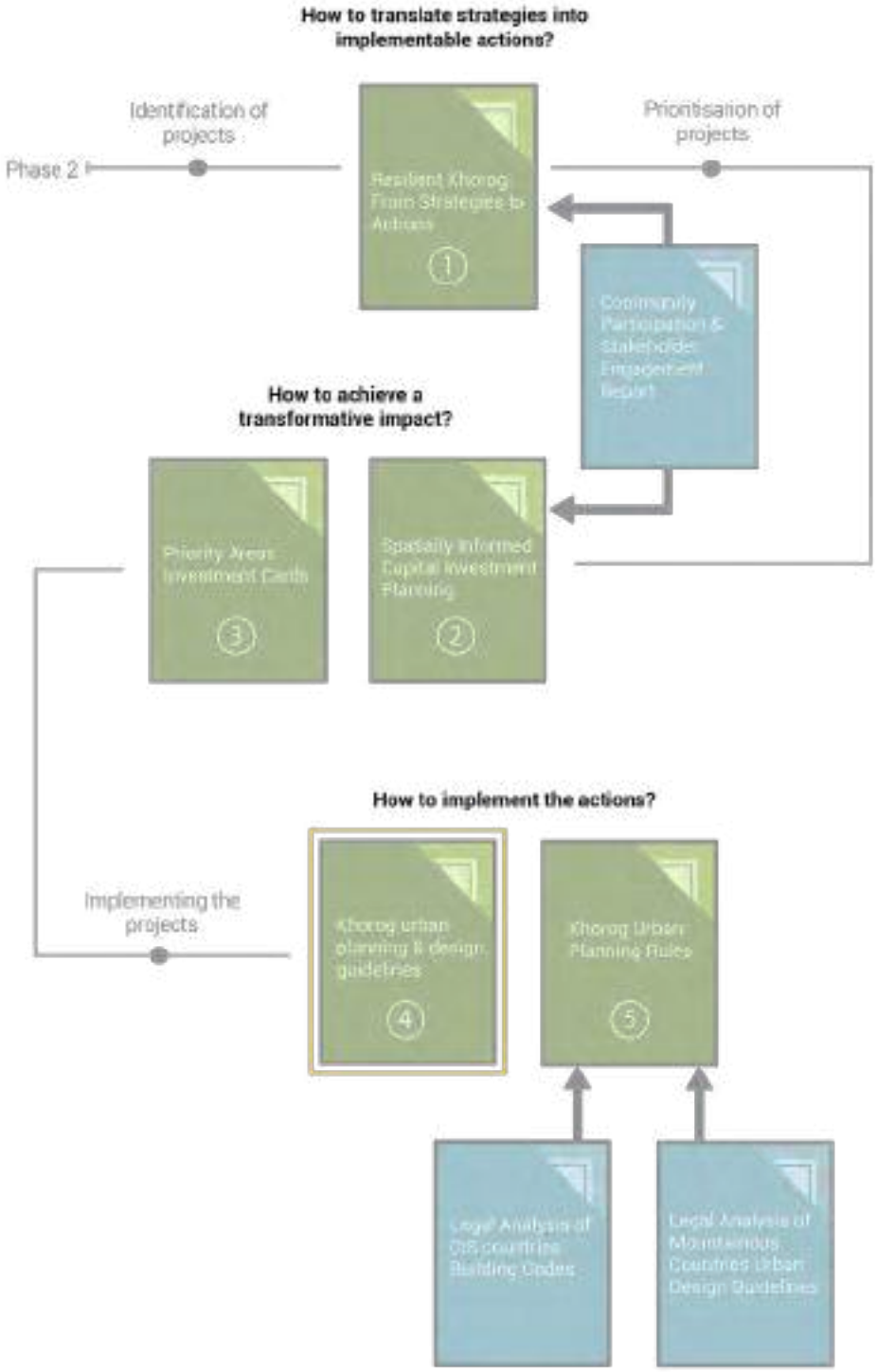

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KHOROG

URBAN PLANNING & DESIGN GUIDELINES

Fig 1. View on the city of Khorog, UN-Habitat, September 2022

INTRODUCTION

1. INTEGRATED SPATIAL PLAN FOR ENVIRONMENTAL AND SOCIO-ECONOMIC RESILIENCE

UN-Habitat has partnered with the Aga Khan Agency for Habitat (AKAH) and the government of Tajikistan, through the Aga Khan Development Network (AKDN), to undertake the 'Integrated Spatial Plan for Environmental and Socio-Economic Resilience' in Khorog Tajikistan. UN-Habitat's Urban Planning and Design Lab (Urban Lab), in a collaborative process with other units and branches within the UN-Habitat Planning Finance and Economy Section and the Urban Practices Branch and with AKAH's Habitat Planning teams in Geneva and Tajikistan, aims to provide planning direction to improve resilience and social stability for existing communities and accommodate the increasing populations in Khorog in a sustainable way through:

1) Developing strategies, masterplans, interventions, and regulations.
2) Knowledge creation, capacity building, and guidelines.

More specifically, the project aims to provide environmental, legal, economic, spatial and infrastructure policies and projections, governance and management, recommendations for transformative projects, and planning and technical capacity building for stakeholders. The UN-Habitat, in conjunction with AKAH's Planning methods and advanced data collection and analysis, provide planning expertise, drawing on existing methodologies, toolkits, and best practices in a collaborative and integrated way to guide the growth of Khorog.

This project is one of several outcomes from an assessment of resiliency that was undertaken for Khorog in 2017 and 2018 by the Swiss State Secretariat for Economic Affairs (SECO) and Holinger, with partnerships from the international community including the European Union for resilient infrastructure, the Government of Japan, the IFC and World Bank.

The work of UN-Habitat in collaboration with AKAH is part of The Khorog Urban Resilience Planning and Proof of Concept Initiative, supported by SECO to drive resilient infrastructure investment and access to basic public services, intended to reducing risk, ensure more reliable infrastructure and a safer environment. This will, in turn, improve economic growth and wellbeing. This project has been undertaken in parallel with other initiatives for Khorog, such as the EBRD and SECO funded phase 1 and 2 water infrastructure projects.

AKAH looks to UN-Habitat to support the Revised Town Planning process to ensure alignment of the town plan to UNDRR resilience principles and best practices. The integrated plan for environmental and socio-economic resilience in Khorog will embed the disaster risk reduction approaches in the planning processes of identified projects.

2. CONTEXT & REPORT OBJECTIVES

The Khorog Urban Planning & Design guidelines conclude a vigorous process of analysis and planning carried within the two phases of the project. They embody UN-Habitat design principles, and highlight the most relevant strategies that would strengthen Khorog's resilience and improve its liveability based on the identified gaps and opportunities.

Khorog's location in a narrow valley that faces a variety of natural hazards requires a particular management of its land assets in a way that ensures a resilient and context-sensitive urban development.

In this regard, the present urban design guidelines provide specific planning recommendations to the city of Khorog based on a thorough analysis of the environmental, cultural, spatial, and socio-economic condition of the city. They also provide a design

framework for local urban planners and stakeholders to achieve a more resilient and inclusive urban development that considers the complexity and specificities of planning in mountainous and risk-prone areas.

2.1. OBJECTIVES OF THE URBAN DESIGN GUIDELINES

Khorog's urban design guidelines aim to establish a common language and design approach among city planners, policy makers, developers and the community, and identifies opportunities to integrate sustainable and innovative design strategies that would support the city in its resilience-shift.

They are intended to serve as a source of inspiration, providing a wide range of recommendations to consider at different scales and levels of development. All stakeholders are invited to use the guidelines as a design framework that allows them to innovate and align their projects with the recommendations.

2.2. KEY AUDIENCE

The guidelines are formulated in a simple and accessible manner to facilitate their use by a variety of stakeholders such as the city's urban designers, planners, architects, engineers, policy makers, property owners, residents and community organisations.
This would provide opportunities for a better appropriation of the guidelines, and encourage a variety of stakeholders to participate actively in the sustainable development of Khorog.

2.3. METHODOLOGY

Khorog's Urban Design Guidelines are based on the triangulation of different sources of data, including field surveys, participatory workshops, geo-spatial data analysis, as well as established UN-Habitat planning principles for sustainable planning, SDGs, and reliable research on planning in hazardous areas.

a. UN-Habitat Sustainable Neighbourhood Planning principles:

UN-Habitat sustainable neighbourhood planning approach proposes 5 general principles that summarize and refine existing sustainable urban planning theories to help build integrated and livable neighbourhoods. These principles promote five fundamental urban design components, namely:

1. Adequate space for streets and an efficient street network.
2. High density
3. Mixed land-use.
4. Social mix.
5. Limited land-use specialization.

UN-Habitat' "My Neighbourhood" urban design guidelines provide detailed guidelines for the design and development of the sustainable neighbourhoods, linking Sustainable Development Goals and the New Urban Agenda to 5 city objectives (5 columns), an achievement that navigates the planning and design initiative in a sustainable manner. These objectives are: Compact City, Connected City, Inclusive City, Vibrant City, Resilient City.

These objectives cover all types of spatial indicators (form, distribution, proximity, diversity, intensity, and connectivity, etc.), thereby ensuring a multidimensional and comprehensive set of recommendations that tackle diversity of spatial, social and economic networks.

b. Assessment of Khorog's urban planning patterns and planning regulations:

The elaboration of Khorog's Urban Design Guidelines (KUDG) was as based on the results of field surveys and the analysis of geo-spatial data, which provided a strong basis to assess the spatial configuration of the city and its impact on the resilience of Khorog.

This has been combined with the "Assessment of Urban Planning Regulations in Khorog", which is a report elaborated by UN-Habitat within the same project to study the strengths and weaknesses of the building law in the city.

This contextual approach allowed for the elaboration of tailored recommendations that respond to the specificities and local challenges observed in Khorog.

c. Research on planning in disaster risk areas

Beside the aforementioned components, the KUDGs are supported by reliable studies and research on hazard risk mitigation in urban areas, as well as a review of several international case studies with similar characteristics.

2.3.1. Applied Tools

Alongside the AKAH's Habitat Planning Framework and "Our City Plans", additional tools have been engaged in the process to align the project to best practices, processes and guidelines. These include the following:

- City Resilience Profiling Tool
- City Resilience Action Planning (CityRAP)
- Making Cities Resilient and the "Ten Essentials for Making Cities Resilient"
- Disaster Resilience Scorecard for Cities
- UNDAF

Additional tools deployed in the project processes, actions and outputs include the Resilience Profiling Tool, which has formed the framework for our assessment, the City Resilience Action Planning, which was used to guarantee engagement with local actors. Furthermore, the UN Development Assistance Framework supported the integration of the UN Country Team in shaping the project's objectives and goals.

2.3.2. Alignment with Global Frameworks

While all measures proposed within the project are targeted for implementation at city level, it is envisioned that such priorities could be replicated to address similar challenges in other cities, and further scaled to regional and national levels. As such, the project is further strategically aligned to various international frameworks, while localising actions and recommendations.

2.3.3. Sustainable Development Goals

Through transformative strategies, the Khorog programme directly supports the realisation of SDG 11 on sustainable cities and communities, with particular reference to the following targets:

- 11.1: provide access for all to adequate, safe and affordable housing and basic services.
- 11.2: provide access to safe, affordable, accessible, and sustainable transport systems; improving road safety, notably by expanding public transport.
- 11.3: enhance capacity for participatory, integrated, and sustainable human settlement planning and management.
- 11.4: strengthen efforts to protect and safeguard the world's cultural and natural heritage.
- 11.7: provide universal access to safe, inclusive, and accessible green and public spaces.
- 11.A: support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning
- 11.B: increase the number of cities adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement holistic disaster risk management at all levels.

In addition, the programme also supports actions for SDG 9 on resilient infrastructure, industry and innovation, SDG 12 on sustainable consumption and production, SDG 13 on climate action, and SDG 17 on partnerships, most notably with reference to the following targets:

- 9.1: develop quality, reliable, sustainable and resilient infrastructure to support economic development and human well-being, with a focus on affordable and equitable access for all.
- 12.8: ensure that people everywhere have the relevant information and awareness of sustainable development and lifestyles that exist in harmony with nature.
- 13.1: strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries.
- 13.2: integrate climate change measures into national policies, strategies and planning.
- 17.16: enhance global partnerships for sustainable development, complemented by multi-stakeholder partnerships that mobilise and share knowledge, expertise, technology and financial resources, in order to support the achievement of the sustainable development goals in all countries, and in developing countries in particular.
- 17.17: encourage and promote effective public, public-private, and civil society partnerships, building on the experience and resourcing strategies that these can bring.

2.3.4. NUA

Tajikistan is a signatory of the New Urban Agenda, with specific commitments that are manifested in the recent adoption of the National Development Strategy

to 2030, which tackles new and traditional challenges that the country is faced with. Tajikistan has built on these commitments through the adoption of the 2030 Agenda for Sustainable Development, the SDGs, the Addis Ababa Action Agenda of the Third International Conference on Financing for Development, the Paris Climate Agreement, and the Sendai Framework for Disaster Risk Reduction 2015-2030.

This specific project in Khorog aligns with the Habitat III New Urban Agenda in meeting "the challenges and opportunities of present and future sustained, inclusive and sustainable economic growth". It also aims to provide the strategic spatial framework to "adopt and implement disaster risk reduction and management, reduce vulnerability, build resilience and responsiveness to natural and human-made hazards, and foster mitigation of and adaptation to climate change".

2.3.5. Sendai Framework

The Sendai Framework for Disaster Risk Reduction 2015-2030 outlines seven clear targets and four priority actions to prevent new disasters and reduce risk posed by those that are existing. The Khorog project is well aligned to the four priority areas and their key actions. It addresses priority 1; understanding disaster risk by promoting collection, analysis, management and use of relevant data to assess disaster risks, vulnerability, exposure, hazard and their possible sequential effects through the use of technological innovation and collaboration. The programme analysis of the current governance structure addresses priority 2; strengthening disaster risk governance. The programme's focus on financing and capital investment planning will ensure that prioritised measures are cost-effective and instrumental to save lives, prevent and reduce loss, and ensure effective recovery and rehabilitation. The latter point is further aligned to priority 3; investing in disaster risk reduction for resilience. Finally, through the development of building codes and demonstration projects, the project addresses priority area 4; for effective response and building back better in times of recovery, rehabilitation and reconstruction.

2.3.6. Paris Agreement on Climate Change

The project's focus on resilience aligns with the Paris Agreement on Climate Change by way of increasing Khorog's resilience in an ability to adapt to the adverse impacts of climate change. Within the Khorog context, this relates directly to the adverse impacts of flooding, droughts, avalanches and landslides. Such disasters have become more frequent in the area, with increasing repercussions.

2.3.7. Paris Dushanbe Declaration for the International Decade on Water Action

The Declaration of The Decade for Action on "Water for Sustainable Development, 2018-2028", was launched in an event in Dushanbe in 2018. This event and its resultant declaration highlighted the importance of water access and management for the achievement of sustainable development. This challenge is of particular importance to Tajikistan, as it will affect the country's ability to create resilience in the face of natural hazards, climate change and political vulnerabilities associated with resource ownership and management. The Declaration for the International Decade on Water Action is aligned with the focus on resilience in Khorog in such a way as to facilitate the realisation of Sustainable Development Goal 6; to "ensure availability and sustainable management of water and sanitation for all".

2.4. STRUCTURE

The guidelines follow a multi-scalar approach that provides recommendations on five planning dimensions: City, Neighbourhood, Street, Open Public Space, and Buildings. Each dimension contains different sub-sections that provide specific themed recommendations.

The guidelines are linked to urban planning principles and are supported by detailed explanation of their rational and objectives, along with maps, diagrams and graphics that facilitate their understanding within Khorog's context. The recommendations are also linked to relevant Sustainable Development Goals to reflect the extent to which Khorog's Urban Design Guidelines contribute to achieving and localization the SDGs.

2.5. DEFINITIONS

- **Accessibility** refers to the ease of reaching destinations. In a highly accessible location, a person, regardless of age, ability or income, can reach many activities or destinations quickly, whereas people in places with low accessibility can reach fewer places in the same amount of time. The accessibility of an area can be a measure of travel speed and travel distance

to the number of places ('destination opportunities') to be reached. The measure may also include factors for travel cost, route safety and topography gradient.[1]

- **Active frontage** refers to street frontages where there is an active visual engagement between those in the street and those on the ground and upper floors of buildings.

- **Adaptation** in human system is the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities.

- **Connectivity** is the degree to which the movement networks interconnect. It refers to the directness or ease of moving between origins (e.g., households) and destinations along the movement network. (UN-Habitat 2018)

- **Density** refers to the "intensity of people, jobs, housing units, total floor area of buildings, or some other measure of human occupation, activity, and development across a defined unit of area. In general terms, urban density describes the degree of concentration or compactness of people or development in a city. "

- **Disaster** is a serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts. (UNDRR 2023).

- **Fine-grained development** is characterised by small blocks in close proximity. Each block consists of several buildings, most with active frontages and minimal setbacks. This leads to an increased number of intersections, connectivity, and encourages walkability.

- **Hazard** is a serious disruption of the functioning of a community or a society involving widespread human, material, economic, or environmental losses and impacts, which exceeds the ability of the affected community of society to cope using its own resources (UNDRR 2023).

- **Informal surveillance** refers to the observation, from the street or from adjacent buildings, provided by ordinary people as they go about their daily activities. This kind of observation can deter criminal activity or anti-social behaviour and make places feel safer. The term can be sometimes interchangeable with 'casual surveillance' and 'eyes-on-the-street'.

- **Mitigation** refers to the lessening or minimizing of the adverse impacts of a hazardous event. The adverse impacts of hazards, in particular natural hazards, often cannot be prevented fully, but their scale or severity can be substantially lessened by various strategies and actions. Mitigation measures include engineering techniques and hazard-resistant construction as well as improved environmental and social policies and public awareness. It should be noted that, in climate change policy, "mitigation" is defined differently, and is the term used for the reduction of greenhouse gas emissions that are the source of climate change (UNDRR 2023).

- **Mixed-use development** refers to development projects that comprise range of compatible activities and land uses within the same area or building.

- **Multi-modal street** refers to a street that accommodates a variety of mobility options such as walking, biking, transit, rail, cars, etc., leading to improved accessibility, reduced emissions, and more active streets.

- **Multi-generational housing** is a typology of housing where two or more generations of adults from the same family share a house or property.

- **Permeability** is the extent to which the urban structure permits, or restricts, movement of people or vehicles through an area, and the capacity of the area network to carry people or vehicles.

- **Public space** is an area in the public realm that is open to public access, provides a public use or recreation function, and that is owned and maintained by councils or other government agencies. However, some privately-held land is available for the public to access and use, such as a building forecourt, a walk-through, or a shopping mall. The private land owner may control aspects of access and use - see Private land.

- **Public transport node** refers to transit stops or, interchanges, and the areas immediately around them.

1 State of Victoria, https://www.urban-design-guidelines.planning.vic.gov.au/toolbox/glossary#letter_F

- **Resilience** refers to the ability of a system, community, or society exposed to hazards to resist, absorb, accommodate to, and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions (UNDRR 2009).

- **Right of Way** refers to areas on, below, or above any public roadway, highway, street, public sidewalk, alley, waterway, or utility easements dedicated for compatible uses.

- **Risk:** The combination of the probability of an event and its negative consequences (UNDRR 2009).

- **Setback** is the distance of a building wall from any lot boundary. A building front setback can add to the perceived width of the street, provide additional public or private space, and allow space for landscaping. For example, a building set on the front property boundary has zero street setback.

- **Split-rate property tax** applies differential tax rates to the taxable value of properties, with a higher rate applied to land value and a lower rate applied to structures and improvements

- **Steep slope:** Steep slopes are defined as those with a 25% inclination and above.

- **Streetscape** is the visual character of a street space that results from the combination of street width, curvature, paving, street furniture, plantings and the surrounding built form and detail. The people and activities present in the street also contribute to the streetscape.

- **Transit-Oriented Development (TOD)** is a planning and design strategy that consists in promoting urban development that is compact, mixed-use, pedestrian- and bicycle-friendly, and closely integrated with mass transit by clustering jobs, housing, services, and amenities around public transport stations (World Bank 2023).

- **Urban Growth Boundary (UGB)** defines the limits within which urban development should happen.

- **Vulnerability** is the condition determined by physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards (UNDRR 2023).

- **Walkability** is the extent to which the built environment supports and encourages walking by providing for pedestrian comfort and safety, connecting people with varied destinations within a reasonable time and effort, and offering visual interest in journeys throughout the network."

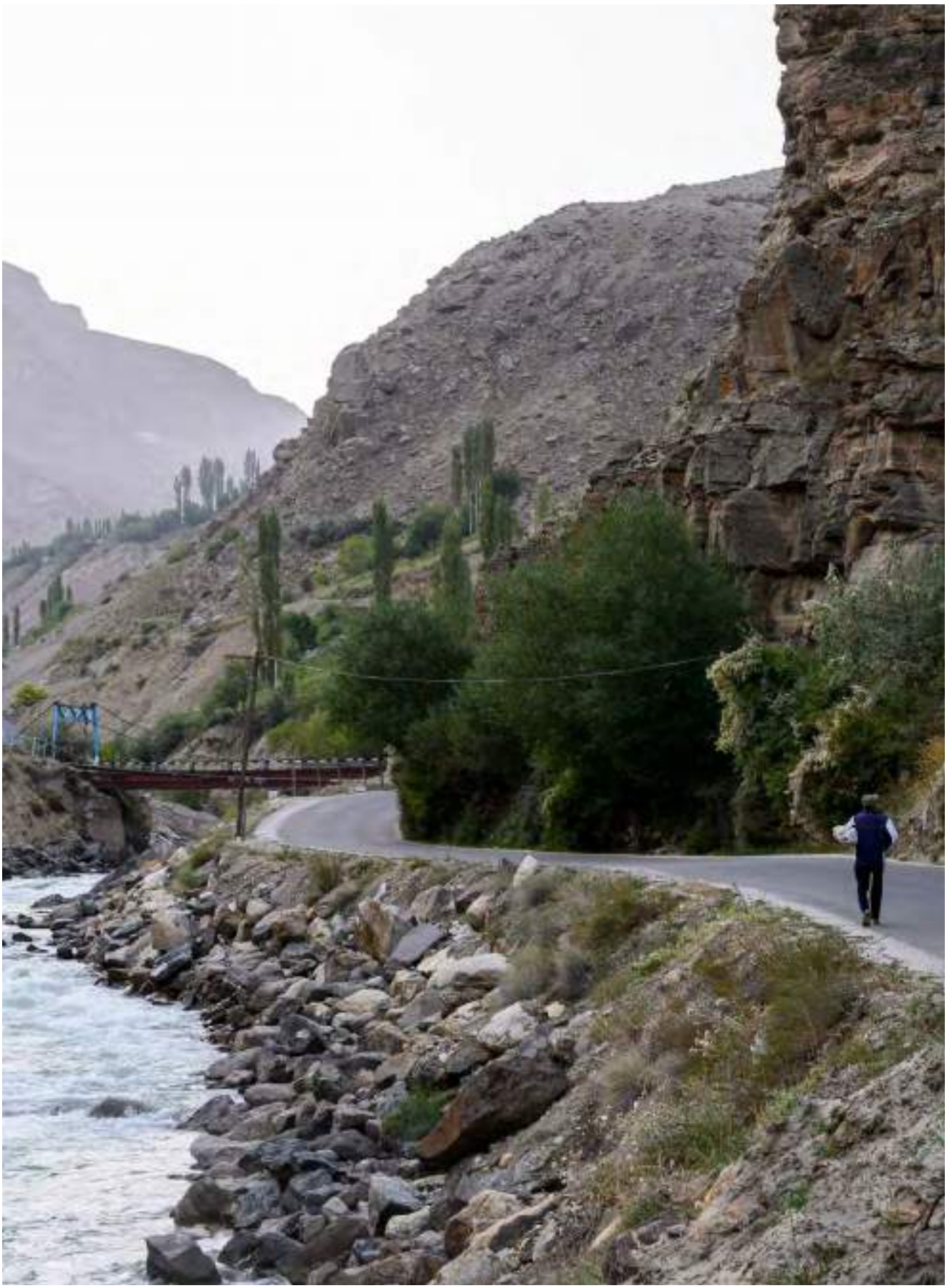

Fig 2. View on the city of Khorog, UN-Habitat, September 2022


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KHOROG URBAN PLANNING & DESIGN GUIDELINES

CITY

C.1
URBAN CONTINUITY & COMPACTNESS

C.1.1
PROMOTE SPATIAL CONTINUITY BETWEEN NEW DEVELOPMENT AND EXISTING URBAN FABRIC

Khorog's location in a narrow valley that faces a variety of natural hazards requires rigorous management of its land assets to ensure a compact urban fabric and efficient infrastructure. Therefore, new development areas should be compact and in continuity with the existing urban fabric and street networks. As a rule, the percentage of linkage between existing and new urban land can be calculated as follows:

Percentage of linkage of urban land= Urbanized perimeter (m)/ Total design area perimeter (m) x100.

The result should be equal to or higher than 50% (Fig.3).

C.1.2
PROMOTE COMPACT URBAN FORM

Beside urban continuity, compactness is a key feature in sustainable urban planning, especially in mountainous areas where suitable land for urban development is usually scarce. Compact development is usually supplemented with densification strategies, mixed-use development and urban growth boundaries to maximise the efficiency of land use and achieve improved productivity, access to jobs, and greater energy efficiency. Moreover, compact urban development promotes efficient service provision by increasing the number of beneficiaries within the area of influence, thus optimising costs of services and infrastructure.

The concept can be applied in new urban development as

Fig 3. Level of urban land linkage

well as in the intensification of existing under-utilised areas (i.e. brownfield development, urban regeneration projects, Transit-Oriented Development (TOD). However, planners and decision makers have to be aware of the adverse negative effects of poorly managed compact development strategies, including congestion, gentrification, lack of green spaces, overcrowding, etc.

Policymakers need to ensure that compact development strategies are supported by investment that focuses on equitable access to housing, jobs and services, efficient public transport networks, and enhancement of diversity and quality of life in urban areas.

Urban regulations and fiscal policies can be tailored to better manage compact urban development including factors such as the taxation of under-density, Congestion tax/fee, subsidies for densification, split-rate property tax (see definitions).[1]

C.1.3 PROMOTE FINE GRAIN DEVELOPMENT

Fine grain urban fabric consists of several small blocks that are close together. Within each block, there are several buildings, the majority of which have narrow frontages, various access points and minimal setbacks from the street. This offers many opportunities for discovery and exploration.

To achieve an optimal fine grain development, it is recommended to keep block width around 100m.

Fine grained urban fabric evolves over time by responding and adapting to what will come afterwards. This evolutionary process creates places that are not frozen in time and allows for an intensification process to happen. Furthermore, land sale is open to a whole variety of investors and developers, from individuals to large companies and institutions that can merge several plots together if needed.

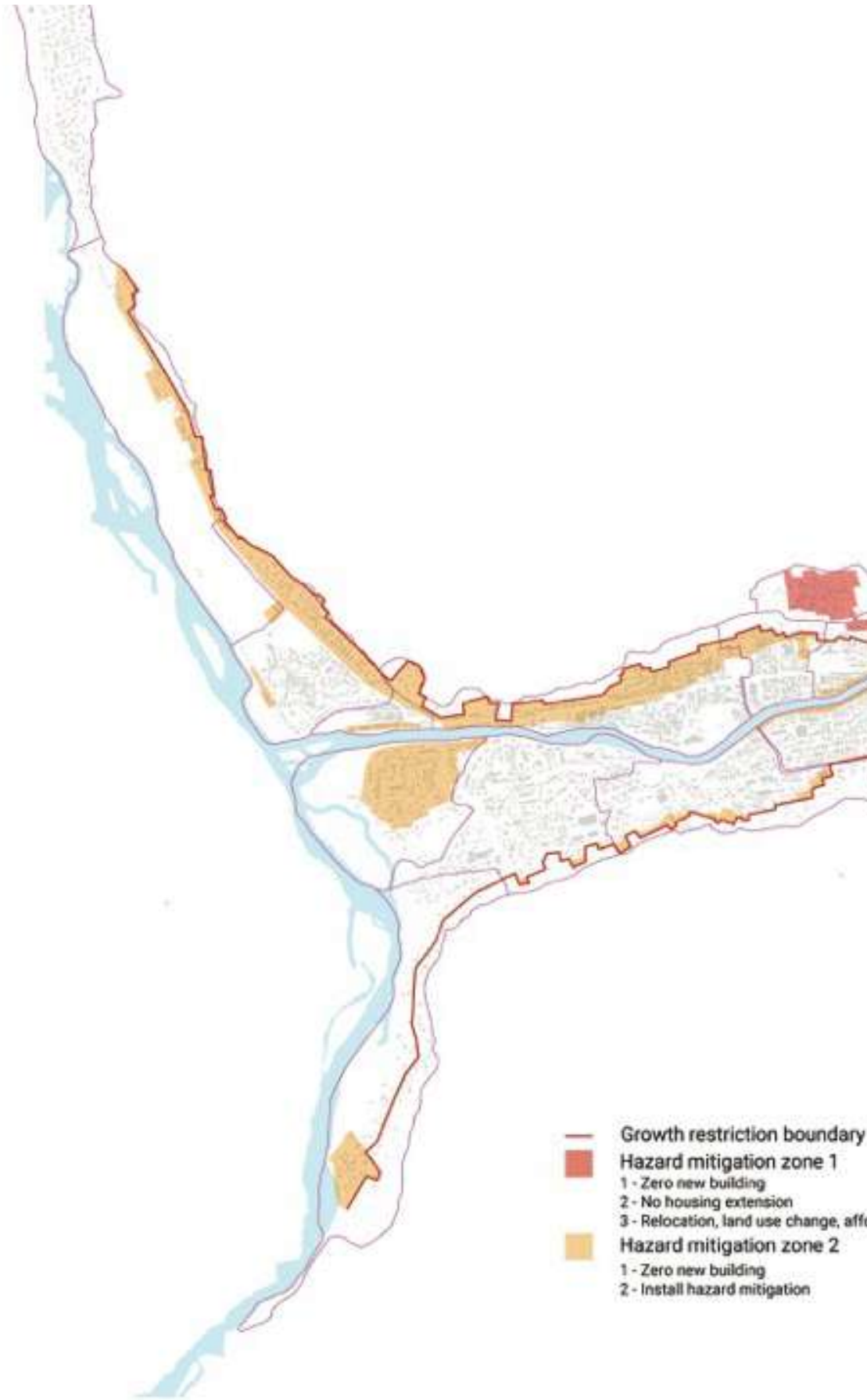
C.1.4 RESTRICT DEVELOPMENT TO THE URBAN GROWTH BOUNDARY (UGB)

The Urban Growth Boundary defines the limits within which urban development should happen. It reflects the results of detailed analysis of hazard areas and suitable land for development.

The UGB establishes two zones of intervention in Khorog:

- **The Red Zone**, covering areas at major risk (beyond the UGB) is restricted to zero buildings (no permits should be issued), no housing extensions (no permits for additional structures) and to a relocation strategy built upon a human-rights approach.
- **The Yellow Zone**, covering areas at risk within the UGB, is also restricted from further construction and only hazard mitigation structures should be implemented such as the building of rockfall barriers, retaining walls, afforestation, etc. **(Fig.4)**.

1 OECD: https://www.oecd-ilibrary.org/development/demystifying-compact-urban-growth_bbea8b78-en


Growth restriction boundary
Hazard mitigation zone 1
1 - Zero new building
2 - No housing extension
3 - Relocation, land use change, aff
Hazard mitigation zone 2
1 - Zero new building
2 - Install hazard mitigation

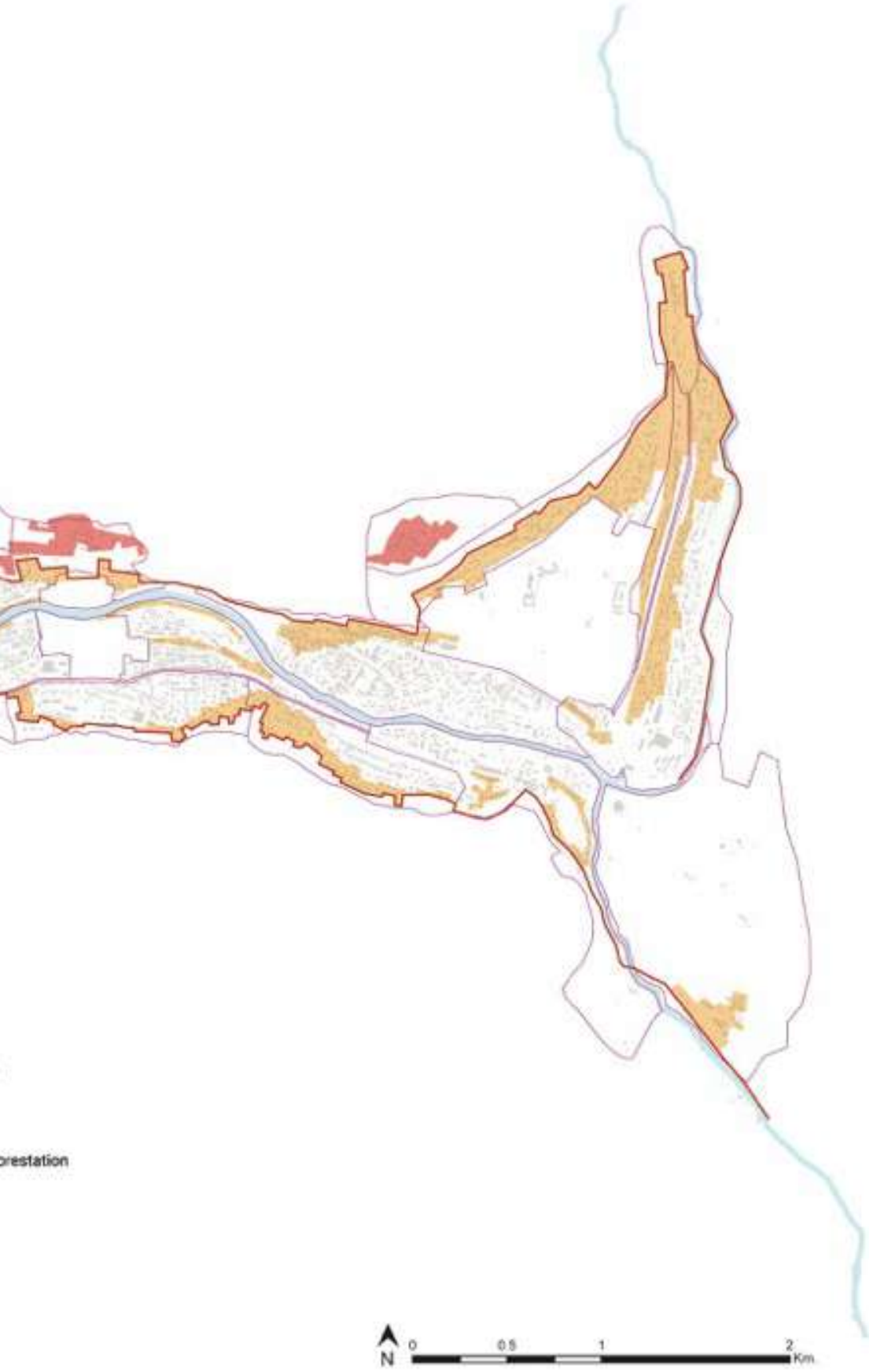


Fig 4. Growth boundary and mitigation zones, UN-Habitat, 2023

C.2 EFFICIENT & CONTROLLED DENSITY

C.2.1 TARGET DENSITIES STARTING FROM 150P/HA WHERE APPROPRIATE

Urban design that promotes value generation considers density as one of the main indicators. Leveraging the agglomeration effect and good jobs/housing ratio can promote the creation of liveable and cohesive communities.

As a benchmark, UN-Habitat recommends densities of at least 150 p/ha to achieve vibrant and dynamic cities/neighbourhoods.

In the case of Khorog, this minimum density should be adapted to the characteristics of the site especially in slope areas that fall under the areas suitable for development where densities can go below this threshold.

C.2.2 PRIORITIZE DENSIFICATION IN DEFINED SAFE AREAS FOR DEVELOPMENT

Priority densification should happen in the 2 areas of transformative impact defined by UN-Habitat **(Fig.6)**. These are the safest zones for development and are part of the overall spatial strategy of Khorog. The priority should also be given to the infill, grey and brownfield development to prevent sprawl and encourage densification within the UGB.

C.2.3 ADAPT DEVELOPMENT AND DENSITY TO THE DEGREE OF SLOPES

The maps 6 and 7 show slope and other hazard areas within the urban perimeter of Khorog. Development on the identified areas should follow specific zoning, land-use and densities adapted to the slope and other factors that affect soil stability. The accompanying table **(Fig.5)** details describes the suitable land uses and measures required in each category of slopes. These recommendations are indicative and must be further developed by local experts, taking into consideration the required geotechnical studies.

C.2.4 ADOPT LAND MANAGEMENT STRATEGIES TO AVOID PROPERTY MARKET DISTORTION

The implementation of redevelopment and densification projects require the existence of functioning land management tools to readjust land parcels, manage the process of infill development, and to fairly distribute the burdens and benefits of the intervention between the public sector, investors, and the community.

Therefore, the awareness of the benefits, costs and externalities of densification need to be increased among planners, decision makers and the community. Densification

Slope	Development potential
0% to 3%	Generally suitable for all development and uses
3% to 9%	Suitable for medium density residential development, industrial and institutional uses
9% to 15%	Suitable for moderate to low-density development, but great care should be exercised in the location of any commercial, industrial or institutional uses. Mitigation measures to be considered
15% to 30%	Only suitable for low-density residential, limited agricultural and recreational uses. Mitigation measures to be considered
Over 30%	Only used for open space and certain recreational uses

Fig 5. Recommended development types according to slope degree , based on Tajik building code

strategies should therefore be well informed in order to better assess their impact on existing land, property and rental markets. Measures to prevent speculation and gentrification should be adopted, including the taxation of empty buildings and empty serviced plots.

C.2.5
TRANSPARENT COSTS AND BENEFITS

Densification and infill projects may be more complex and costly than expected. Therefore, the distribution of costs, benefits, and risks need to be made transparent and explicit over the short and long term financing of the project, taking into account that densification depends and requires improved public space, infrastructure and overall management of the interface between private and public spaces and stakeholders. Financing densification as a construction process is not enough, Addressing maintenance cost is key.

Social impact assessments should also be conducted before implementing any densification initiative to identify and analyse the social impacts of a proposed intervention on communities.[2]

2 https://unhabitat.org/sites/default/files/documents/2019-06/planning_compact_cities_exploring_the_possibilities_and_limits_of_densification.pdf

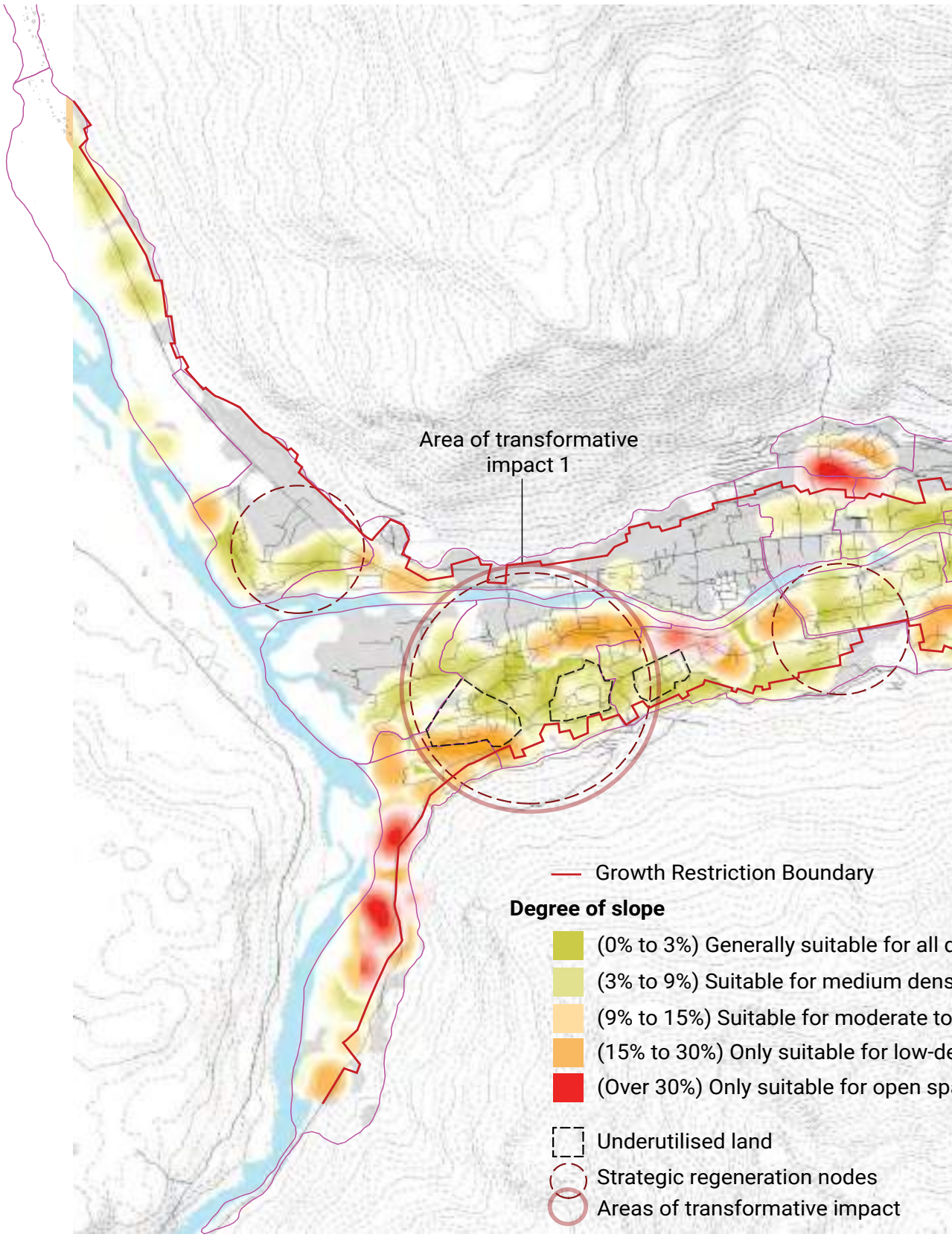
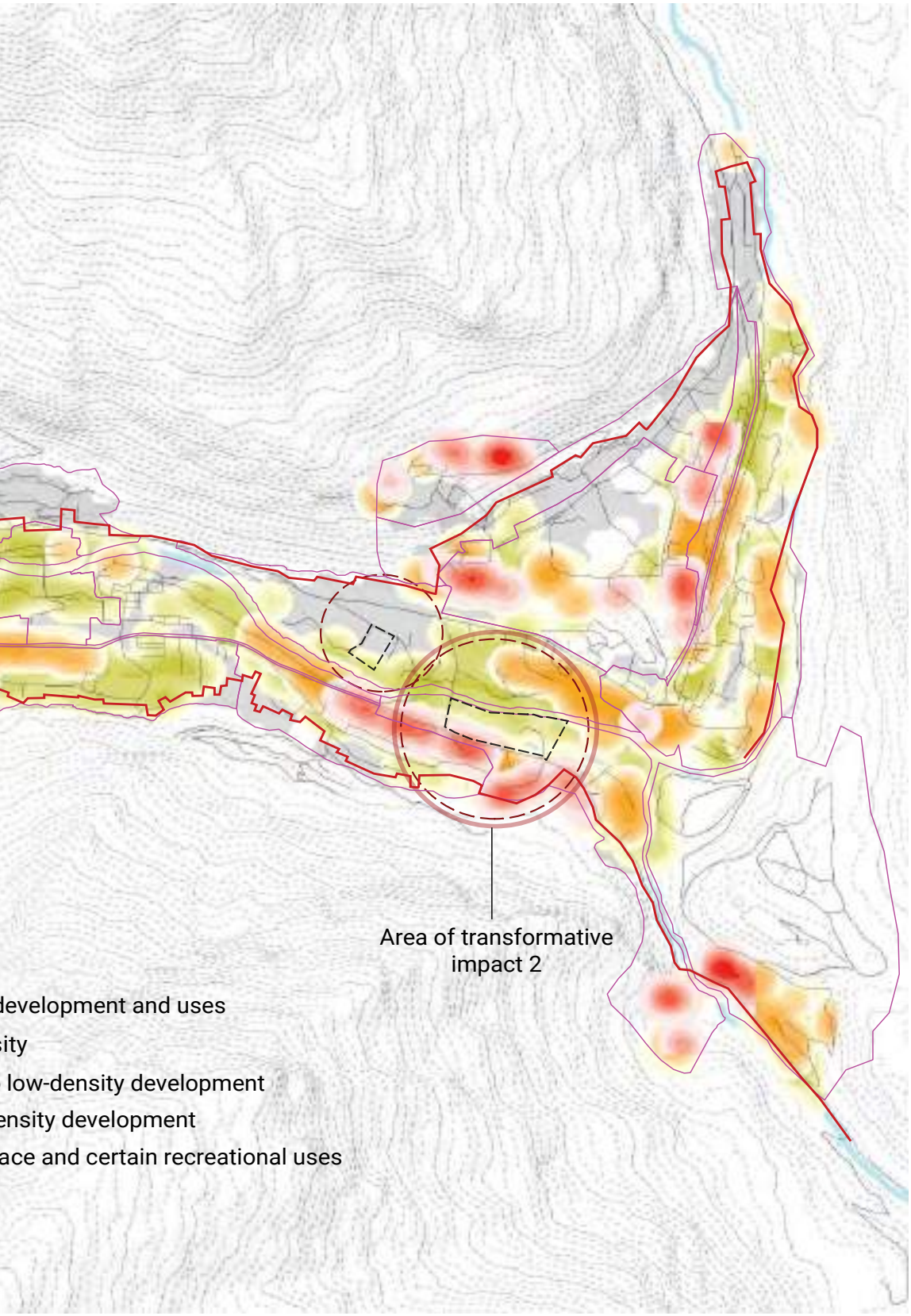


Fig 6. Density restrictions in slope areas, UN-Habitat, 2023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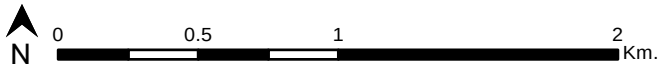
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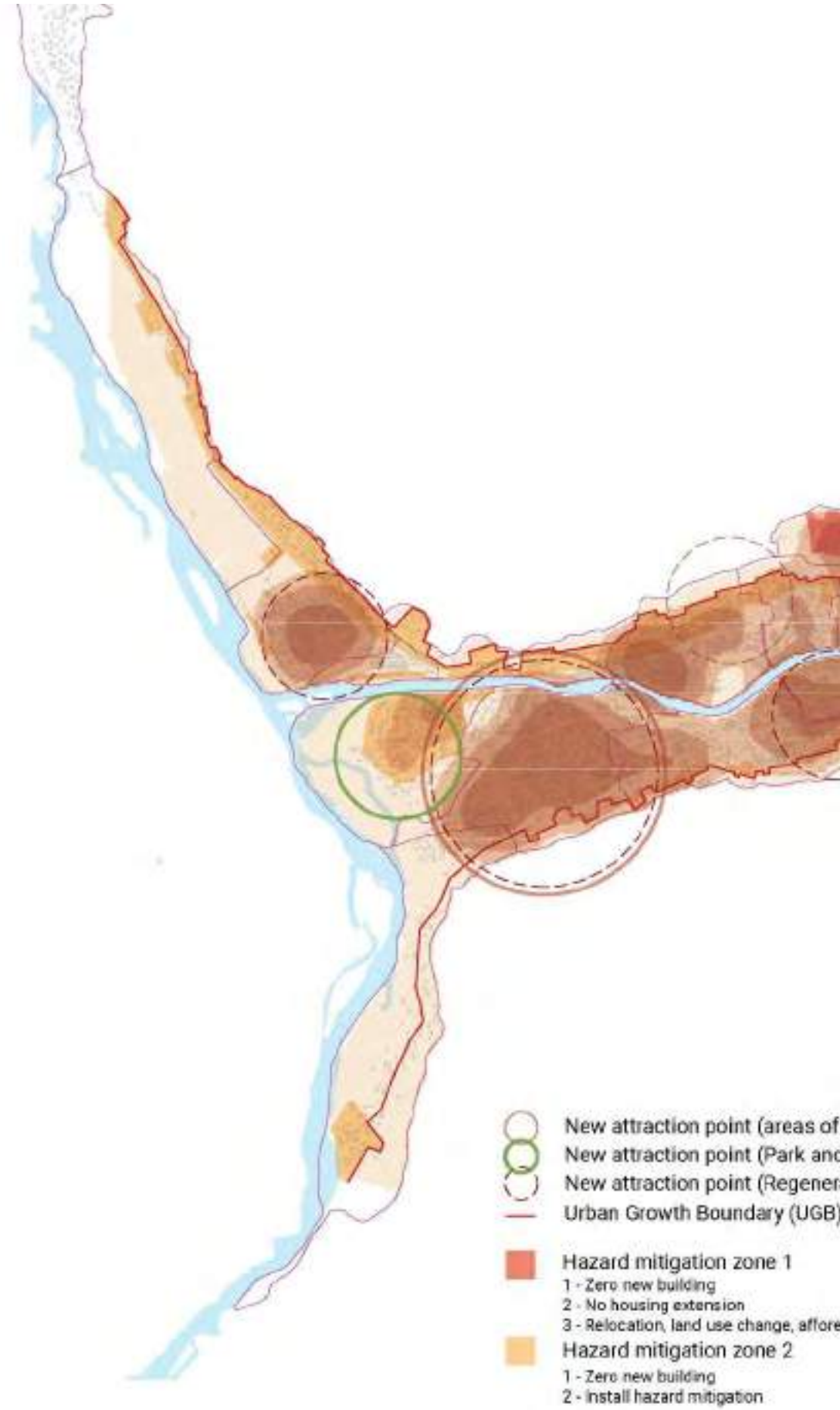
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Urban Growth Boundary (UGB)
Hazard mitigation zone 1
1 - Zero new building
2 - No housing extension
3 - Relocation, land use change, afforе
Hazard mitigation zone 2
1 - Zero new building
2 - Install hazard mitigation

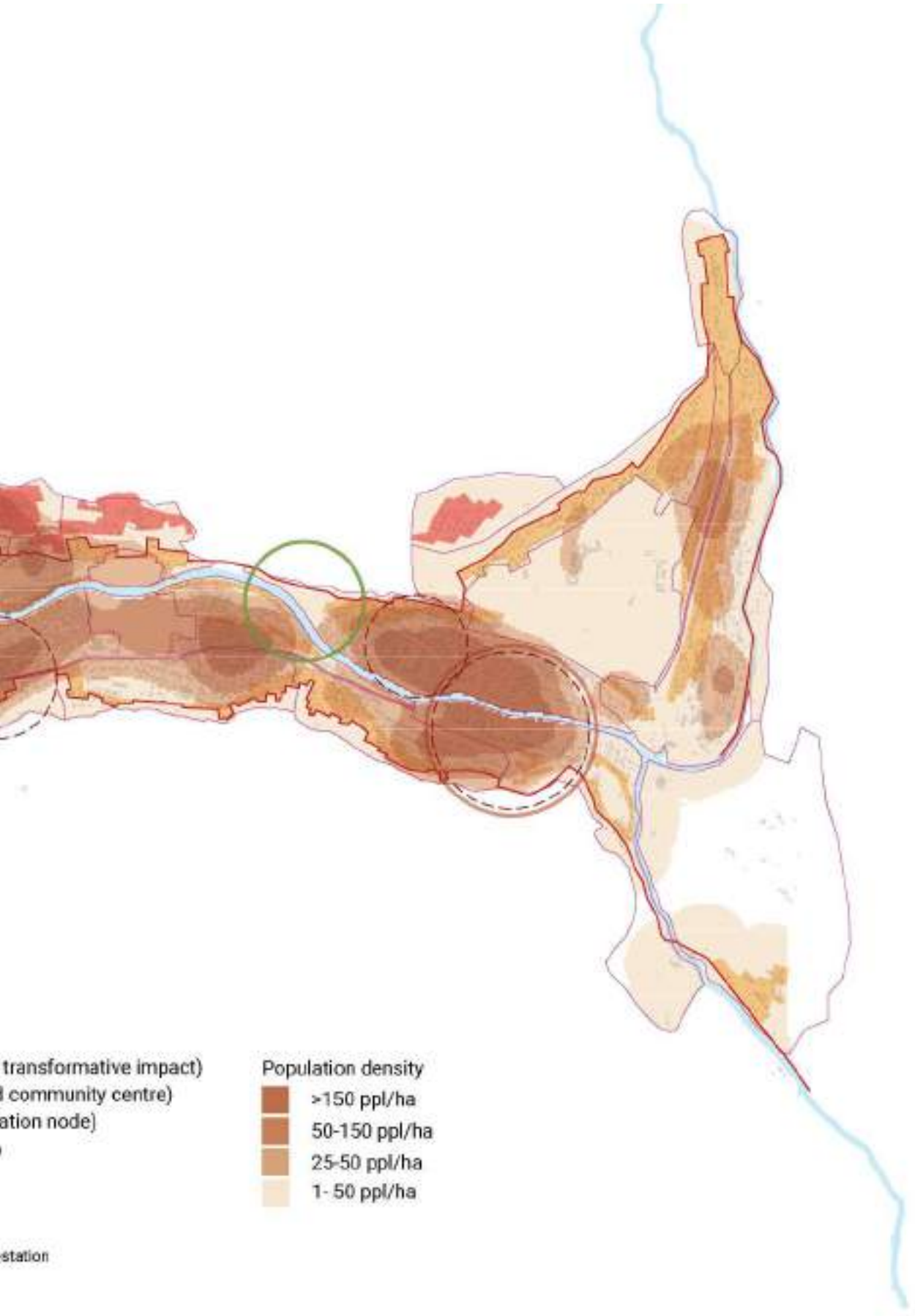


Fig 7. Proposed population density after the application of nodal densification, UN-Habitat, 2023

C.3 LOCAL ECONOMY

C.3.1 USE URBAN DESIGN AS A DRIVER FOR ECONOMIC DEVELOPMENT

Make use of urban design to guide and support local economic development. Adequate spatial distribution of industries and services, coupled with adequate density and well connected infrastructure, can support employment generation and create a healthy environment for businesses to thrive. This should be accompanied by adequate policies that facilitate and encourage economic development.

Fig.8 shows the results of a multi-dimensional analysis (accessibility, spatial connectivity, economic productivity, etc.) that allowed the identification of primary economic nodes in Khorog.

By promoting mixed-use development in the identified areas of transformative impact, the new points of attraction/activities are created to cover the deficit areas. Mixed-use nodes consolidate the urban structure and facilitate a more balanced development.

C.3.2 PROMOTE MIXED-USE DEVELOPMENT TO GENERATE EMPLOYMENT AND IMPROVED QUALITY OF LIFE

Mixed-use areas are characterized by the presence of primary (residential, workplace, retail, etc.) and secondary use buildings and/or spaces (services, cafés, restaurants, etc.). When the primary uses of a neighbourhood are effectively combined with secondary uses, further entrepreneurial activity is supported, setting the stage for continued economic growth.

Furthermore, the proximity of residents to retail, services, public spaces and transport nodes make mixed-use areas convenient places to live. Traffic congestion, energy use and greenhouse gas emissions in these areas are usually reduced.

UN-Habitat recommends that the distribution of the total floor area of mixed-use development should be around:

40-60% for retail/service use

30-50% for residential use

10% for public facilities.

This should be accompanied by an evaluation of the number of local jobs that can be created, and the financial business generated at the community level.

C.3.3
INTRODUCE MECHANISMS TO INCENTIVE MIXED-USE DEVELOPMENT

Encouraging mixed-use development requires a balance between offering incentives, determining obligations and responsibilities, and negotiating agreements between the city, the landowners, the community and the developers. Furthermore, zoning codes need to be updated to integrate mixed-use development, especially in single-use and under-utilized areas. Investments in infrastructure, public facilities, green spaces and multi-modal mobility are important mechanisms to broaden the appeal of these areas.

Fiscal tools such as Tax Increment Financing (TIF)[3] can be used to capture the increase in land value and divert property tax revenue to further finance that development. Other incentives can be:

Allowing for higher Floor Area Ratio (FAR) in specific investment in mixed-use projects;

Tax incentives for promoting development near transit nodes;

Reduced parking requirements;

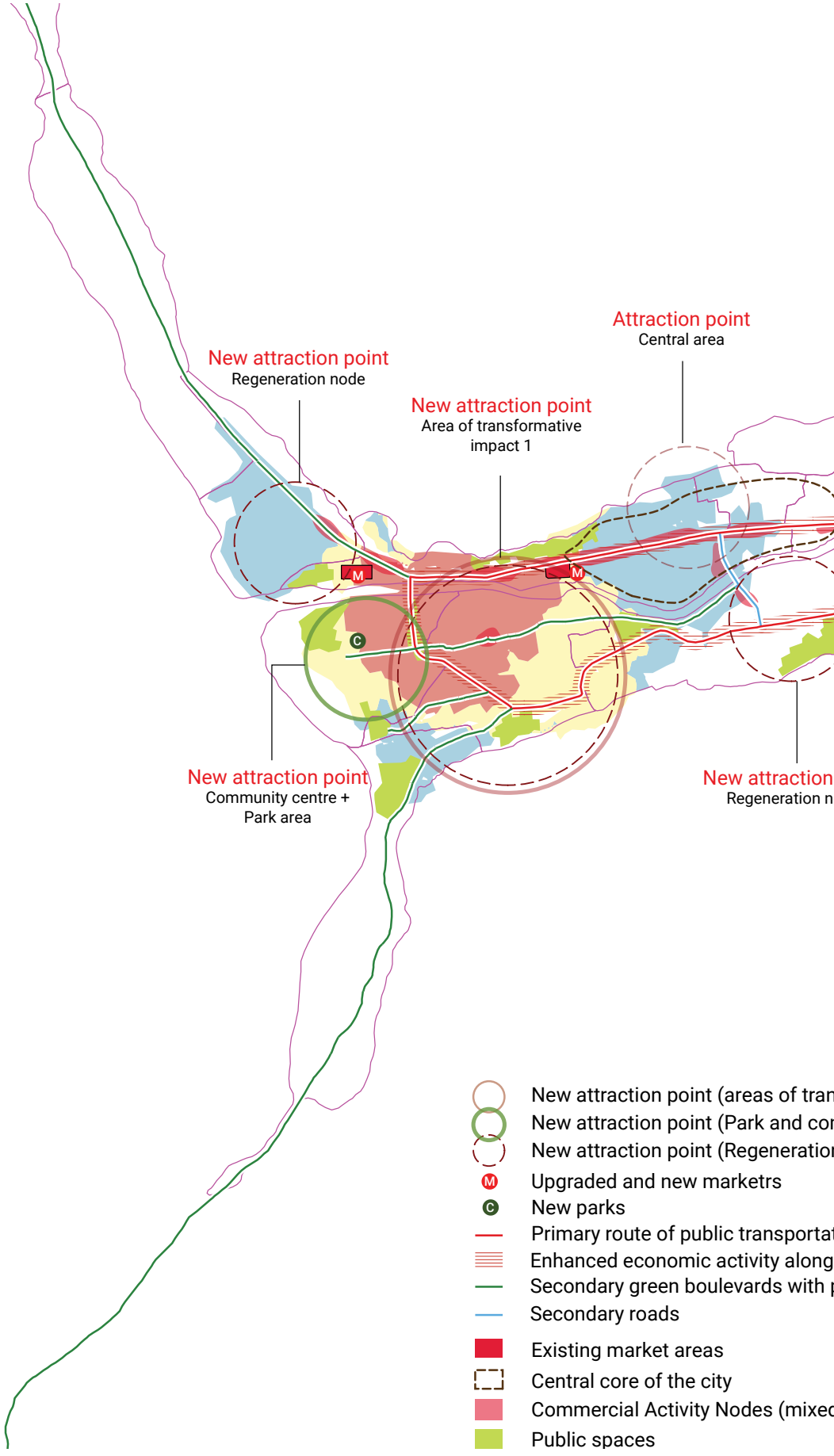
Subsidies for densification.

3 TIF uses the increased property and/or sales taxes generated by a new development to finance costs related to that particular development These costs may include public infrastructure, land acquisition, relocation, demolition, utilities, debt service and planning costs.

C.3.4
ADOPT HOUSING POLICIES TO SUPPORT INCLUSIVE MIXED-USE DEVELOPMENT

The creation of mixed-use districts may lead to gentrification and an increase in property value and rents in their vicinity. This can increase the vulnerability of low-income households and limit the supply of affordable housing units.

In this regard, it is recommended that the city adopts policies that promote housing affordability in mixed-use areas such as mandatory or voluntary inclusionary zoning incentives or requirements **(See N.1.2)**.


New attraction point
Regeneration node
New attraction point
Area of transformative impact 1
Attraction point
Central area
New attraction point
Community centre + Park area
New attraction
Regeneration n
M
C
New attraction point (areas of tran
New attraction point (Park and cor
New attraction point (Regeneration
Upgraded and new marketrs
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Primary route of public transportat
Enhanced economic activity along
Secondary green boulevards with p
Secondary roads
Existing market areas
Central core of the city
Commercial Activity Nodes (mixed
Public spaces

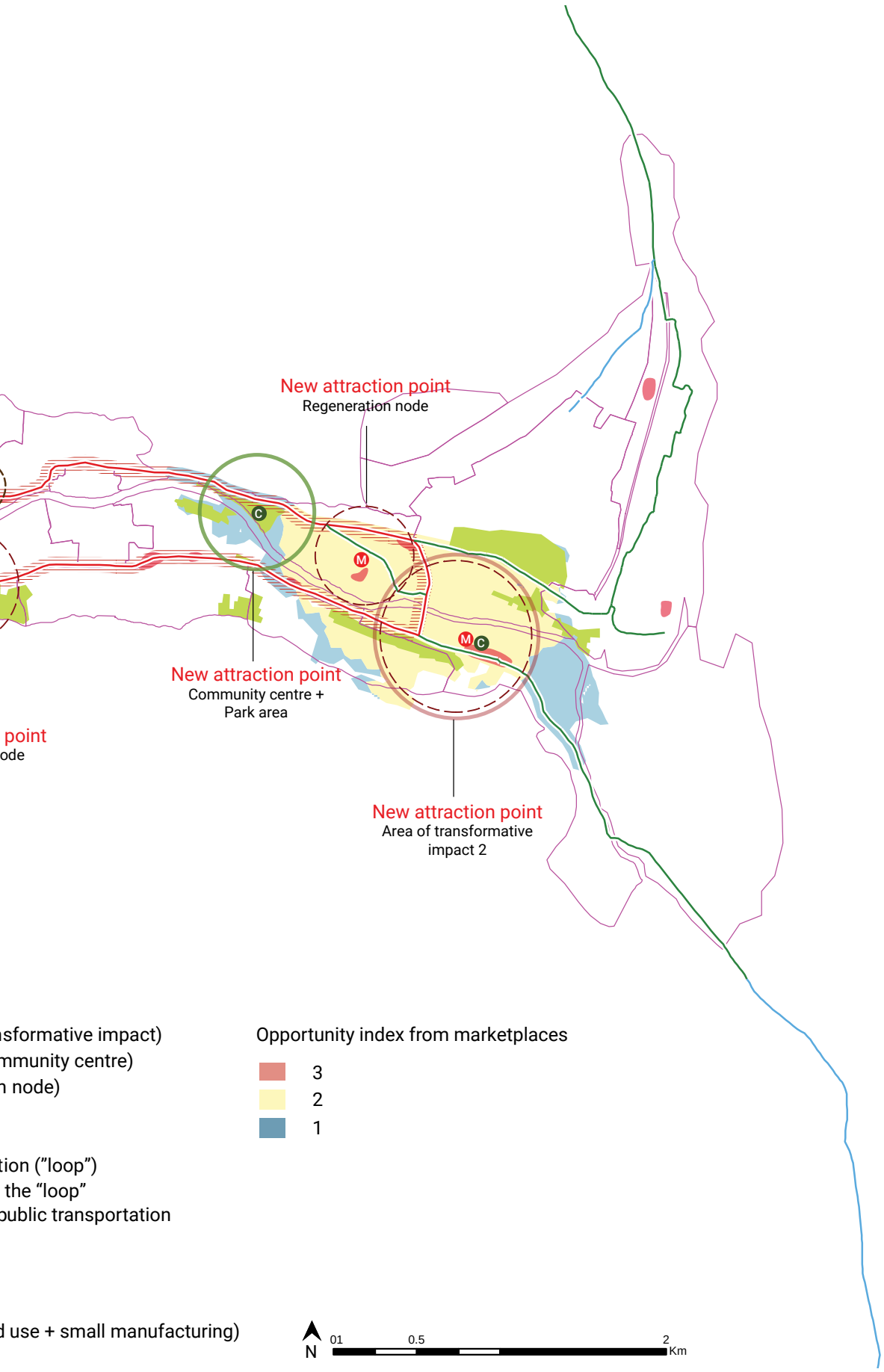
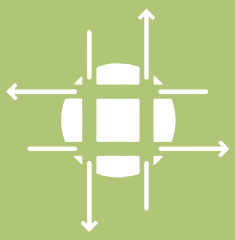


Fig 8. Map of new activity areas and attraction points in Khorog, UN-Habitat, 2023



C.4 EFFICIENT CONNECTIVITY

C.4.1 ACHIEVE TERRITORIAL CONNECTIVITY

Mobility networks should take into consideration territorial cohesion and promote a balanced and harmonious development at the urban, regional, national, and -in the case of Khorog- cross-border scales.

This requires strategic territorial plans to leverage the geographical, economic and infrastructural opportunities in Khorog in order to achieve larger economic integration and social development in the region.

This can include the creation of a system roads, nodes and logistical hubs based on strong road/air connectivity, efficient regional road network that facilitates the smooth movement of people and goods, and a network of dry ports and logistical hubs that ensure the proper storage and transfer of goods.

It is therefore of great importance that Khorog develops regional strategies that integrate territorial connectivity as a backbone of regional development.

C.4.2 MAXIMISE ROAD CONNECTIVITY

Connectivity affects the degree to which transportation networks such as streets, walking and cycling paths, connect people to their destinations (including intermediate destinations such as public transport services).

The level of efficiency of a road network depends on two essential factors. i)Road provision, and ii) how the elements that compose it are distributed (permeability).

Road provision is reflected in the length of street segments, calculated in linear km, as well as the density of nodes/intersections per km2. The higher the density of these two elements, the greater the provision.

UN-Habitat recommends a benchmark value of 100 intersections per km2, and a street density ranging between 6% and 36% to achieve higher levels of connectivity in a city.

Street density = Total street length/Total of urban surface

Road network permeability brings a finer grain to the analysis, as it relies on both the location

C.4.3
CONNECT NEW DEVELOPMENT SITES WITH THEIR SURROUNDING

(proximity) of streets and the relationship between them. A highly permeable network has many short links, numerous intersections, and minimal dead-ends. As permeability increases, travel distances decrease and route options increase, allowing more direct travel between destinations, creating a more accessible and resilient transportation system (Planning institute Australia 2017).

For instance, urban forms that are cut through by highways or which have many culs-de-sac tend to reduce the road network's permeability and encourage longer journeys by car.

The proposed street network in Khorog integrates these factors to achieve an efficient transport system that allows for interconnected walking and cycling routes and short block lengths. This offers multiple routes to various destinations and makes it convenient to walk and cycle **(Fig 10, 11)**.

Street connectivity can be further enhanced when combined with adequate density, mixed-use planning and fine grained urban development.

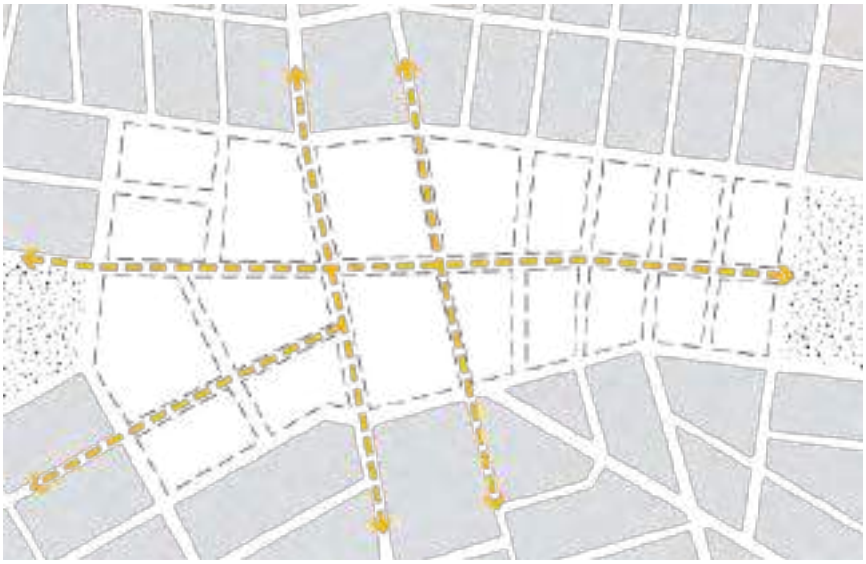


Fig 9. Approach to link the new development site to its surrounding

1. SOURCE: STATE OF VICTORIA'S URBAN DESIGN GUIDELINES

New development projects should be well integrated in their surrounding areas in order to achieve a continuous connectivity and homogeneous movement network. This includes streets, roads, public transport services, pedestrian and bicycle paths.

At least two 'through' streets across the new neighbourhood in a development site should be provided, linking 'centre to edge'. Large development sites may require additional through routes **(Fig.9)**.

In addition to street connectivity, new development sites should ensure the provision a hight level of facilities, open spaces and services, especially if they are lacking or are insufficient in the adjacent neighbourhood.

Furthermore, the provided open spaces should be designed to complement the existing open/ green space network, and should serve both the intensity and the type of development (density, character, use, etc.).

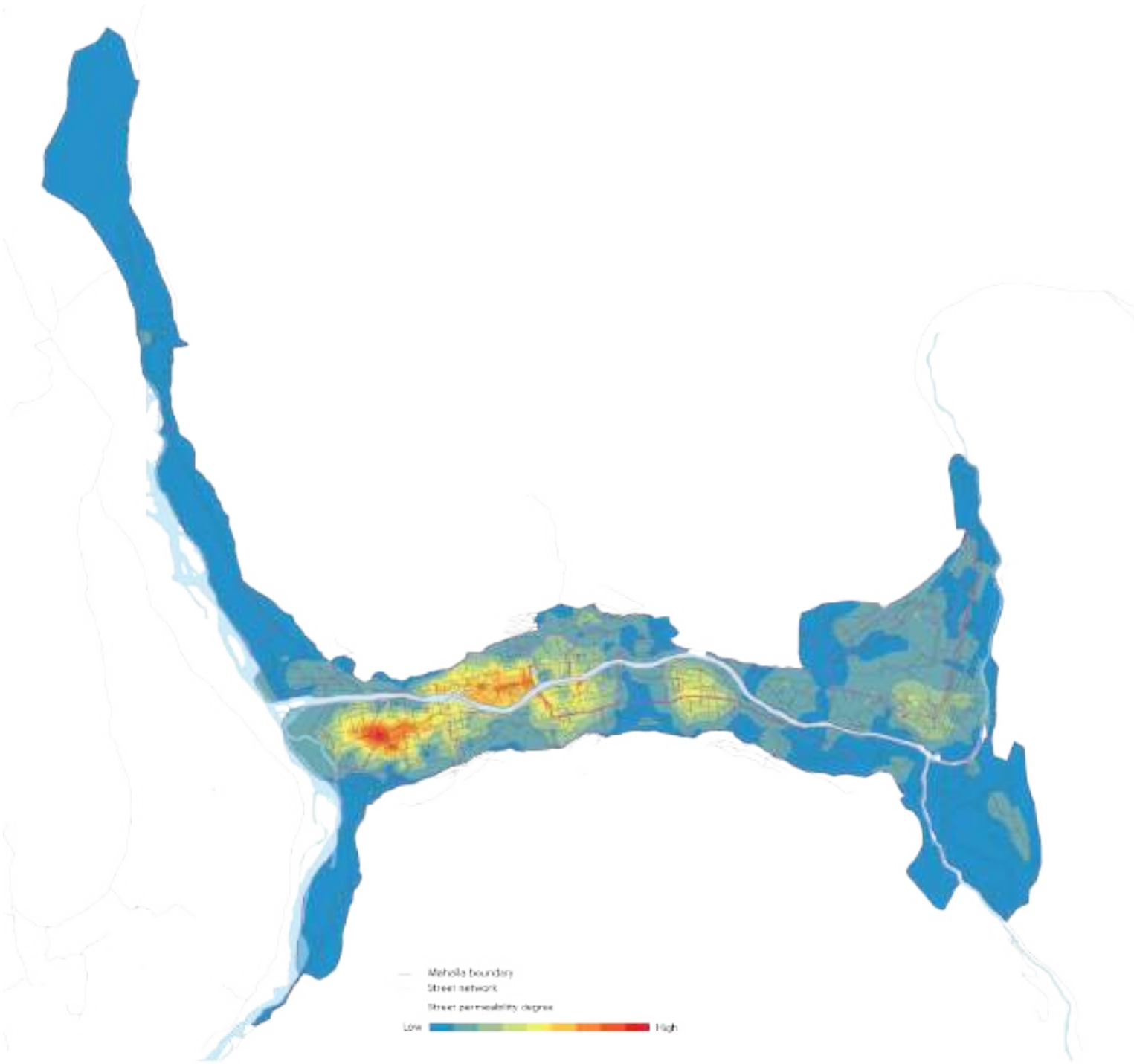


Fig 10. Current level of street permeability, , UN-Habitat, 2023

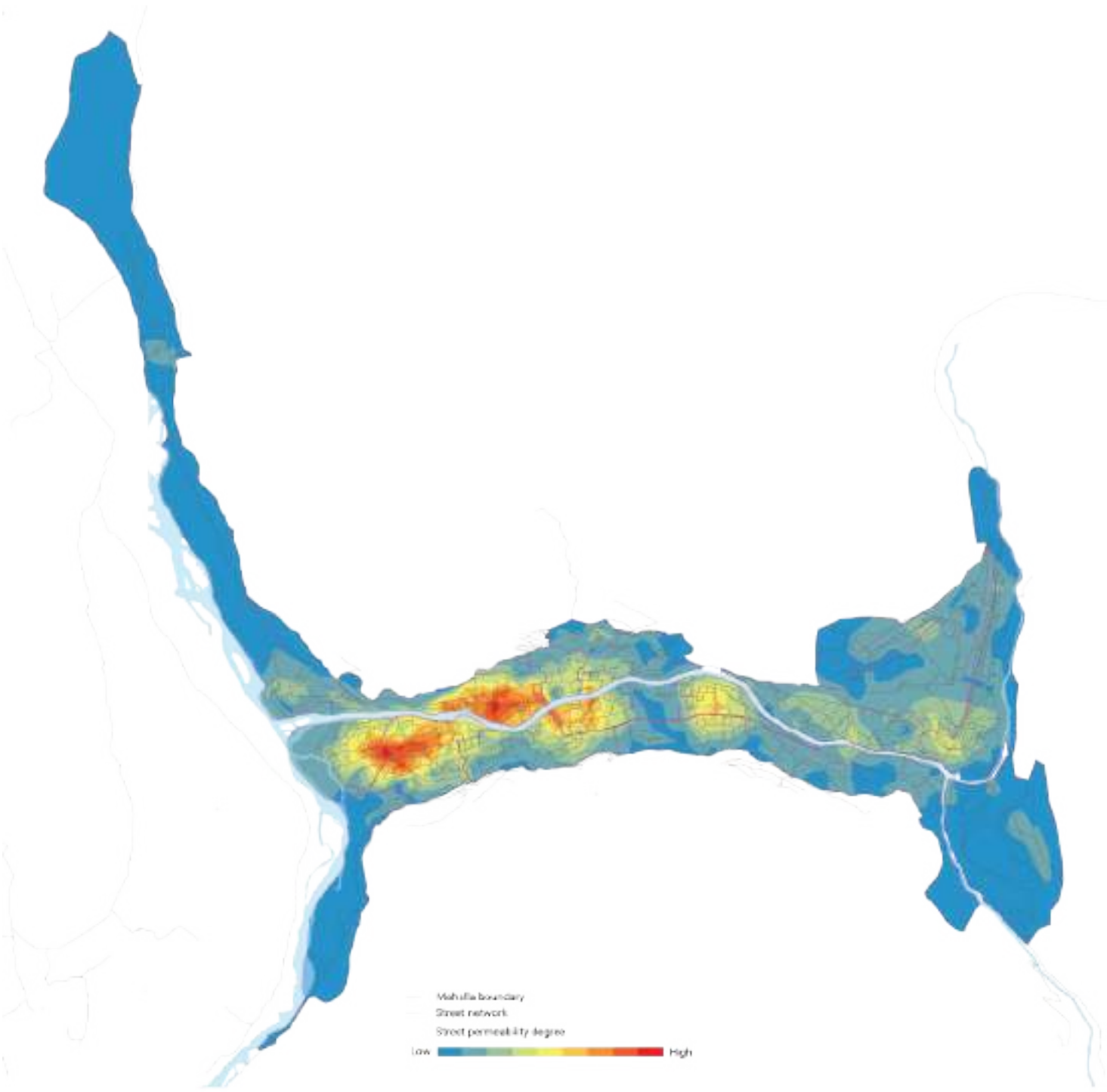


Fig 11. Improved level of street permeability, UN-Habitat, 2023

EFFICIENT PUBLIC TRANSPORT

C.5.1
DESIGN PUBLIC TRANSPORT SYSTEMS TO SERVE ALL CITY AREAS, ESPECIALLY THE SOCIALLY AND ECONOMICALLY VULNERABLE

Urban design and planning should aim at bringing people and places together in a way that makes functional endpoints as close to residents as possible, leading to a reduction in transportation needs altogether. In other words, addressing the mobility challenges in cities should not focus on merely adding urban transport infrastructure to increase the movement of people and goods, but should rather value accessibility and proximity of services, work and leisure to the city residents.

Integrated public transport systems with high passenger capacity, hight area coverage, with low energy consumption and reduced carbon emissions should be promoted.

They should serve all city areas, and ensure that the mobility options are within geographical and financial reach of all residents, especially the socially and economically vulnerable.

C.5.2
OPTIMISE TRANSIT TIMETABLES AND BUS-STOPS

In order to enhance the passenger's experience and improve the efficiency of the public transport system, It is recommended to increase the number of bus-stops and locate them strategically to ensure proximity to the maximum number of users and ensure their safety.

Fig.13 shows the proposed location of public transportation stops based on opportunity index analysis, which indicates the level of diversity of activities, facilities and uses that can be accessed within a certain area.

In addition, the introduction of reliable and optimised timetables is important to encourage the use of public transport and provide a comfortable users' experience.

C.5.3
MAKE PUBLIC TRANSPORT SYSTEMS SUPPORT OTHER NON-MOTORIZED MOBILITY OPTIONS

Fig 12. Bike carrier attached to a public bus

Source: BusVic

Khorog's public transport system should be designed to complement and strengthen non-motorised mobility options such as walking and cycling. This requires the integration of non-motorized transport in the city's mobility strategy, taking into account the needs and behaviour of the local community.

This integration can be achieved through solutions such as:

- Buses and other public transport vehicles designed to carry bicycles **(Fig 12)**.

- Public transport stations should be placed strategically at walkable distances from residential areas and activity nodes. Their design should also ensure easy access to all users, including the elderly and people with reduced mobility. Map 15 demonstrates the impact of improved public transportation system on pedestrian accessibility in Khorog.

- Transit stations can include safe parking for bicycles, as well as access to micro-mobility options such as shared e-bikes.

- Buses and other public transport vehicles should be barrier-free and easily accessible.

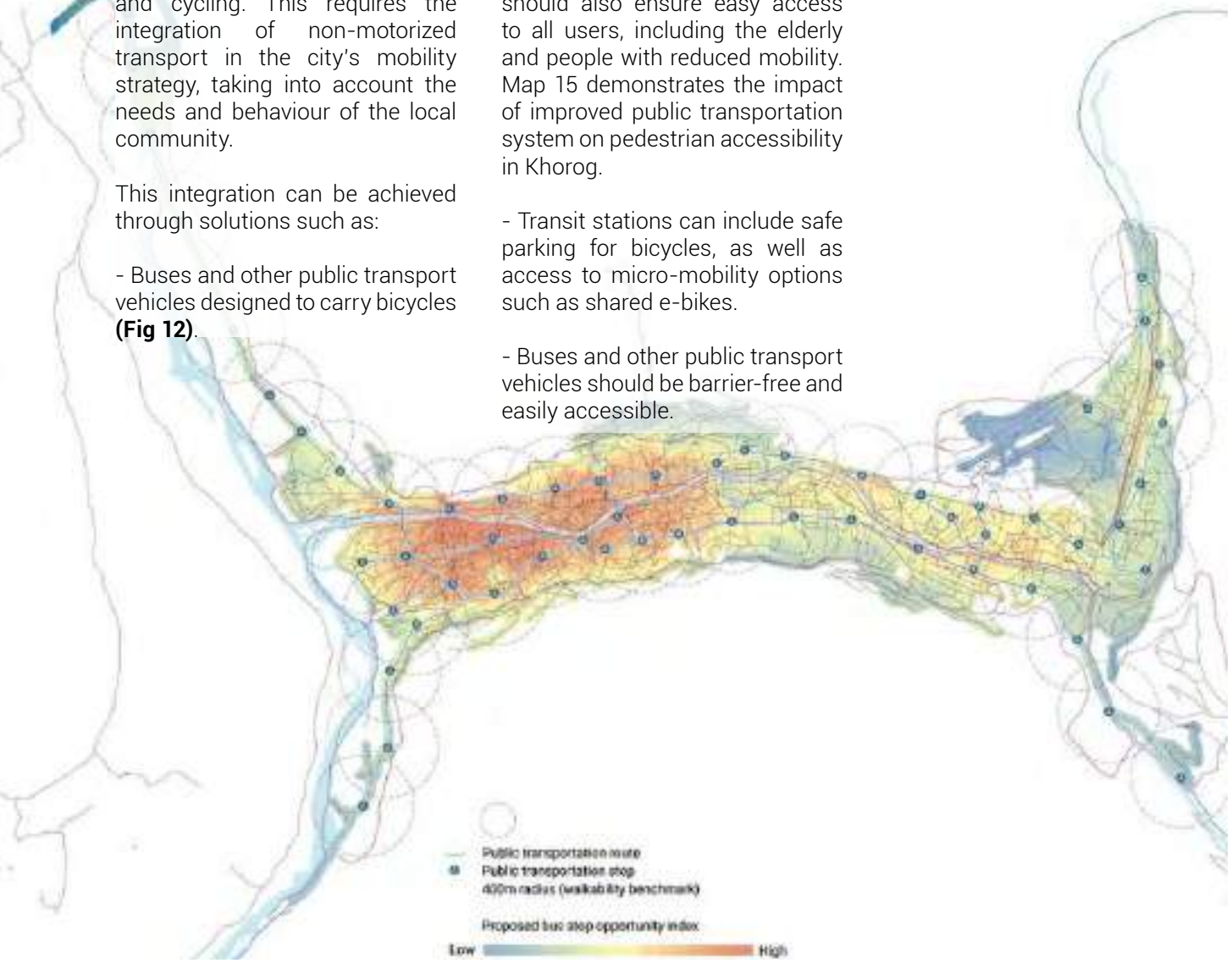
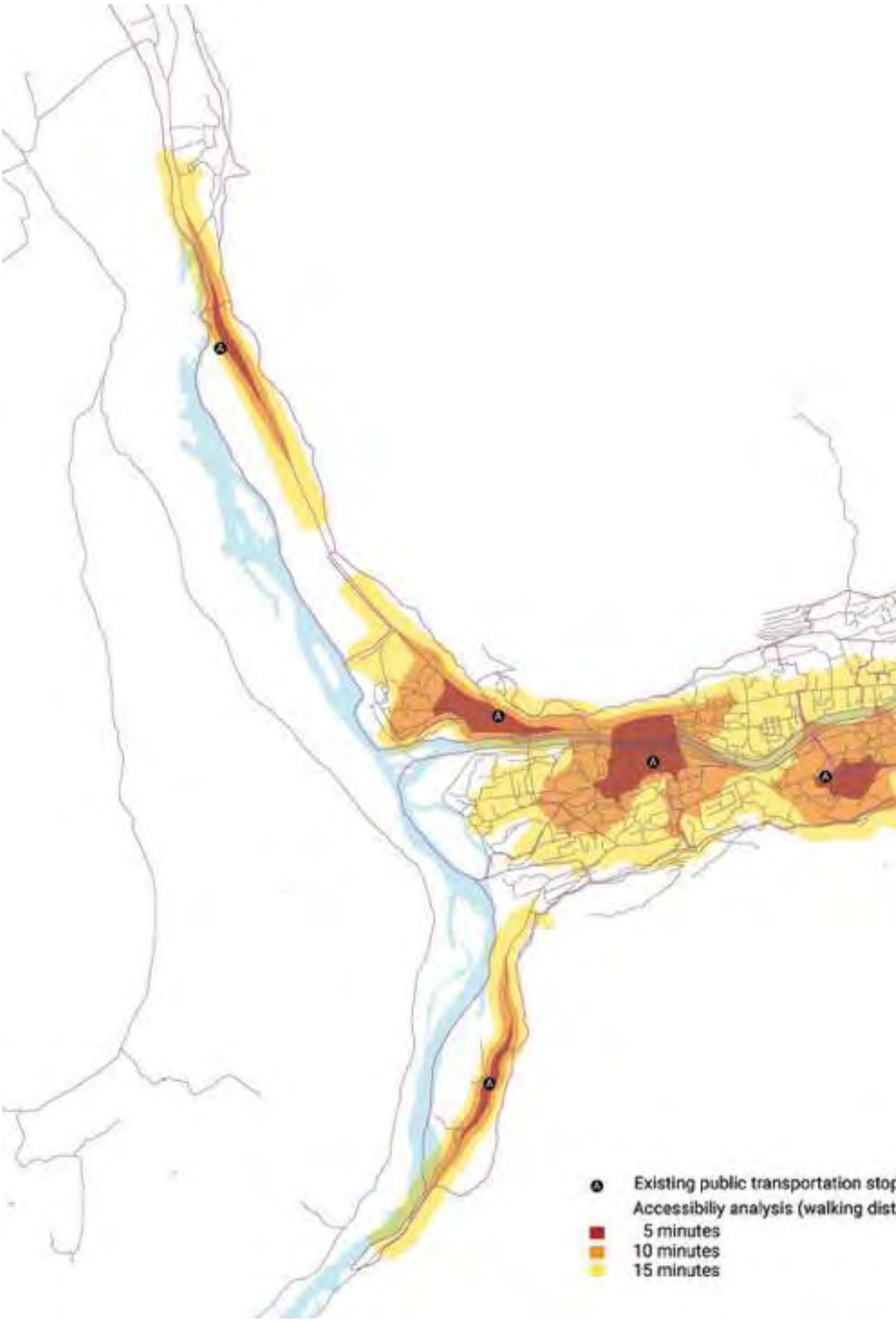


Fig 13. Map of bus stop opportunity index, UN-Habitat, 2023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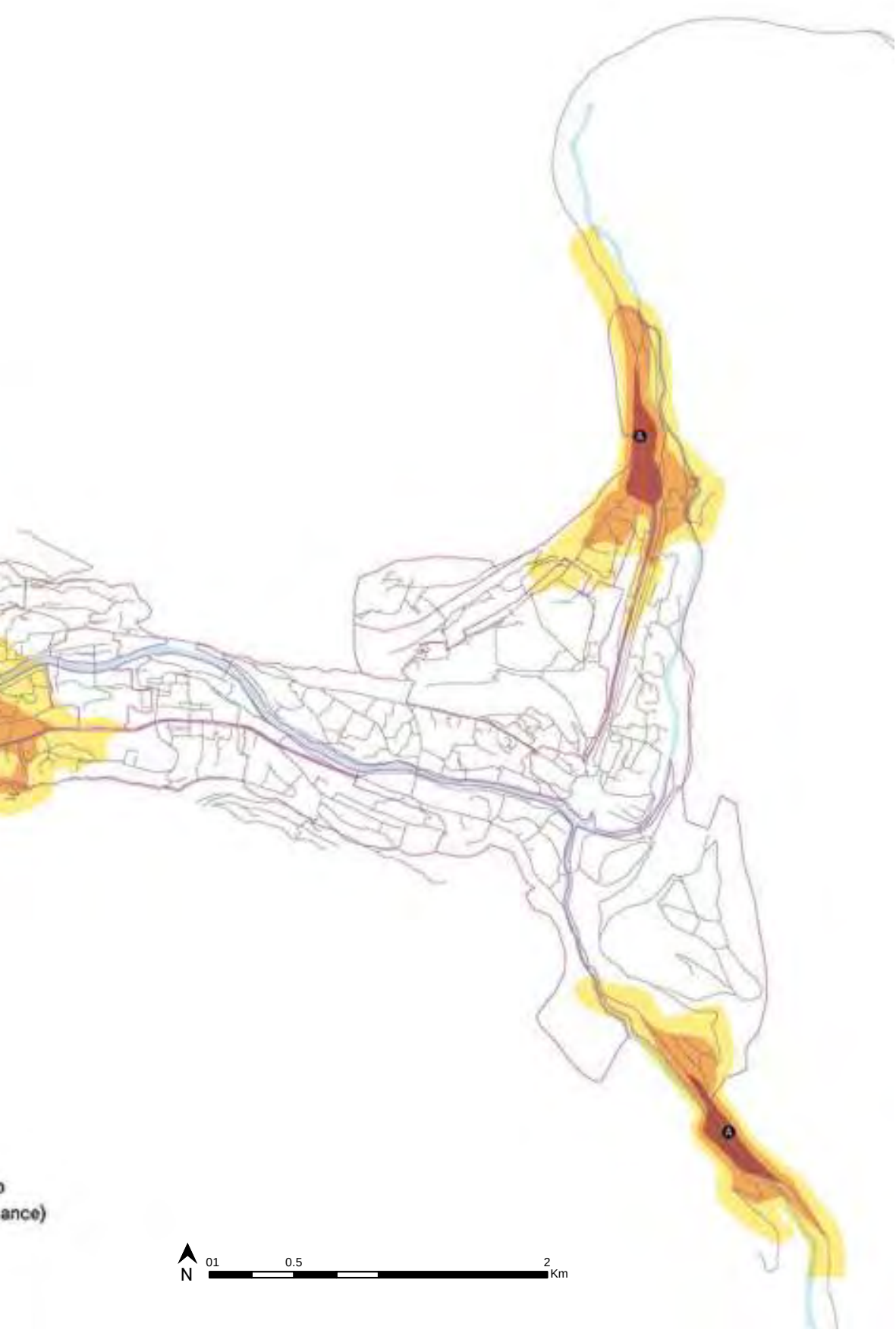
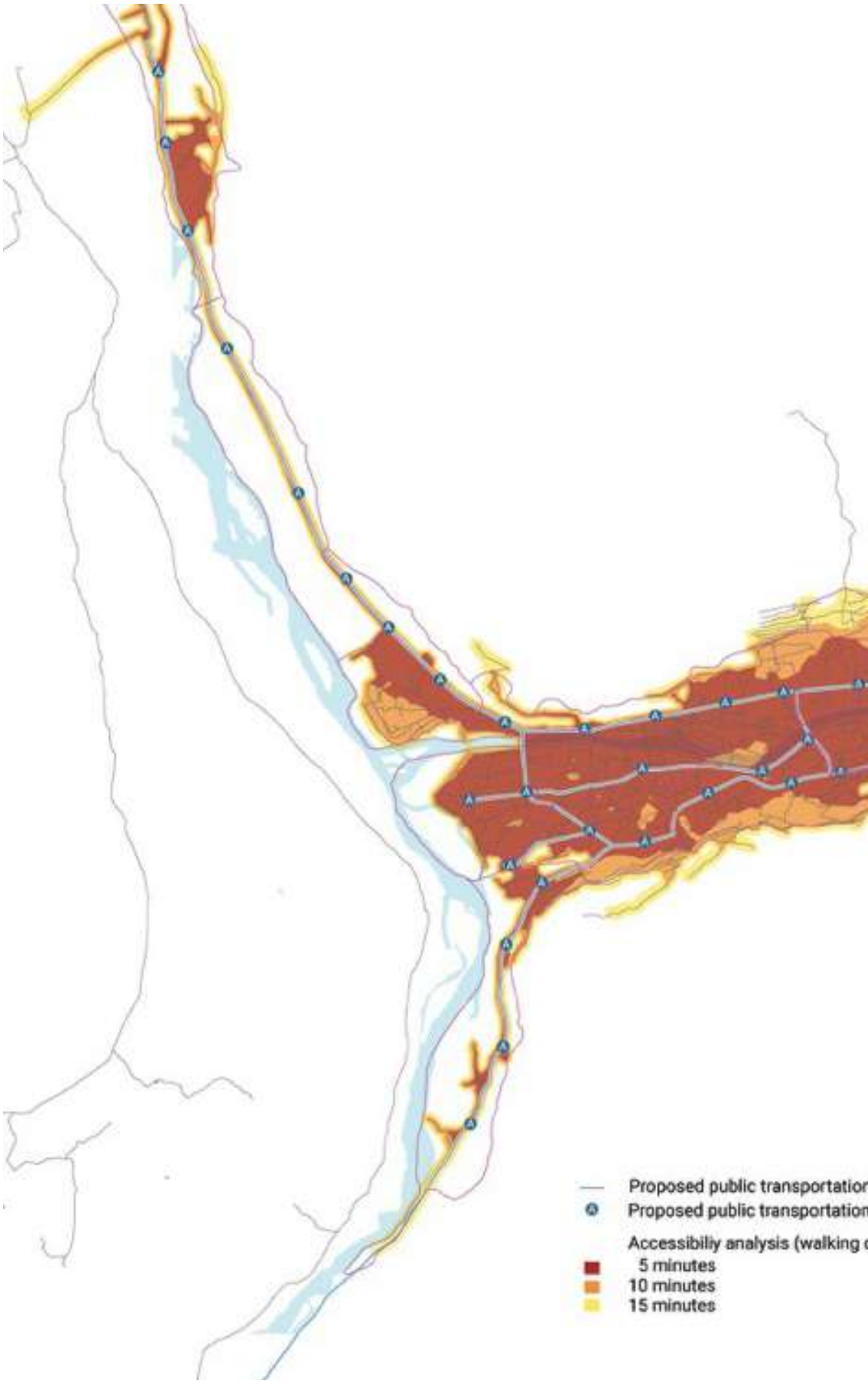


Fig 14. Pedestrian accessibility analysis (current), UN-Habitat, 2023


Proposed public transportation
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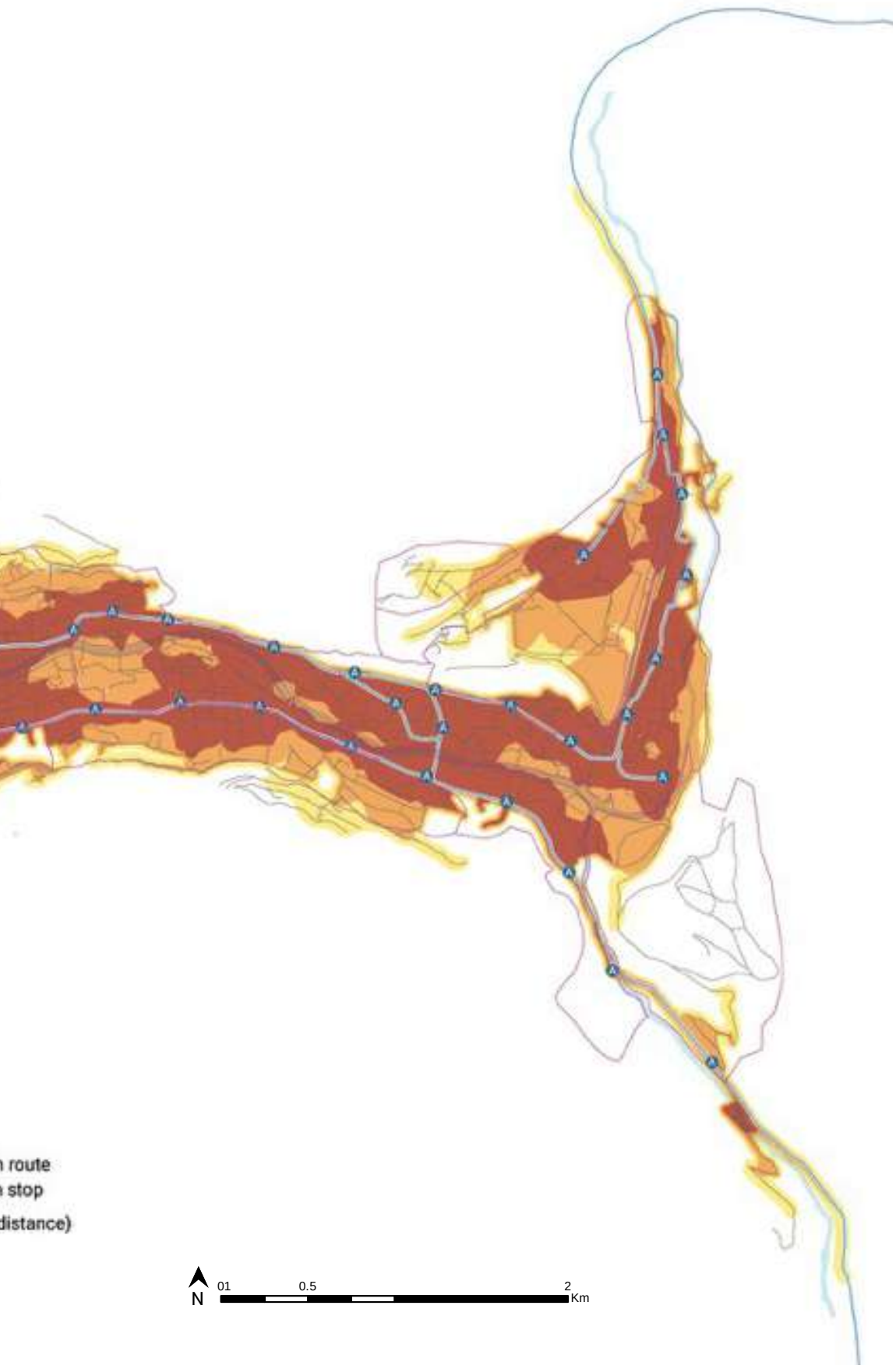


Fig 15. Impact of improved public transportation on pedestrian accessibility, UN-Habitat, 2023

C.5.4
DESIGN PUBLIC TRANSPORT SYSTEM AS A DRIVER FOR ECONOMIC DEVELOPMENT

Use Transit-Oriented Development (TOD) as a strategy to ensure compact, mixed-use, suitably dense, pedestrian and bike-friendly urban development, organized around public transportation stations. The strategy embraces the idea that locating amenities, employment, retail shops and housing around public transportation hubs promotes public transportation usage and non-motorized travel. Well-planned TOD is inclusive in nature and integrates considerations of resilience to natural hazards **(Fig.17)**.

Fig 16. Cable car as a public transport system in La Paz, Bolivia

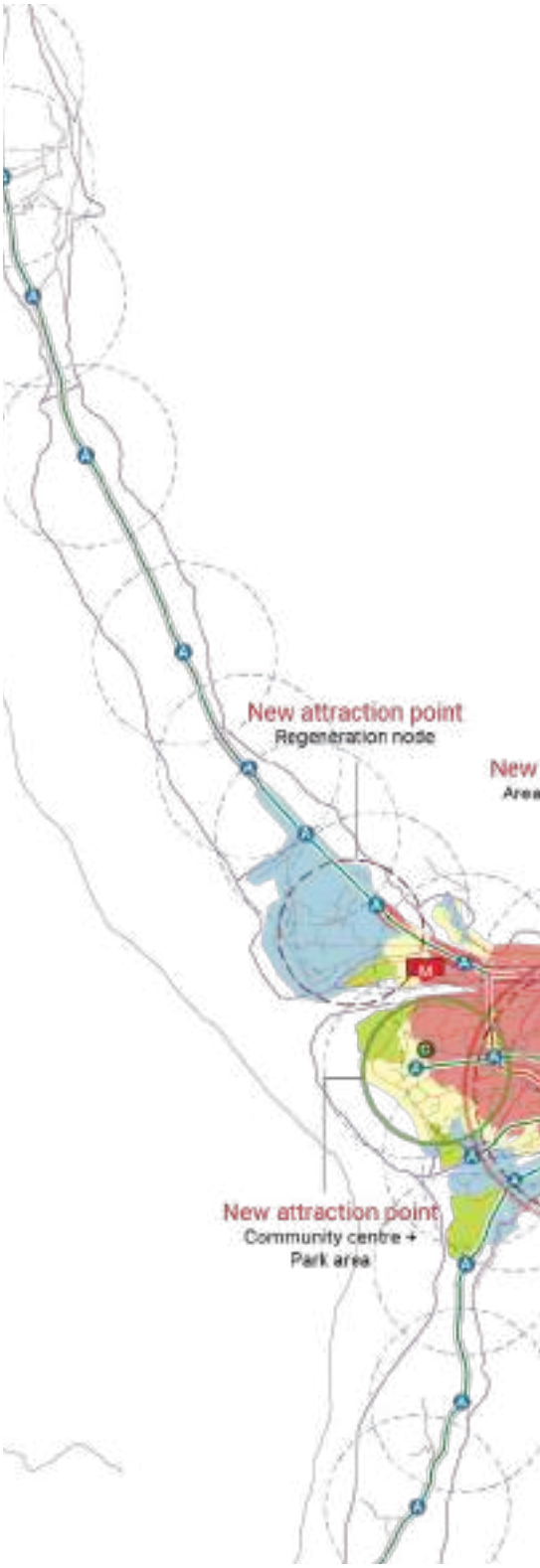
Source: picture alliance / Photoshot

C.5.5
ADAPT PUBLIC TRANSPORT SYSTEMS TO THE LOCAL, NATURAL AND SOCIAL CONDITIONS

Public transport systems should be designed around users' needs and the local environment rather than around a technology. This means that public transport solutions have to be adapted to the natural specificities as well as the social and economic conditions of Khorog.

For instance, compact bus vehicles are more agile and more adapted to navigate narrow streets and curves. They also contribute less to traffic congestions. Cable-cars also prove to provide alternative solutions for public transport in mountainous areas, and could be well adapted to Khorog's topography.

Furthermore, transitioning public transport fleets to clean-energy is one of the key ways in which Khorog can reduce its ecological footprint and improve the quality of air.



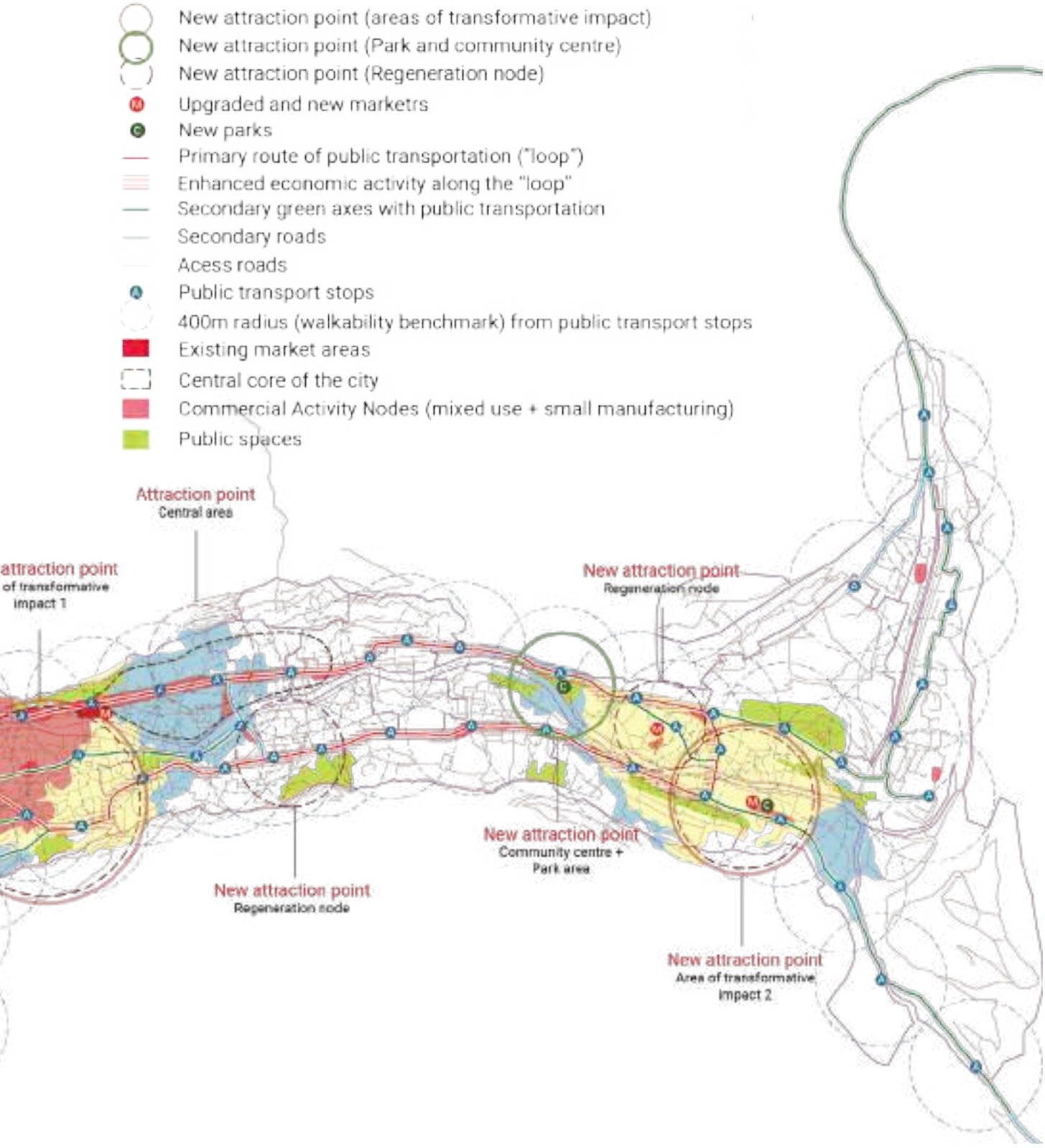


Fig 17. Map of proposed public transportation network and activity nodes, UN-Habitat, 2023

C.6 URBAN RESILIENCE

C.6.1 INCLUDE HAZARD CONSIDERATION IN ALL URBAN PROJECTS

Urban design projects are required to include hazard consideration to ensure that project sites incorporate disaster risk reduction measures into their basic design, and do not increase existing levels of vulnerability.

It is therefore recommended to elaborate different land development scenarios that factor disaster risk considerations in order to understand the implications (within geographical and time frames) of disaster risk on proposed land use, and develop policies and regulations to ensure all occupancy types can be safely undertaken **(Fig.18)**.

C.6.2 INCLUDE SPECIAL REGULATIONS AND ZONING IN HAZARD-PRONE AREAS

Special regulations and zoning should be assigned to risk prone areas following the risk analysis map. Setbacks or buffers should be introduced along fault lines, as well as in avalanche, landslide, rockfall and flood prone areas.

The zoning should define these buffer zones depending on the intensity and the extent of risk areas.

For instance, a buffer zone of 15m to 50m should be crated along rivers to protect the riverbank and minimize the impact of flooding.

The buffer zones can be designed to accommodate promenades, green spaces, sport and leisure facilities, etc. The zoning can also provide incentives to homeowners whose buildings are in flood-prone areas to convert their ground floors to freeboards above the base flood elevation (BFE) in order to avoid future flood damage **(Fig.19)**.

C.6.3 ENSURE SHORT DISTANCES AND GOOD ACCESSIBILITY TO SAFE HAVENS FOR THE ENTIRE POPULATION OF THE CITY

Emergency shelters and safe havens are vital for disaster affected people. The location, capacity and quality of these facilities should be comprehensively considered in order to measure catchment areas, as well their spatial accessibility and distribution under different disaster scenarios.

Emergency evacuation strategies should therefore be embedded in street designs, evacuation routes, zoning codes and public transport systems in order to minimize the impact of hazards on people and assets.

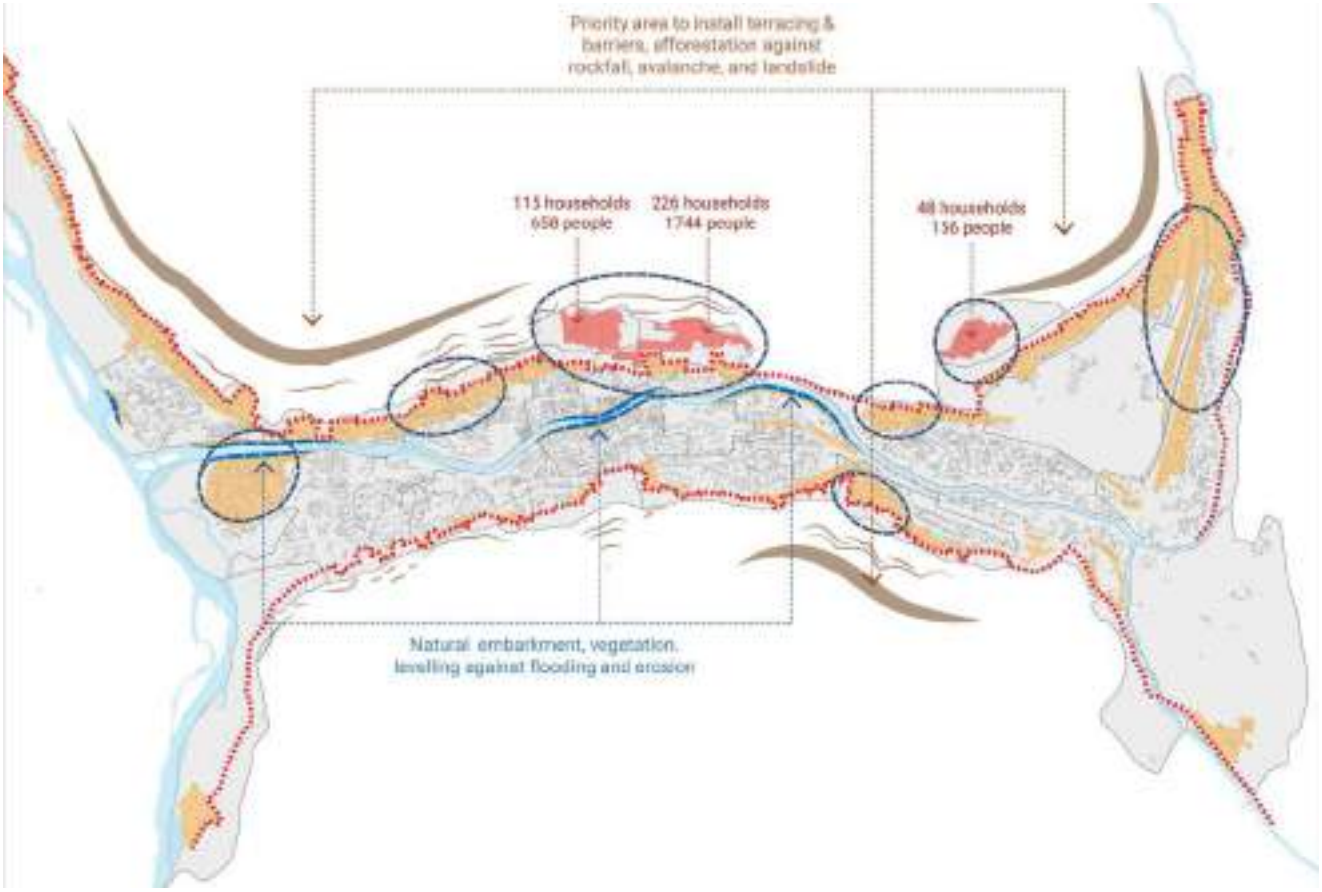


Fig 18. Map of risk mitigation measures in Khorog, UN-Habitat, 2023

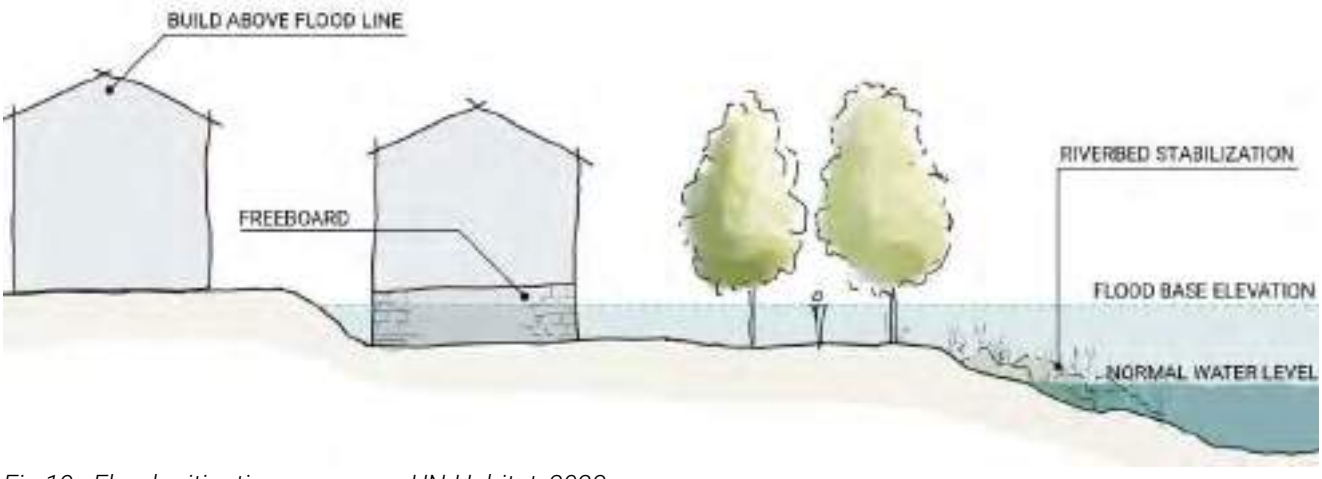
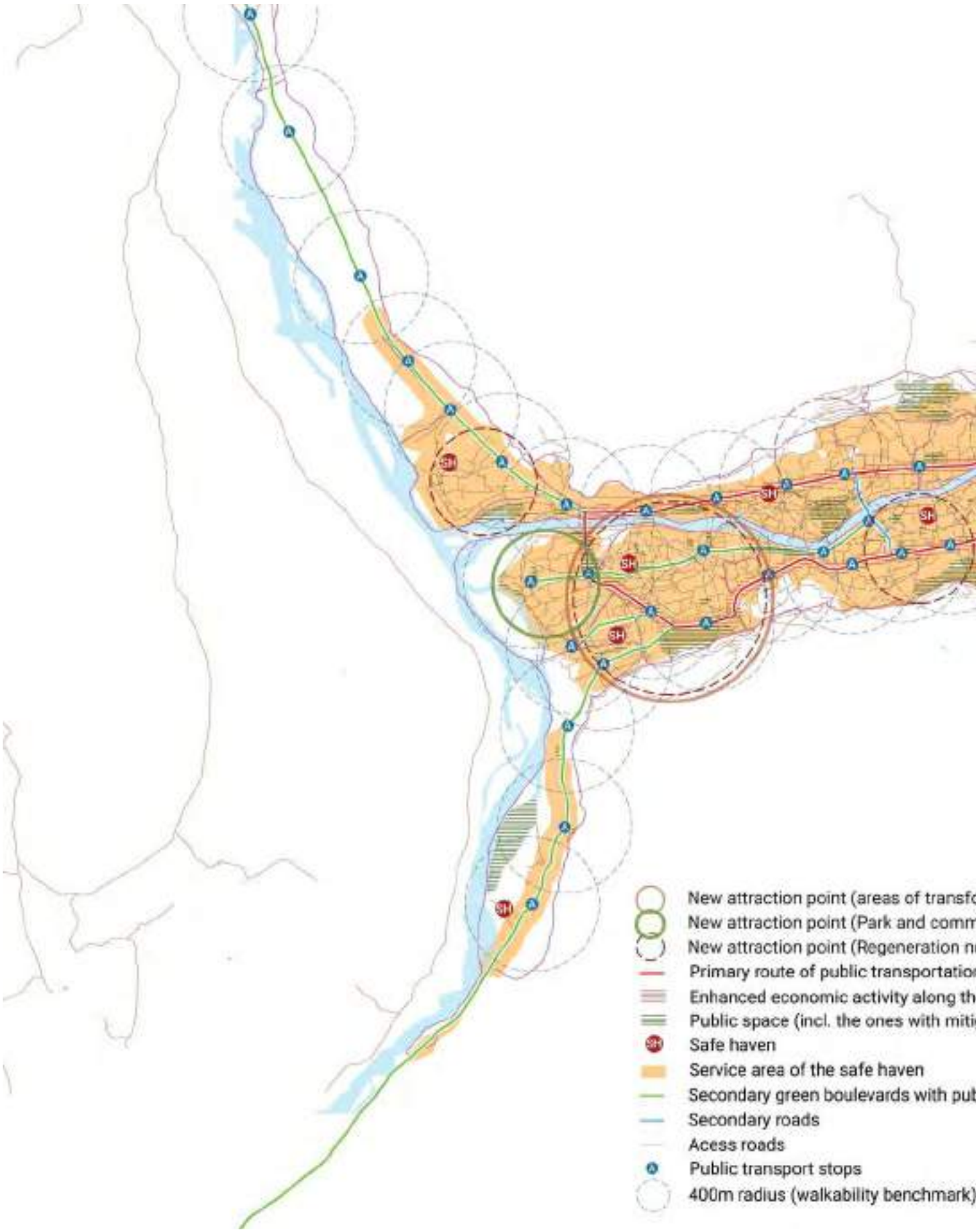


Fig 19. Flood mitigation measures, UN-Habitat, 2023


New attraction point (areas of transfo
New attraction point (Park and comm
New attraction point (Regeneration n
Primary route of public transportatio
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Safe haven
Service area of the safe haven
Secondary green boulevards with pub
Secondary roads
Acess roads
Public transport stops
400m radius (walkability benchmark)

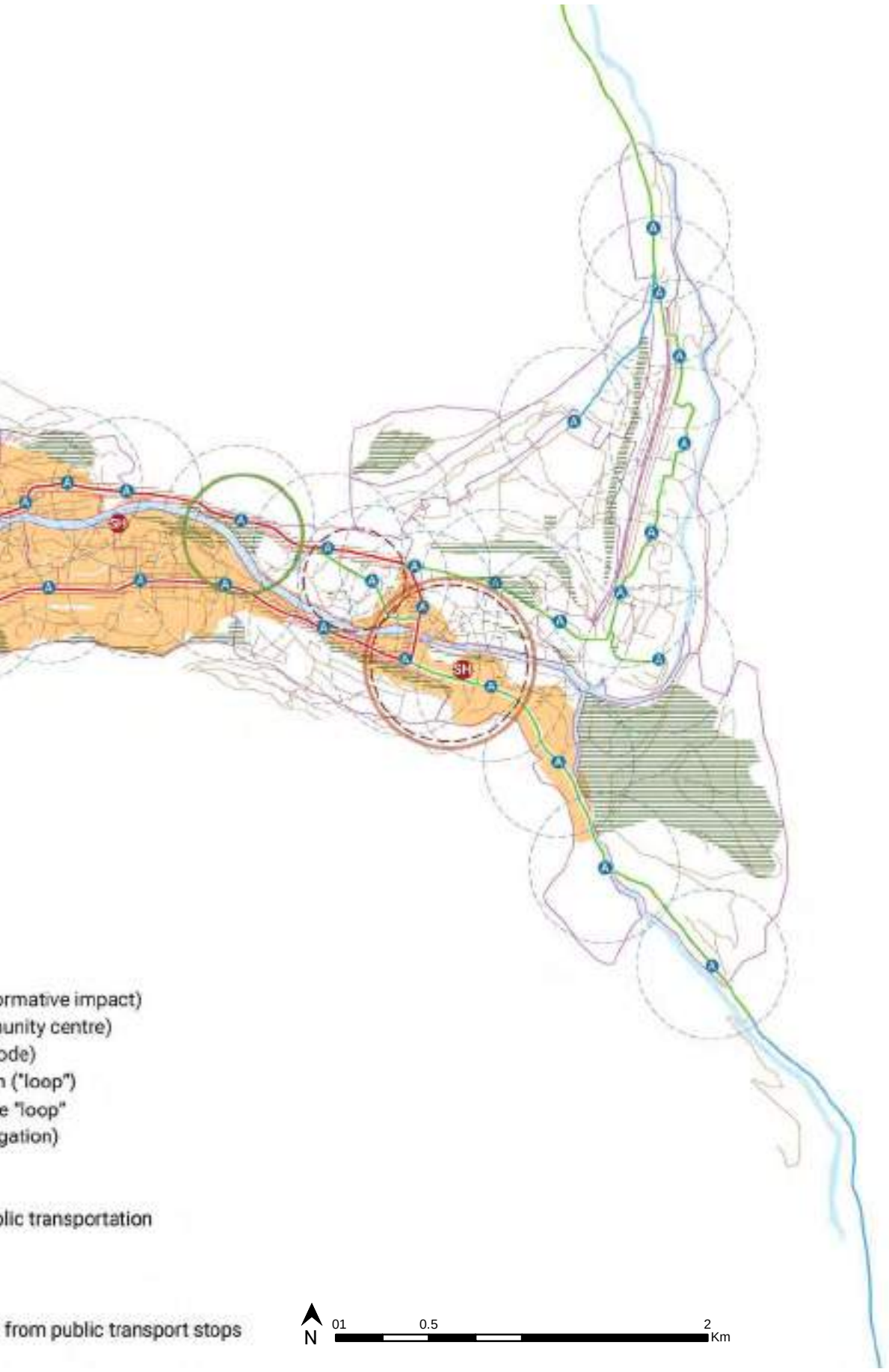


Fig 20. Urban resilience strategy in Khorog, UN-Habitat, 2023

C.6.4
USE NATURE-BASED SOLUTIONS TO ENHANCE THE CITY'S SOCIAL AND ENVIRONMENTAL RESILIENCE

Nature-based solutions involve working with nature to address societal challenges and deliver infrastructure, services and integrative solutions that benefit human well-being and biodiversity. This innovative approach can be integrated in urban design and planning to complement and strengthen existing risk management interventions.

Natural processes and elements such as urban forests, wetlands, green spaces or flood planes can be utilised to build robust and interconnected ecosystems that add value to the urban quality of life and provide ecosystem services to its inhabitants (urban cooling, slope stabilization, water filtration, etc.).

For instance, bioengineering techniques can be used in the renaturation of rivers and the stabilization of riverbanks through the use of plants, rocks and other natural elements to reduce water velocity or influence the river's hydrodynamics for flood and erosion risk reduction.

In Khorog, the afforestation strategy in the northern and southern areas of the city, coupled with the strengthening of the green space network can improve biodiversity, reduce the impact of storms by allowing increased absorption, infiltration and storage of storm water, reduce heat island stress, stimulate local economy, and improve the quality of life. **(Fig.21)**

In order to be successful, Nature-Bases Solutions require a strong understanding of the local ecosystem and the complexity of the human-nature interface. Hence, NBS should be contextualised and built upon the assessment of their functions, benefits, location, suitability and costs.

C.6.5
PROMOTE, PRESERVE AND OPEN UP NATURAL SPACES AND ECOSYSTEMS

Green systems within the city are a vital element to foster sustainable urban development. A hierarchical, interconnected system of natural spaces, ranging from regional natural parks to pocket green spaces, should become the main structuring elements of the city. This principle reflects the importance of identifying and preserving natural systems and features, strategic landscape patterns, and distinctive land forms which protect valuable ecosystem services and biodiversity hotspots.[4]

It is therefore crucial that the urban projects in Khorog are designed around these natural systems to reduce the city's ecological footprint and maximise the social, economic and environmental benefits derived from them.

Furthermore, linking the Khorog's ecological assets when fragmented and opening them up to the public can strengthen the city's identity and foster the connection between the community and its natural environment.

4 UN-Habitat, Urban patterns for a green economy, leveraging density

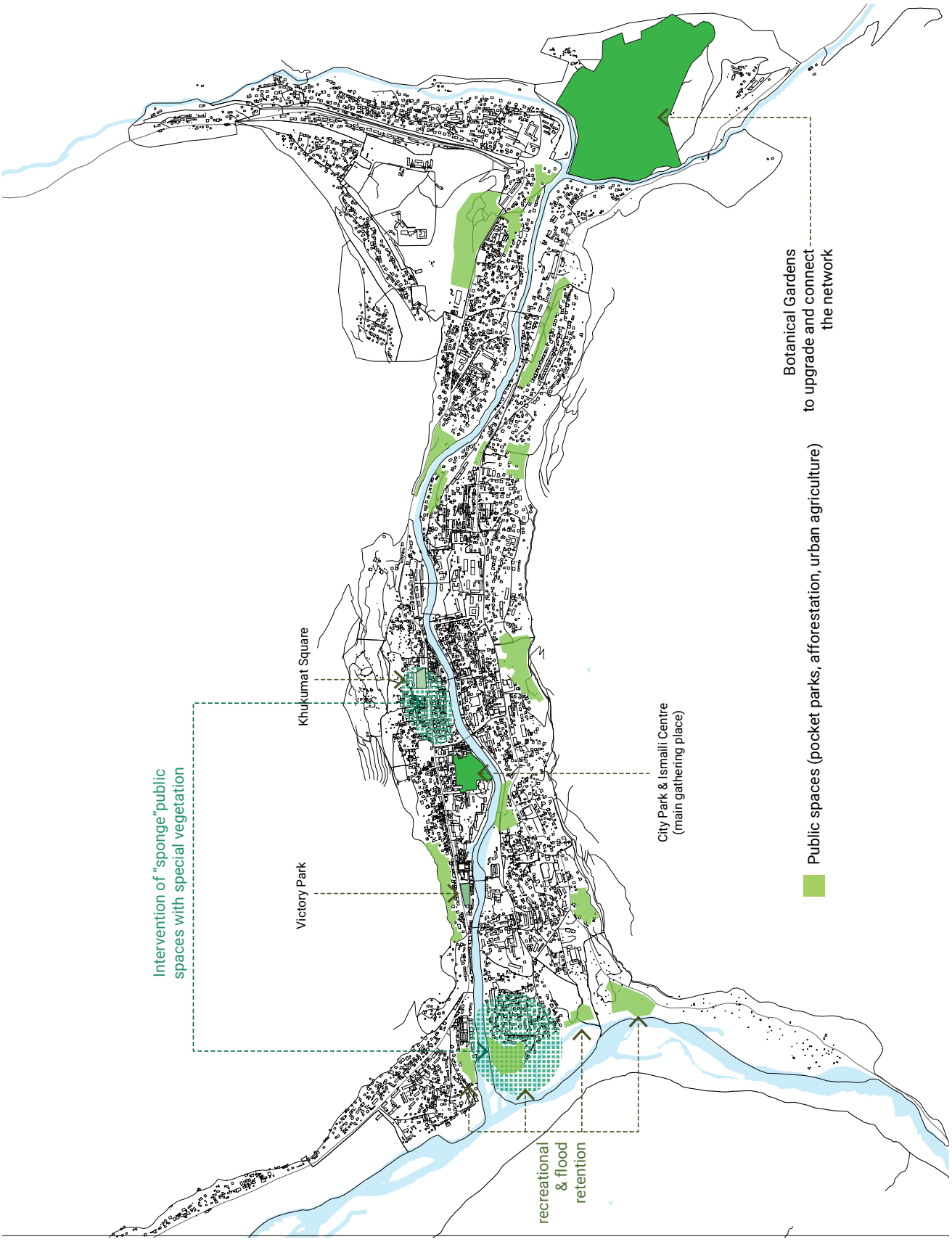


Fig 21. Diversity of nature-based solutions for urban application, UN-Habitat, 2023

C.7 CONTEXT-SENSITIVE DESIGN

C.7.1 PRESERVE THE CITY'S VISUAL IDENTITY AND VERNACULAR URBAN PATTERNS

Ensure new development does not disrupt the vernacular or historical urban pattern and follows the character of traditional spatial organizations. Vernacular urban morphology is a result of complex social and cultural factors that embody people's traditions, adaptability to local climatic conditions, their know-how and their appropriation of the space. The understanding of these elements is crucial for the preservation of the city's identity, as well as its tangible and intangible cultural heritage. This may be reflected in the use of local material, the articulation of buildings and open spaces, streetscape, and in the relationship between the city and its natural environment. These characteristics should be analysed and their relevant features should be included in the new urban structure/ development.

C.7.2 PRESERVE NATURAL ASSETS AND ECOSYSTEMS

Khorog's natural features and ecosystems are defining factors of the city's identity and should therefore be preserved and promoted. Revealing the city's natural resources and supporting them with sensitive urban design strategies (Creation of natural reserves, integration of nature-based solutions, protection of wildlife, etc) will enhance local character. Natural assets should be revealed and integrated to create pleasant landscapes and vibrant places that attract residents and tourists.

C.7.3 WORK WITH NATURAL FEATURES TO ACHIEVE OPTIMAL DESIGN SOLUTIONS

Topography, land form features, altitude, water bodies and climatic patterns are some of the elements that give mountainous areas particular climatic characteristic that influence wind dynamics, air flow, temperature and sunlight.

These climatic features and their daily and seasonal changes should be considered as decisive factors in the massing, building and street orientation, urban morphology, vegetation, energy performance, etc.

For instance, buildings should be oriented in a way that ensures optimal ventilation and natural light no matter the climatic conditions. An optimal orientation would also allow for better energy performance of buildings and neighbourhoods (i.e. passive heating/cooling).

Streets and open spaces should

Fig 22. Traditional residential street in Khorog, UN-Habitat, April 2023

be designed to serve as air flow corridors, ensuring permanent ventilation of the city and reducing the heat-island effect in hot days. Vegetation can be used to reduce wind velocity and provide shade. **(See C 7.4)**

Similarly, accommodating taller building structures on the north side of streets can reduce excess shadow-casting over sidewalks, patios and outdoor spaces, especially in winter time.

C.7.4

DETERMINE OPTIMAL SITE ORIENTATION AND MASSING TO REDUCE WIND SPEED AND ENSURE OPTIMAL VENTILATION

Mountainous areas are know for dynamic wind flows both on a daily and seasonal basis. The changing temperature patterns have a direct impact on the direction and velocity of winds. The consideration of these patterns in the urban design process is essential in order to avoid exacerbating the discomfort that strong wind can cause for pedestrians.

Understanding the horizontal and vertical wind movements and their impact on the local micro-climate can help identify the best locations for urban ventilation corridors while achieving good control of wind velocity at the street level.

The adequate massing and orientation of buildings, coupled with the strategic positioning of vegetation in public space can provide effective solutions to reduce wind velocity. Variations in building heights along a block length can reduce ground-level speed. In low- and medium rise buildings, a variation of one- or two storeys can be effective **(Fig.23)**.

Because wind tends to accelerate in open spaces, planting dense vegetation along the edges and against blank walls can reduce wind velocity.

Building projects above 6 storeys are not recommended in Khorog as they lead to increasing wind turbulences and can have negative impacts on the city's micro-climate.

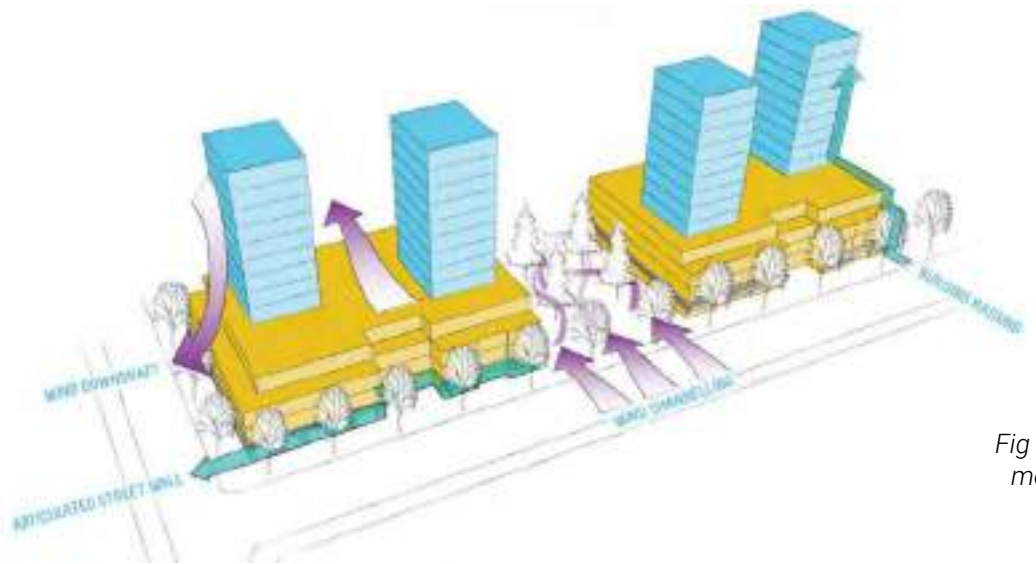
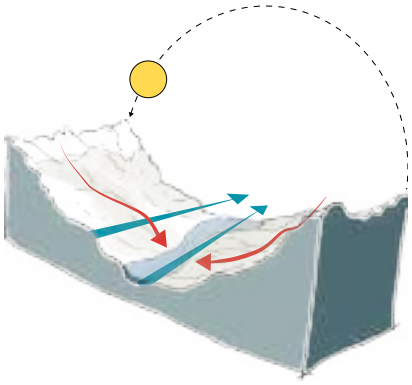
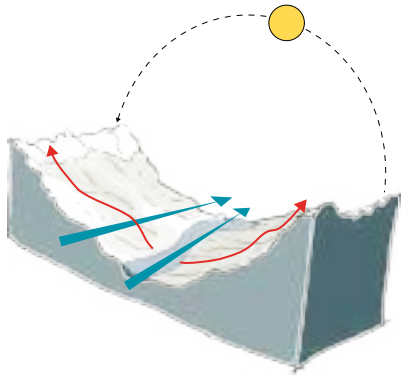


Fig 23. Wind dynamics in urban areas



Katabatic Wind – A downhill wind, usually at night. The mountain summits cool down quicker than the valleys causing the cold (and denser) air to rush down towards the valley floors. Adequate massing and orientation of buildings is required to reduce wind velocity, especially in winter.



Anabatic Wind – uphill wind, usually in the afternoon. The sun warms the mountain slopes causing warm air above them to rise. This in turn draws up air from the valleys below to replace it. It is recommended to create wind corridors to allow for this air movement to occur. This would limit the heat-island effect in the city and ensuring proper urban ventilation

Fig 24. Illustration of wind dynamics in mountainous areas, UN-Habitat, 2023

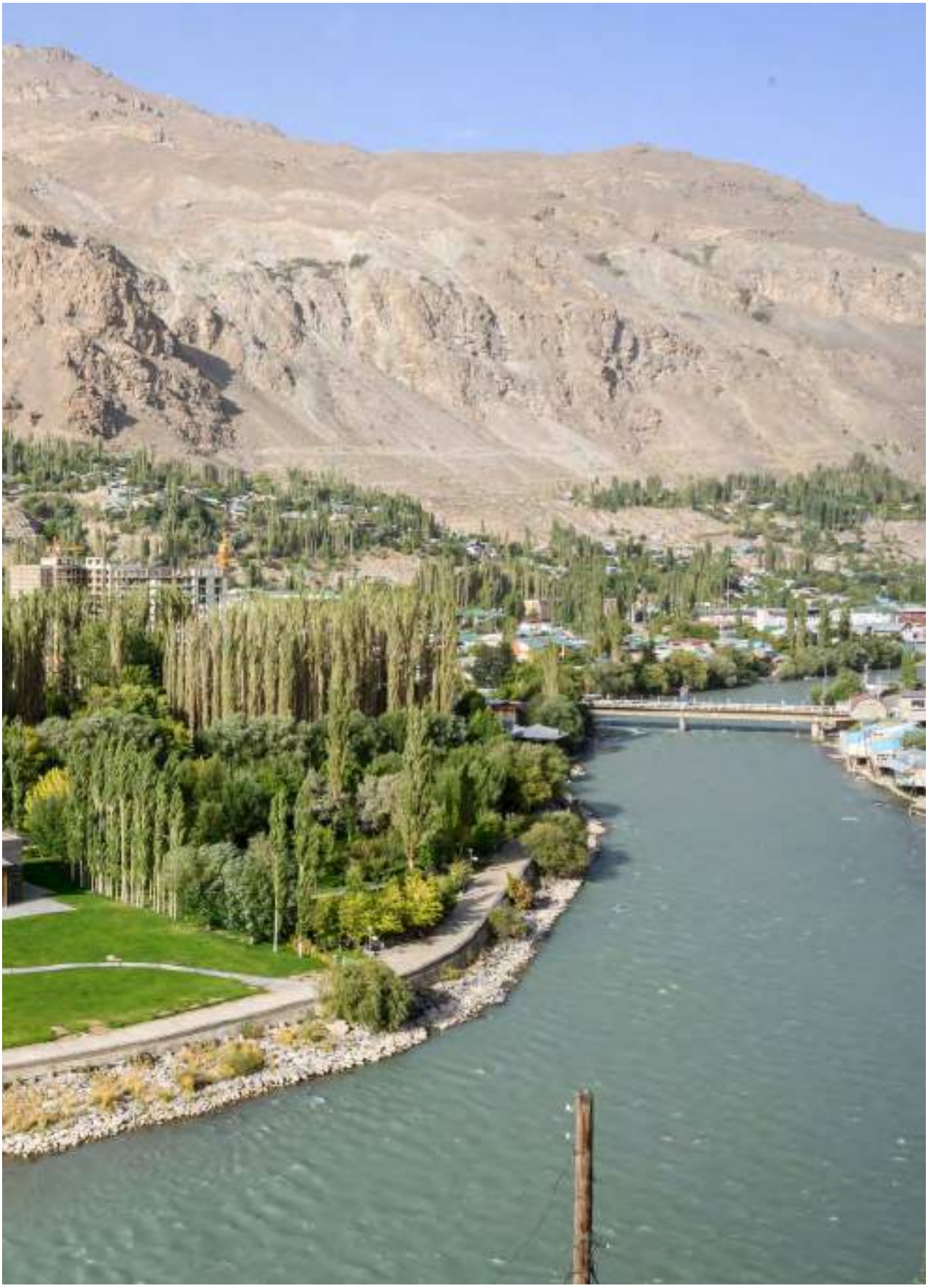


Fig 25. View of Gunt river, Khorog, UN-Habitat, September 2022

C.8
SERVICE PROVISION

C.8.1
PROVIDE QUALITY SERVICES AND PUBLIC FACILITIES THAT RESPOND TO THE CURRENT AND FUTURE NEEDS OF THE POPULATION

one of the core functions of the city government is the provision of good quality, affordable and sufficient public services such as waste management, water, sanitation, heating, education, housing, health, etc.

This is not an easy tasks as it requires the understanding and anticipation of complex demographic, social, economic, financial and political dynamics that effect the development and growth of the city.

An evidence-based approach is therefore necessary to establish reliable future growth scenarios, to identify deficit areas, and help in the prioritization of projected services. The Capital Investment Plan that UN-Habitat has developed for Khorog is a spatially-informed methodology designed to support the city to strategically align its service provision with the future development plans.

This methodology should be coupled with an efficient allocation of resources as well as strong policy and institutional coherence that fosters collaborative public service delivery at the local and regional scales.

C.8.2
ENSURE THAT SERVICES ARE DISTRIBUTED EQUITABLY AND ARE ACCESSIBLE TO ALL RESIDENTS

Providing mixed services is crucial to enable diversity and to minimize the emissions from motorized traffic.

A proper layout and design of streets and blocks is vital for providing reasonable walking distances from dwellings to an activity centre and/or public transport services.

- 400m (or 5 minute) street walking distance to an activity centre provides good accessibility for areas designated for medium and higher density residential uses.

- Schools and open public spaces should be placed within a fifteen-minute walk and intercept the local transit nodes;

- A variety of uses and services can also be generated by offering short frontages and shop windows on the street.

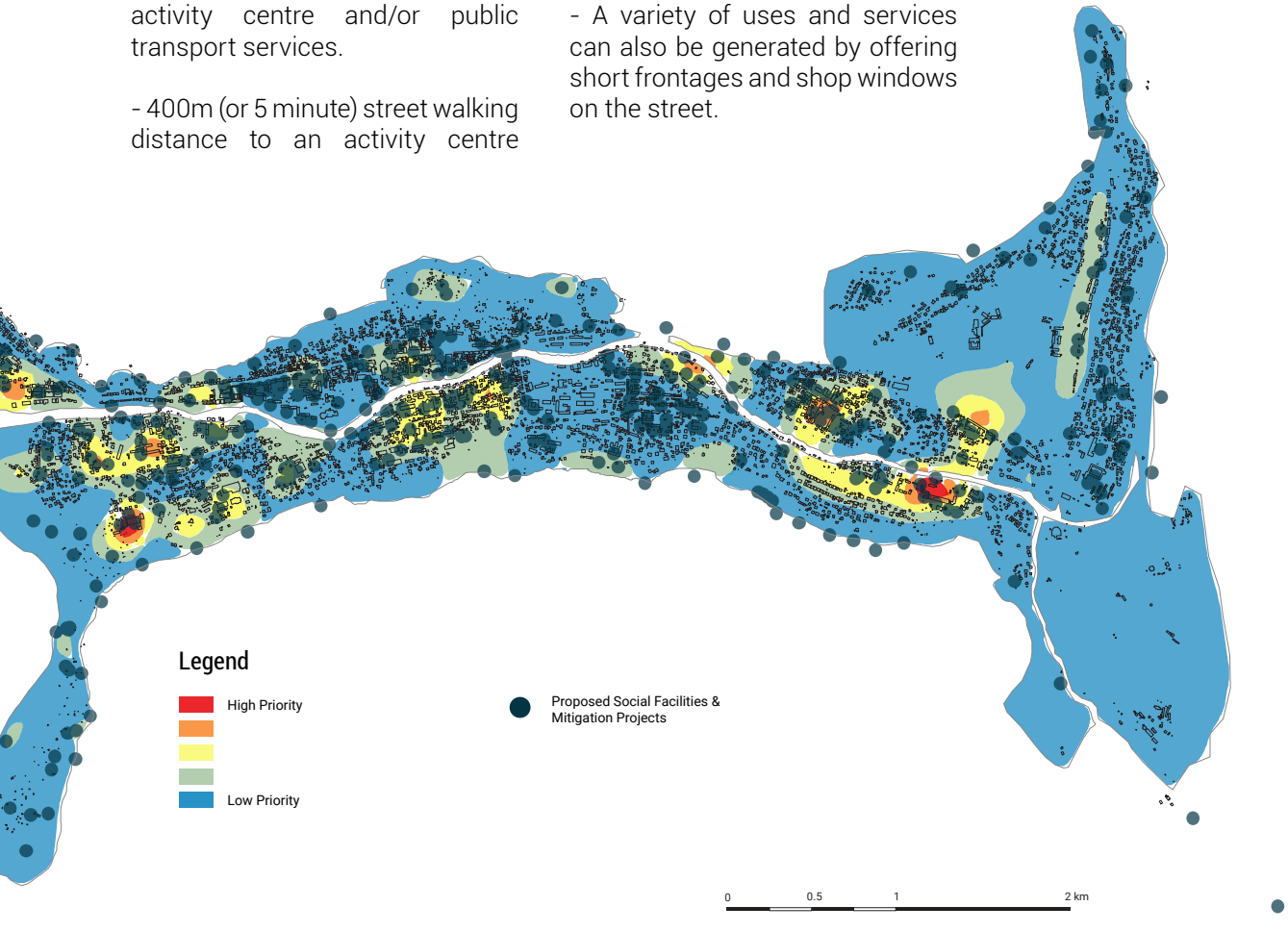


Fig 26. Map of priority public facilities in Khorog, UN-Habitat, 2023

NEIGHBOURHOOD

N.1
ADAPTED HOUSING TYPOLOGIES

N.1.1
ENCOURAGE DIVERSITY OF TENURES, HOUSING TYPOLOGIES AND TENURE-BLIND DESIGN

In order to accommodate the diverse needs of citizens, different types of housing typologies are needed, mixing middle and high-income housing with low-income housing. This helps in creating neighbourhoods conducive to inclusive growth whereby low-income residents are incorporated into the economic fabric of a city, thus providing economic mobility and income revenue.

Furthermore, multi-generational housing, housing with services for people with disabilities, and housing for young people can be included, among others. This would encourage social inclusion and diversity in the neighbourhoods.

The quality of the construction and the design should be independent of the tenure type to avoid social stigmas associated with low-cost/ affordable housing.

N.1.2
ENSURE SOCIAL MIX AND DIVERSITY OF TENANTS IN NEIGHBOURHOODS

The availability of houses in different price ranges and tenure types in any neighbourhood allows the accommodation of residents from diverse backgrounds and with different income levels, leading to more inclusive neighbourhoods.

20% to 30% of the residential floor area should be for low-cost /affordable housing, and should offer different of tenure types (rental, ownership, etc.). However, **each tenure type should be no more than 50% of the total.**

Adequate policies and regulations are necessary to maintain the provision of affordable housing units. These can include:

- Adoption of inclusionary zoning incentives to reserve a portion of new residential projects for low and middle income households.

Fig 27. Demonstration project in Khorog, UN-Habitat, 2023

N.1.3
ENGAGE COMMUNITIES EARLY ON IN THE DESIGN PROCESS

- Use of development agreements and capital subsidies to support mixed-use development that includes an affordable residential component;
- Re-zoning for higher residential density in order to align supply with housing market conditions;
- Protection against the loss of affordable rental units due to deterioration by working with low-income households to keep their properties viable. This can be achieved through tax incentives, building restoration programs, and expanded access to capital.
- Provision of counselling, legal and financial assistance as part of eviction prevention programs.[5]

The benefits of planning and designing with and not for communities have been highlighted by numerous best practice examples of inclusive neighbourhoods. Supporting such an approach can build learning and knowledge sharing platforms between stakeholders and communities, encourage communities to take "ownership" of finished products and reduce conflict between groups.

5 https://localhousingsolutions.org/policy-objectives/encouraging-walkable-mixed-use-development/

Fig 28. Participatory design event with Khorog children, UN-Habitat, September 2022

N.2
LAND USE SPECIALISATION

N.2.1
REDUCE THE AMOUNT OF SINGLE FUNCTION BLOCKS OR NEIGHBOURHOODS

Single function blocks are usually linked to low levels of social inclusion. This could create unsafe neighbourhoods prone to crimes. Therefore, land-use specialization should be avoided, and replaced by mixed-use zoning that guarantees the use of the street at all hours of the day and night, provides a feeling of safety, and reduces city congestion and car dependency.

Apart from the city centre where there is a high concentration of economic activity, the rest of Khorog is characterised by a lack of diversity of uses and a high level spatial fragmentation. This combination of factors has negative implications on the overall economic and social development of the city.

Urban blocks should therefore should be designed to include a variety of uses (residential, commercial, cultural institutional, recreational, etc.) especially along the primary mobility axes. This would assist local government in providing walkable, vibrant neighbourhoods with convenient transit and pedestrian linkages, proximity to jobs, access to nearby public services, public spaces and activity-oriented destinations.

UN-Habitat recommends that **single function blocks should cover less than 10 % of any neighbourhood.**

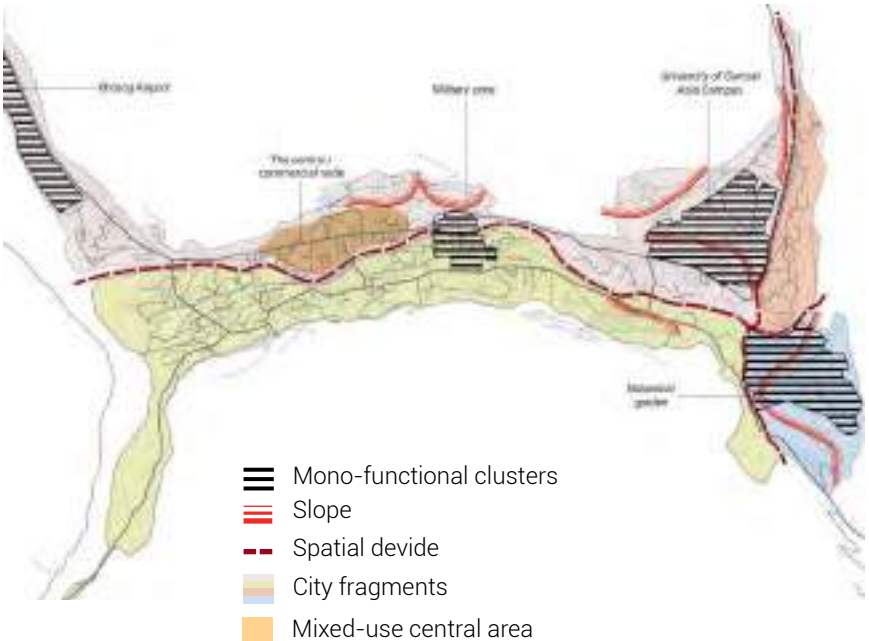


Fig 29. Current land-use analysis of Khorog, UN-Habitat, 2023

N.2.2
INTEGRATE OPEN SPACE AS A CORE COMPONENT OF NEIGHBOURHOOD DEVELOPMENT

Public space gives vibrancy to urban life, and it is intimately linked to the sizing, scaling and to the rhythm of the urban fabric. Open public spaces should therefore be designed as fundamental components of neighbourhoods, and support different functions such as leisure, ecosystem services, disaster mitigation, evacuation, etc.

Green space-Oriented Development in which urban density is correlated with upgraded green spaces that have reasonable access to public transport. Concentrating urban densification around green spaces offers many advantages to residents including ecosystem services such as physical and mental health benefits, the mitigation of extreme heat events, biodiversity and clean air and water **(Fig.30)**.

Fig 30. Open space system in the demonstration project in Khorog, UN-Habitat, 2023

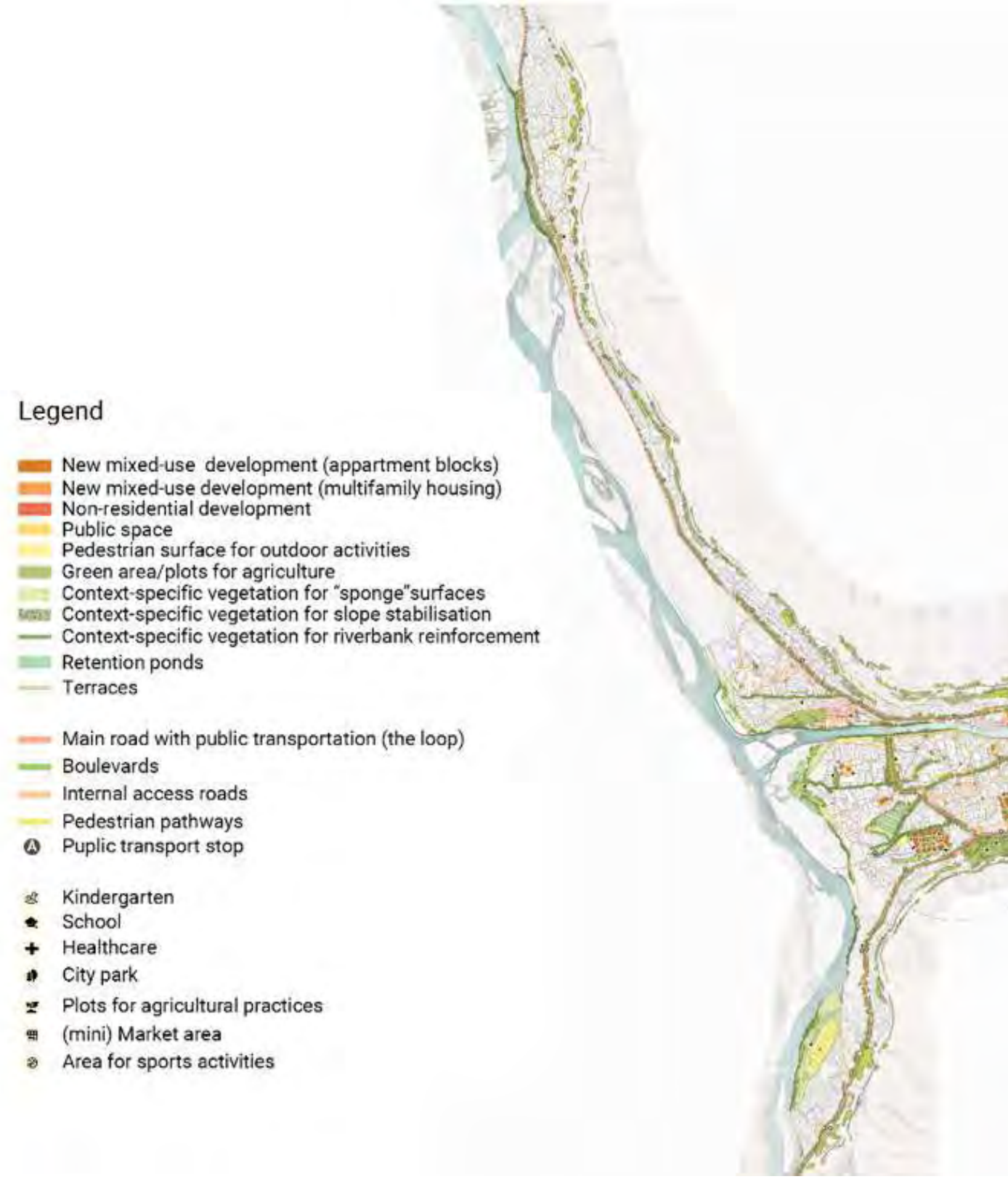

Legend
New mixed-use development (appartment blocks)
New mixed-use development (multifamily housing)
Non-residential development
Public space
Pedestrian surface for outdoor activities
Green area/plots for agriculture
Context-specific vegetation for "sponge"surfaces
Context-specific vegetation for slope stabilisation
Context-specific vegetation for riverbank reinforcement
Retention ponds
Terraces
Main road with public transportation (the loop)
Boulevards
Internal access roads
Pedestrian pathways
Puplic transport stop
Kindergarten
School
Healthcare
City park
Plots for agricultural practices
(mini) Market area
Area for sports activities

Fig 31. Proposed master plan of Khorog with new mixed-use development, UN-Habitat, 2023

N.3
NEIGHBOURHOOD CHARACTER

N.3.1
PROMOTE CONTEXT-SENSITIVE DESIGNS THAT CREATE A SENSE OF PLACE AND IDENTITY IN THE NEIGHBOURHOOD

Neighbourhood design should not be limited to the provision of physical functions such as housing, amenities and services. The aim of the planner should be focused on developing a sense of place and a feeling of belonging from the community and with the neighbourhood.

These crucial aspects can greatly impact the economy and social life in the neighbourhood, and enable communities to play a much stronger role in shaping the areas in which they live.

Neighbourhoods with strong identity and sense of place tend to have close-knit communities and support mechanisms that foster their social and economic resilience.

From a design point of view, neighbourhood development should consider the existing context, scale and interface with adjacent sites. It should include attractive spaces for encounter, leisure, urban art and expression, and provide design solutions that strengthen the history and identity of the neighbourhood.

From a governance perspective, participatory approaches for planning and management that include the community and other stakeholders from very early stages are to be encouraged.

N.3.2
DESIGN FENCES TO ENHANCE THE NEIGHBOURHOOD CHARACTER AND SAFETY

Front fences and walls should not dominate the public domain. They should rather respond to and complement the context and character of the area. Furthermore, ensuring visual permeability is crucial for neighbourhood safety through natural surveillance. Natural surveillance promotes the creation of environments where people can easily observe the space around them while carrying out their day-to-day activities (VPUU 2017).[6]

Some characteristics of the front fences are as follows:

they should be visually permeable (no more than 50% of the allowable fence area will be solid masonry, timber or metal);

they should have a maximum height of 1.2m;

they should have a consistent character with other front fences in the street;

they should not be constructed of solid metal panels or unfinished timber palings.

6 Source: Violence prevention through urban upgrading, A manual for safety as a public good, 2017

Fig 33. Proposed urban renewal strategy in Khorog's demonstration project, UN-Habitat, 2023

Fig 34. Example of low, see-through fence

Photo credit: Zakary Baker

STREETS

S.1
ACTIVE & MULTI-MODAL STREETS

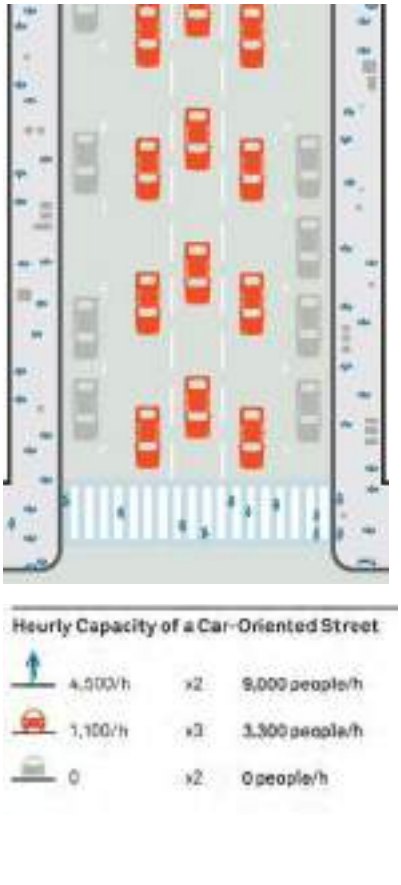
S.1.1
PROMOTE THE DESIGN OF MULTI-MODAL STREETS

Car-oriented street designs have for long influenced the use and function of streets, very often reduced them to mere transport axes at the expense of the ecological, economic and social dimensions that streets can have in cities.

As an alternative to this design model, multi-modal streets offer ample possibilities to improve Khorog's resilience. By reducing the space allocated to private cars and the integration of more sustainable and diverse mobility modes (cycling, walking, public transport), multi-modal streets are able to bring in new economic, socio-cultural and climatic functions, while enhancing accessibility and safety of streets. Furthermore, the redistribution of allocated spaces allows for a variety of non-mobility activities such as seating and resting, bus stops, trees, and green infrastructure strategies **(Fig.35)**.

Fig.38 and fig.39 illustrate the proposed design approach for the main multi-modal street in Khorog as well as a model of shared space. This spatial reconfiguration of the streetscape would allow for a stronger integration of public

Car-oriented street



Multi-modal street

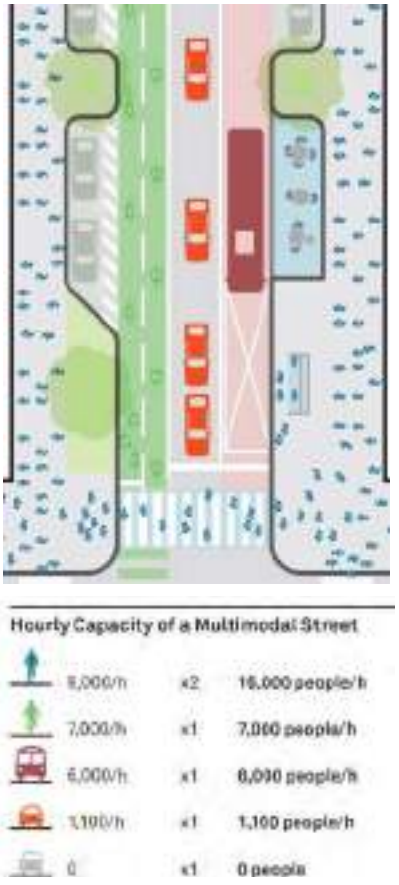


Fig 35. Comparison between car -oriented and multi-modal street approach

Source: Global designing cities initiative 2023

transportation routes, roads and economic nodes while providing an extensive network of pedestrian paths and walkways at both the city and neighbourhood levels.

S.1.2
PROMOTE ACTIVE FRONTAGE ON THE GROUND FLOOR OR IN ALLOCATED PLACES WITHIN THE IDENTIFIED NODES

The allocation of continuous retail or business and services that open directly to the sidewalks makes streets vibrant public spaces. Khorog's continuous active frontage, which is currently mainly limited to the main road, should be expanded to other city areas to create lively public spaces and support local businesses and economy.

Where retail is not viable at the street level, efforts should be made to activate the internal uses at ground level. Continuous windows at-grade allow for visual access to internal uses, passive surveillance and illumination between outdoor spaces.

To maximize the benefits of active frontages, planners should ensure that services and retail outlets are located along home-to-work routes.

S.1.3
DESIGN STREETS TO BE ACTIVE PUBLIC SPACES

Street design should not be dictated only by the requirements of cars, it should not have a single solution and type of section, meaning that other functions and the climatic, socio-cultural, and economic context must be considered. The design should reflect a shift from streets as mere functional axes to active public spaces. Hence, the hierarchy level of each street type should express the urban character of the hosted functions, and provide specific design elements that support them.

Fig 36. Parklet project designed by Rebar outside Tony's Pizza Napoletana in San Francisco

Fig 37. Example of active interface between building and sidewalk

Source: https://www.spur.org/publications/urbanist-article/2014-06-03/designing-ground-level

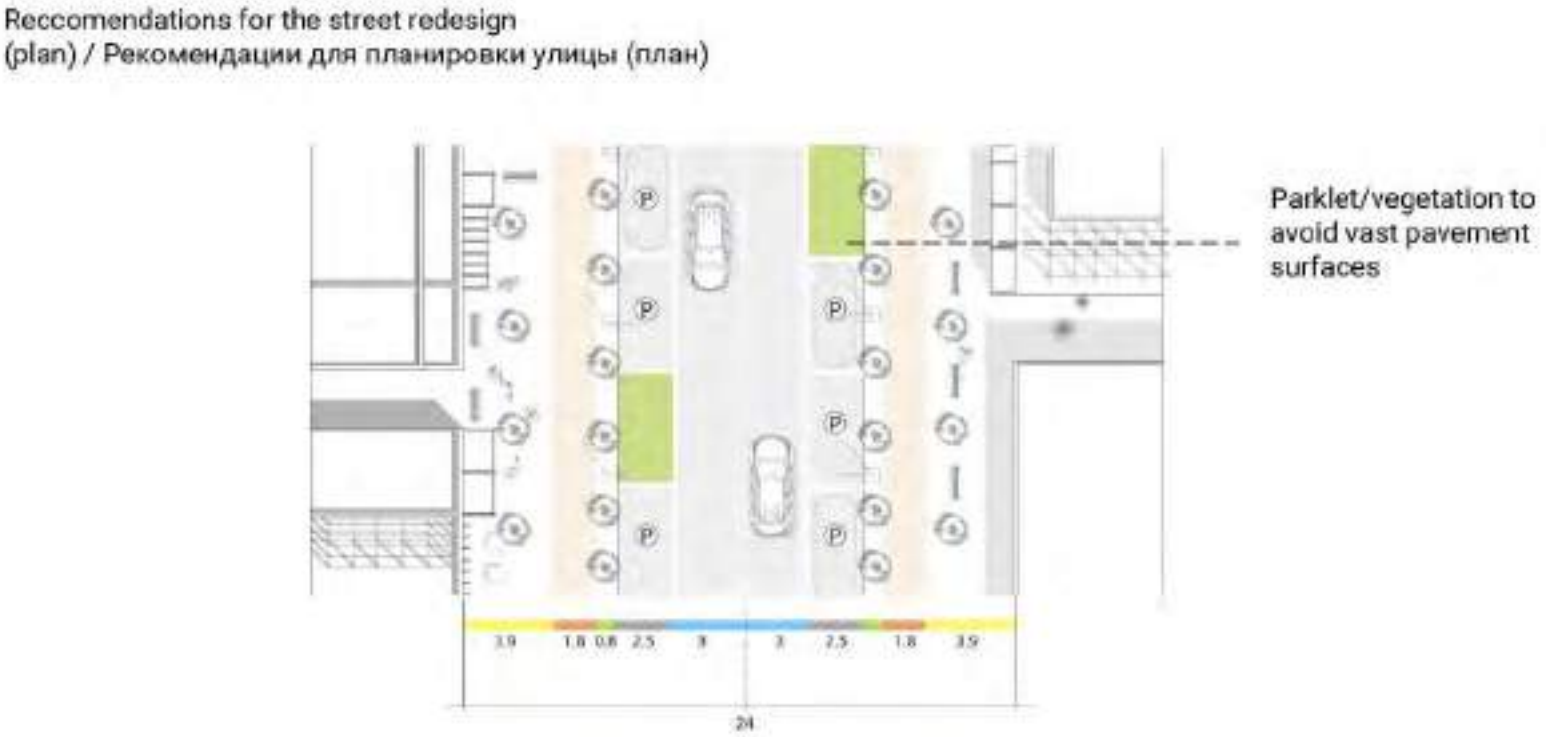


Fig 38. Design proposal of the main multi-modal street in Khorog (The loop), UN-Habitat, 2023

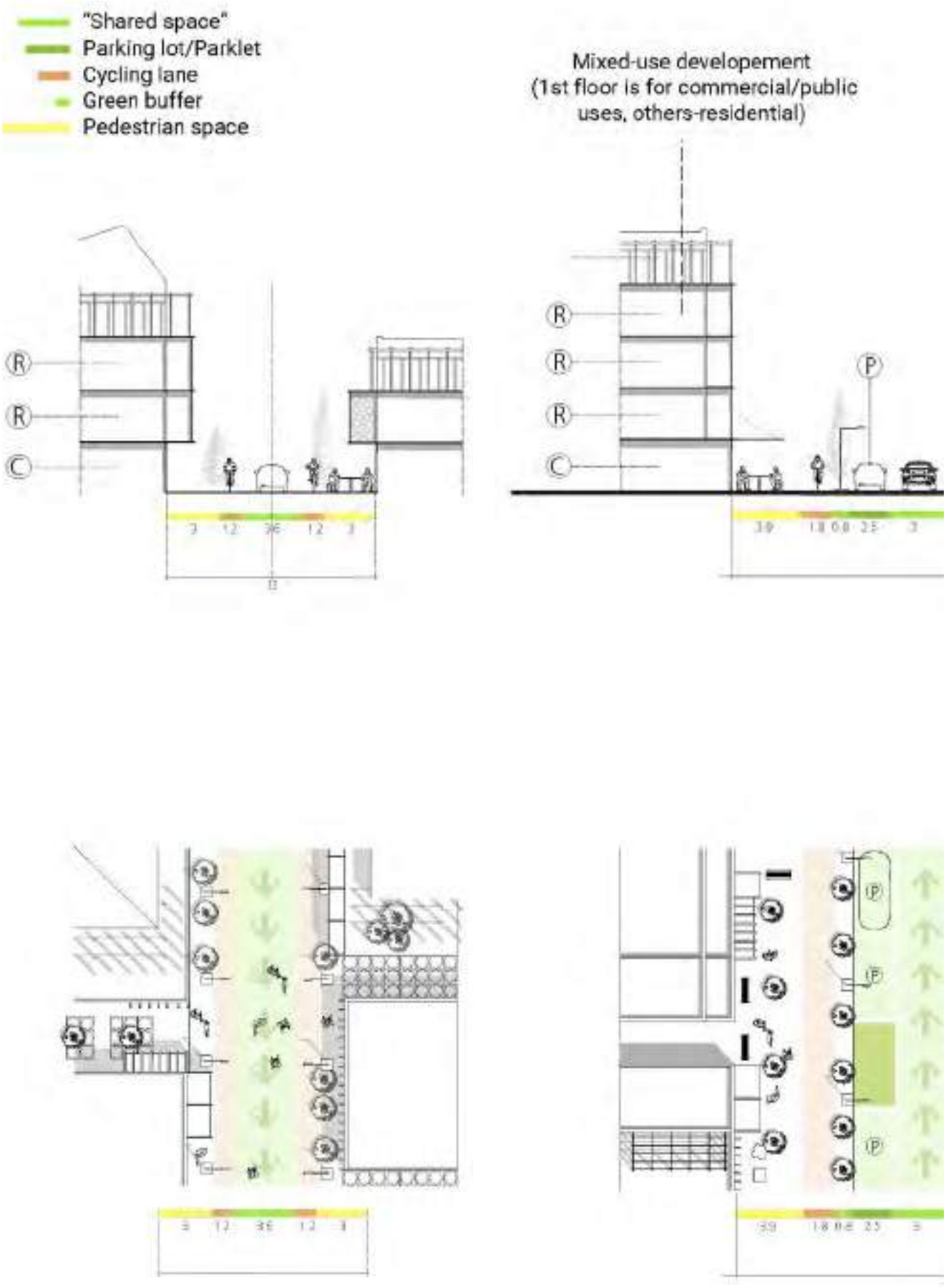


Fig 39. Design proposal of shared-space in Khorog, UN-Habitat, 2023

S.2 STREET DESIGN ELEMENTS

S.2.1 ENHANCE USERS' EXPERIENCE AND COMFORT THROUGH STREET DESIGN

The design of pleasant and functional streets is a complex process that requires creativity, technical knowledge, and understanding of the social and behaviour patterns of the site.

Design principles such as the human scale, walkability, orientation, materiality, lighting and climate-optimised design contribute to year-round comfortable and enjoyable streets.

Massing and street trees can be used to provide a sense of definition and enclosure.

Arcades and canopies can be used to add depth and weather protection. Adequately dimensioned sidewalks can encourage walkability and boost local economy. All these elements should be combined following a human-centred approach aimed at enhancing users' experience , safety and comfort.

S.2.2 LAY OUT STREET AND BLOCK PATTERNS TO CREATE VIEW LINES TO LANDMARKS AND NATURAL FEATURES

Streets and block patterns should be carefully designed to create view lines to key landmarks and enhance the natural features of the city (view corridors to the river, mountains, parks, historical sites, etc.). Visible landmarks and landscape features are important for navigation and orientation, and they can help create a sense of place.

S.2.3 DESIGN SAFE SIDEWALKS AND PATHWAYS

Sidewalks and pathways should be of an appropriate width convenient for all street users and compatible with the character of the street, providing a safe space for walking, cycling, stopping, socializing, resting, turning around in a wheelchair, etc. The average sidewalk width might vary depending on the context and character of the street. Rather than following a specific recommendation, it might be useful to consider several indicators of ergonomic design such as:

3 m width is sufficient for multiple users to have a conversation while walking, a wheelchair user needs 1,5 m to turn around and 1,8 to pass other wheel chairs, etc.

S.2.4
INTEGRATE SAFE BIKE LANES IN STREET DESIGN

Furthermore, the function of the street is a defining factor for the width and design of sidewalks. For instance, boulevards and commercial streets may require wider sidewalks to accommodate higher pedestrian flows, terraces, green spaces, benches, etc. The design of sidewalks should ensure that there are no conflicts between those elements, and that they all contribute to the enhancement of the street quality.

The minimum width of a two-way bike lane is 1.8m - 2m. This allows cyclists to ride side by side or pass each other safely.

Where possible, bike lanes should be physically separated by vegetated buffers or safety strips in order to provide safety and protect cyclists from parked and moving cars, preventing motorized vehicle encroachment and double-parking.

Different design techniques may be used to distinguish the bike lane, e.g. colour, texture, or physical barriers (trees, vegetation, etc.).

Minimize the number of crossovers that intersect roads, pedestrian and bicycle paths.

Special attention needs to be given to the design of intersection in order to provide contextual solutions to maximize visibility and protect cyclists and pedestrians.

Path treatments across vehicle crossovers are very useful in emphasizing priority for pedestrians and cyclists.

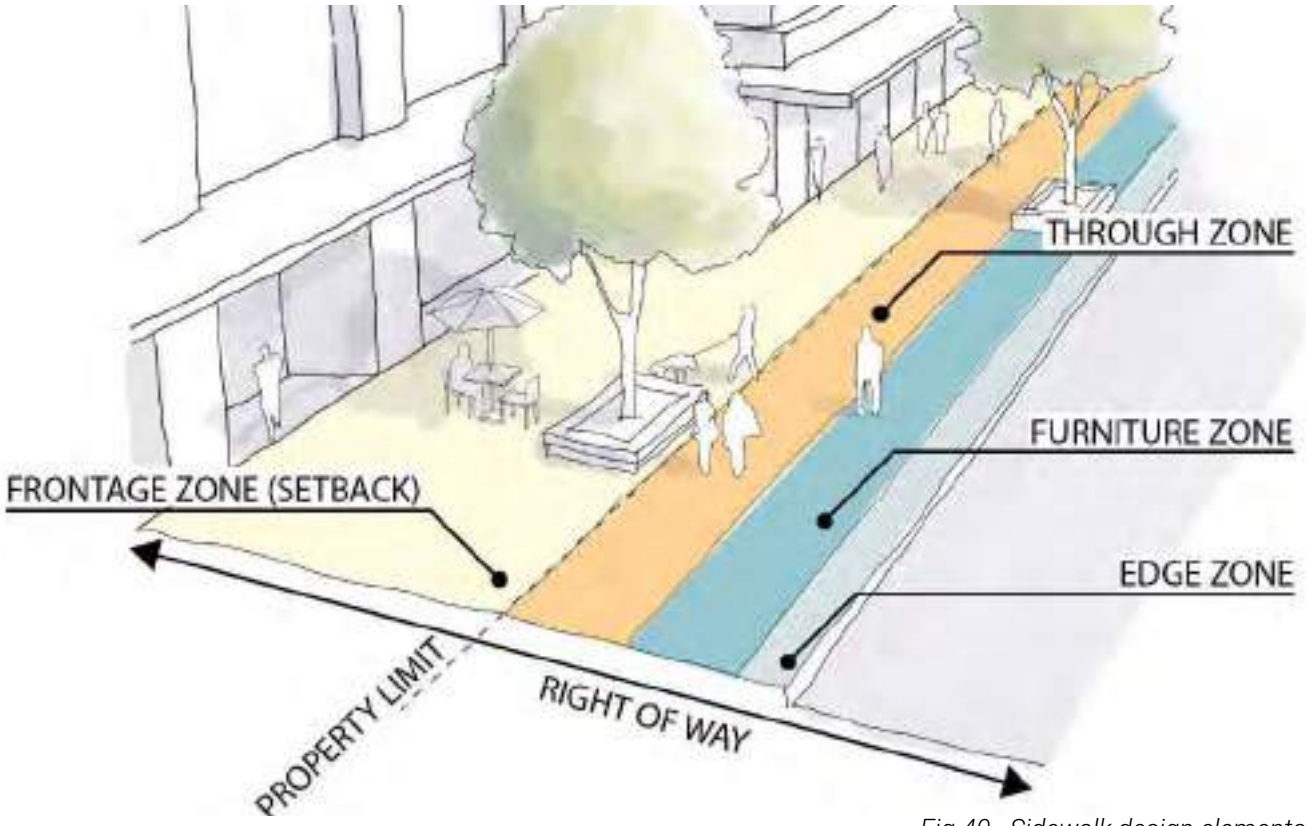
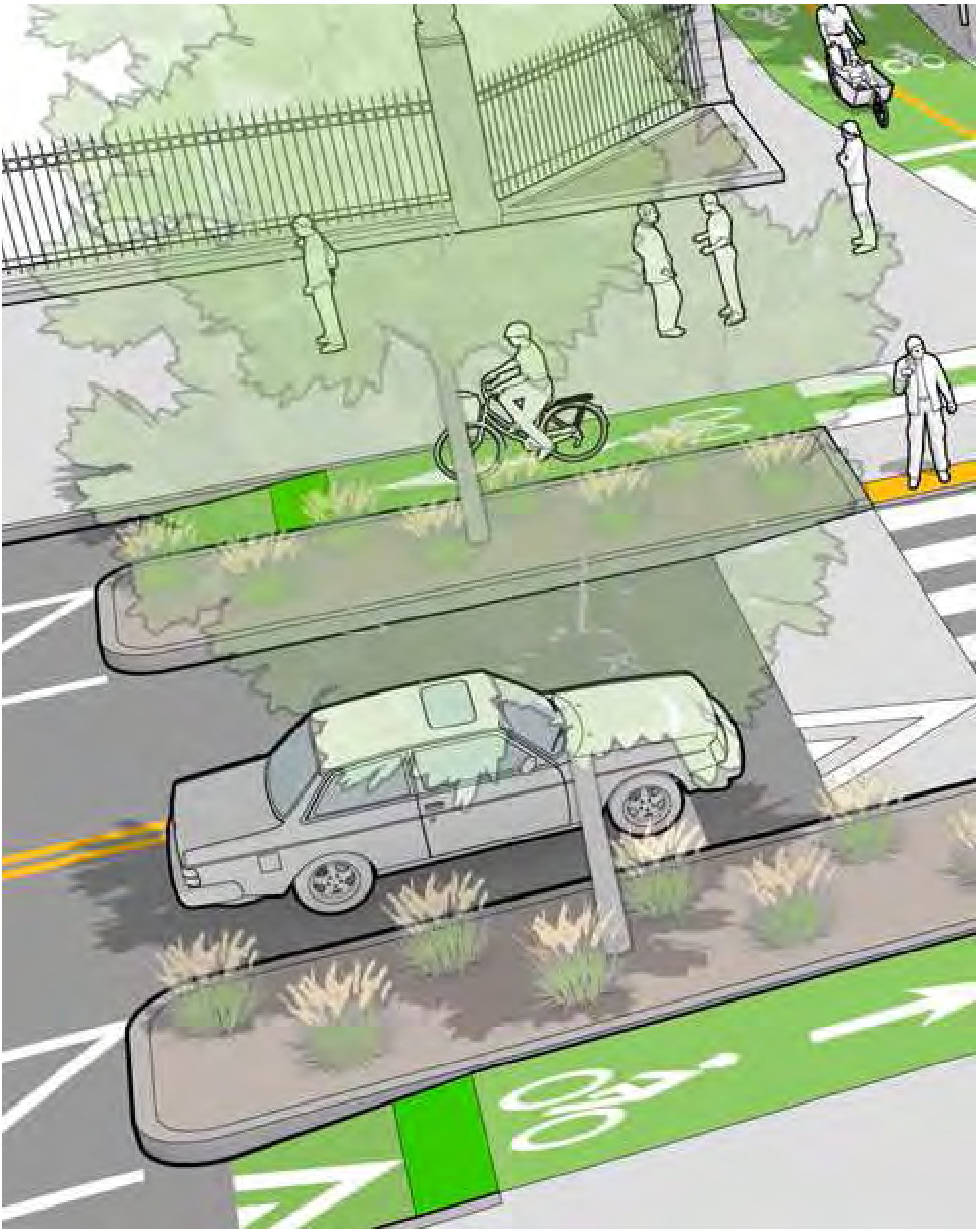


Fig 40. Sidewalk design elements
Source: Based on "Seattle urban design guidelines



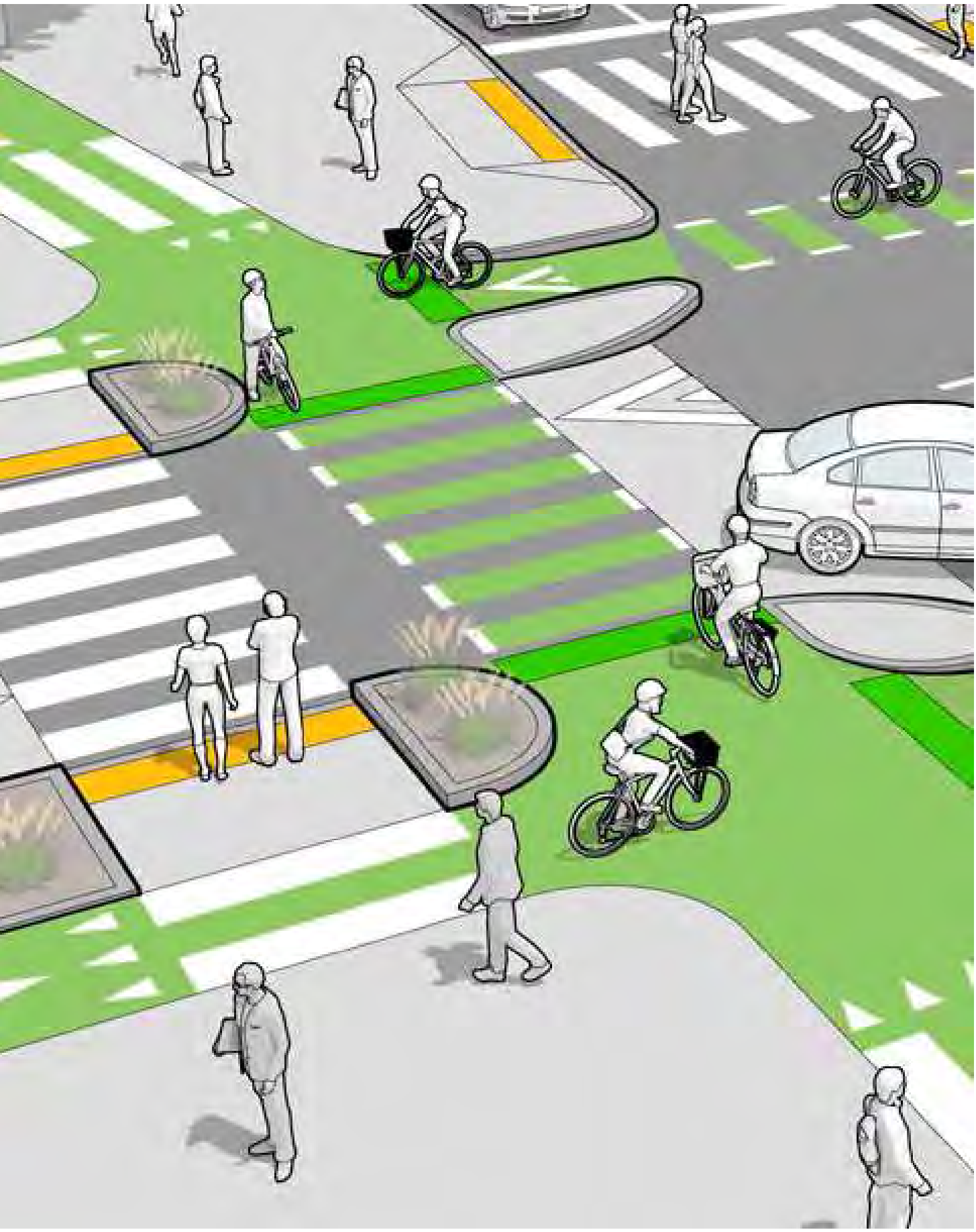


Fig 41. Illustration of safe and context-sensitive intersection design

Source: Toole Design 2023

S.2.5
BRIDGE DESIGN CONSIDERATIONS

Bridges are essential connection points in Khorog. However, bridge projects should be based on thorough diagnosis of deficit areas as well as on the social, economic and spatial impacts within their area of influence.

Bridges in Khorog should be designed/upgraded to accommodate pedestrian paths and cycling lanes, and ensure the safety and comfort of all users. They should also be aesthetically pleasing and structurally durable.

Bridges provide excellent opportunities for panoramic views on the river. Creative design can leverage these opportunities by integrating landscape elements, viewing platforms and street furniture where appropriate.

Consider reviewing snowmelt and drainage patterns bridges to prevent hazardous, icy conditions. Appropriate materials should be used to increase the safety users.

Provide pedestrian-oriented lighting and signage along the bridge.

S.2.6
ESTABLISH CREATIVE AND FORWARD-LOOKING RIGHT-OF-WAY PLANS

Efficient and attractive road networks rely on access to public land (e.g. Right of Way, see definition) that anticipate the city's needs in terms planning, transportation and utilities. It is therefore important to develop creative and forward-looking Right of Way (R/W) strategies, which integrates current and future needs with pedestrian safety measures as well as commercial and residential functions.

The establishment of R/W should include necessary roadway and drainage design as well as all major elements such as transit facilities, signalization poles, lighting poles, street furniture. The design of these elements should be accurately established based on proper survey data. The designer must be aware of the nature, type, frequency of trips and number of vehicles utilizing the street.

Impact upon property owners and occupants is no longer to be considered a "Right of Way Issue" but is to be handled as a "Design Issue" that requires close coordination with other functions that have input to the project development and design.

The following considerations should be included in the design process of Right Of Way plans:

Reduce the number of R/W takings to what is reasonably practical and does not interfere with the effectiveness of the overall intended project. Innovative steps considered should be outlined and an explanation should be included as to why they were incorporated or not.

Consideration of cost savings factors given restraints of available funds and limitations. Describe cost savings factors implemented or considered, including an explanation as to why they were incorporated or not.

Determine who the stakeholders are besides motorized vehicles (Pedestrians, cyclists, businesses, fauna and flora, natural ecosystems, etc) and weigh various interests, including social, economical, environmental and safety factors.

Determine the effect on future development and the environment and future right of way requirements as well as the need for flexibility during construction

Determine alternate design considerations that may need to be implemented as part of a Transportation Project in order for private properties to function efficiently and effectively within their new context.

Justify every right of way acquisition that is needed to accomplish the project, and why it is required and cannot be eliminated.[7]

7 Source https://www.state.nj.us/transportation/eng/documents/BDC/pdf/ROWDesignGuidelines2012.pdf

Fig 42. Integration of urban furniture in bridge design

Source: Getty Image, Credit:kickstand

S.3
INCLUSIVE & SAFE STREETS

S.3.1
PRIORITIZE PEDESTRIAN, NON-MOTORIZED MOBILITY

Walkability is the key to promoting a sustainable city. It is supported by the connectivity of the street network and by a pleasant and comfortable urban landscape that should be diverse and rich in experience in a sufficiently dense space.

Streets are primary public spaces that should embody safe and pleasant spaces for all users following universal design principles.

Special attention has to be paid to the design of intersections based on a thorough analysis of pedestrian and vehicle movements, land use, crosswalks, view corridors, attractions and junction functionality.

The design of intersections should lead to the integration of their design elements with the entire public realm in a holistic way to create vibrant, safe and seamless public spaces **(Fig.43)**

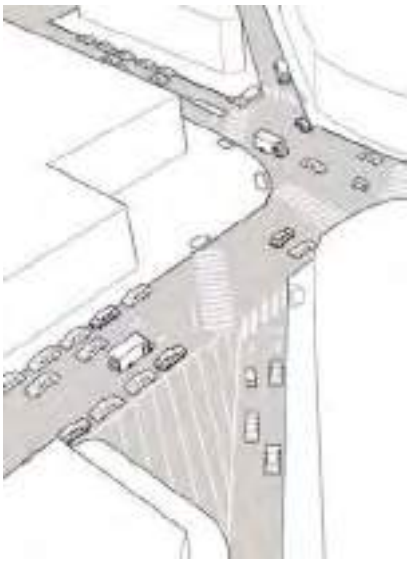
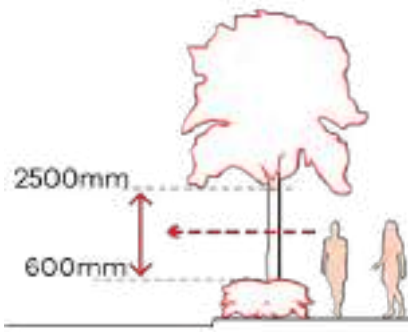


Fig 43. Design solutions for safe intersection (up: before, below: after)

Source: Global City Designing Initiative 2023

S.3.2
ENHANCE SAFETY THROUGH ADEQUATE STREET DESIGN



Creating safe streets for all users is a crucial responsibility shared by designers, regulators, and the community. Some of the most common causes of traffic conflicts are primarily linked to the failure of street designs to provide adequate solutions that protect vulnerable users.

- **Sidewalks**: When sidewalks are narrow, nonexistent or blocked, pedestrians are forced to walk on the roadbed, making them exposed to crash risks.
- **Street lighting** is a crucial component of street security in urban areas. It also enhances safety for street users and improves the quality of life on the street.
- **Wide streets** without refuge spaces or protection for pedestrians make crossings unsafe especially for the elderly and vulnerable people.
- The provsition of **cycling lanes** can reduce the exposure of cyclists to crashes with motor vehicles.
- **Surface degradation**, potholes, and obstacles are major sources of unsafety and discomfort for pedestrians, cyclists, and disabled people. Even trees, street lighting or benches can turn into dangerous obstacles if not positioned properly.
- **Lack of visibility** in large intersections leads to poor navigation and assessment of users' movements. Large intersection should either be avoided or designed to guarantee good visibility and safety for all users.
- **Include splays** to driveway exits from laneways, buildings and car parking facilities to maintain sightlines from vehicles **(Fig.44)**.
- **Boarding areas for transit** riders should be designed to ensure safe boarding and alighting of public transport users.
- **Enhanced predictability:** When signals and countdown clocks are not provided, or when signal cycle lengths result in a long wait time, pedestrians are unable to safely judge the time they have and are more likely to cross unsafely. [8]

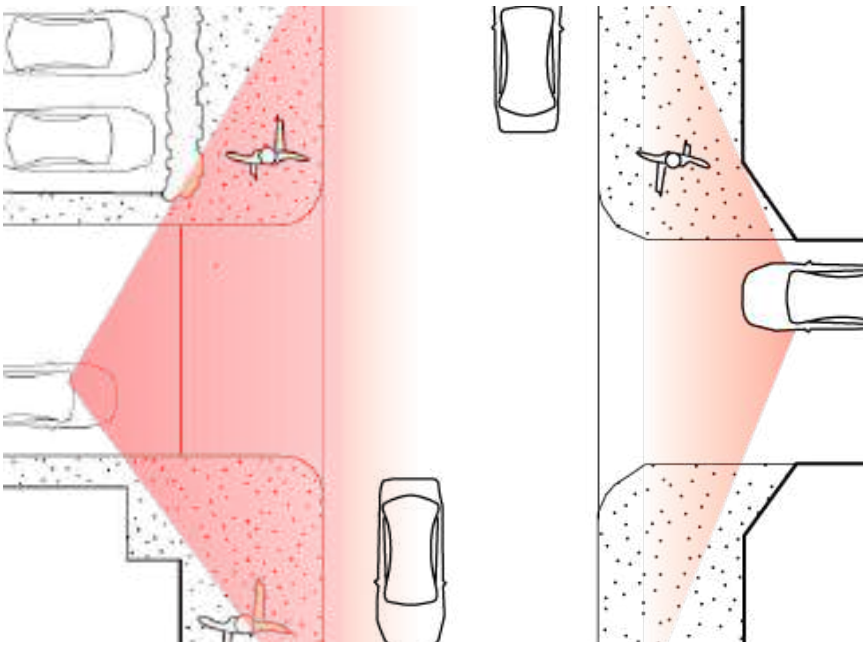


Fig 44. Crossover design features to maximise visibility and pedestrian safety

Source: Victoria State urban design guidelines

8 Global designing cities initiative 2023

S.3.3
ORGANIZE ROUTES TO DESIGN FOR AND ACCOMMODATE OVERSIZE VEHICLES

Truck and delivery programming should be in coordination with the mapping of primary bicycle, transit and pedestrian corridors, as well as through the analysis of key access routes, bridges hazards, and industrial or commercial land uses.

The map below **(Fig.49)** designates specific routes where extensive reconstruction is not required to accommodate oversize vehicles.

On designated freight routes with frequent delivery vehicles, streets should be "**designed for**" these vehicles, meaning that the design should allow for a particular vehicle type to complete a turn fully within its designated travel lane or lanes. However, in the case of streets with high pedestrian volumes or with occasional large turning vehicles, designers may consider "**accommodating**" these vehicles,

The effective turning radius, not the actual radius, should always be used to determine the ability of vehicles to negotiate a turn **(Fig.45)**. That's because effective radius provides more pedestrian space and shortens pedestrian crossing distance, hence reducing pedestrian exposure to accidents.

Effective turn radius is the radius available for the design vehicle to make the vehicle turn, accounting for the presence of parking, bike

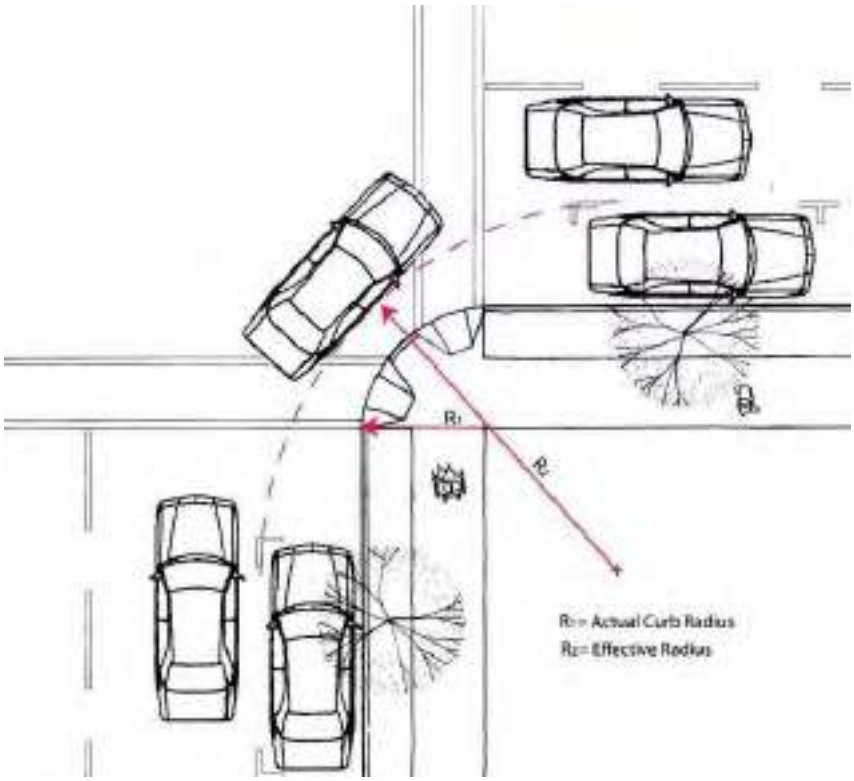


Fig 45. Difference between actual Curb Radius and Effective Radius

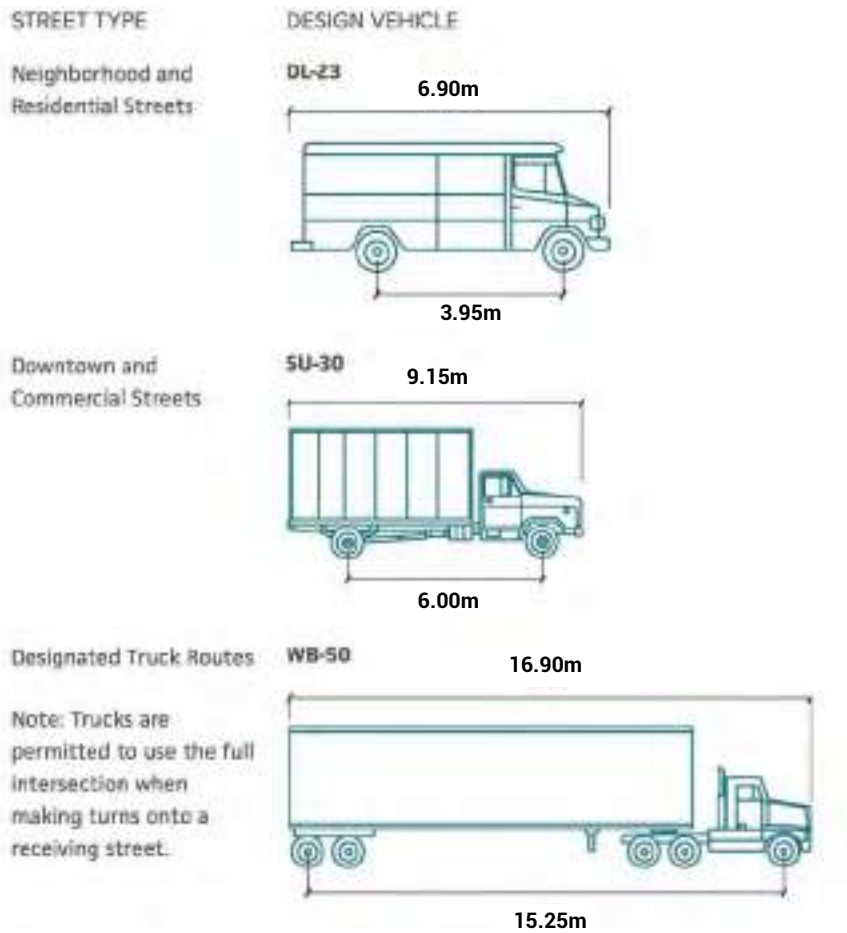


Fig 46. Types of delivery vehicles according to road typologies

Source: Urban Street Design Guide, www. nacto.org

S.3.4
PROVIDE INNOVATIVE SOLUTIONS TO ENHANCE PEDESTRIAN ACCESS, ESPECIALLY FOR PEOPLE WITH LIMITED MOBILITY

lanes, medians, or other features.

In commercial and mixed-use areas with frequent pedestrian volumes, locate vehicle and service access to the rear or side of buildings. By providing rear or side lane access for vehicle, service and delivery functions, street frontages can remain safe and active, uninterrupted by vehicle crossovers.

When on-street parking is the only option available, the design should allow for designated delivery areas with adequate safety strip to avoid encroachment into bicycle lanes and sidewalks.

The designation of specific time-slots for delivery when pedestrian volumes and traffic are low can be an effective way to reduce conflict between users.

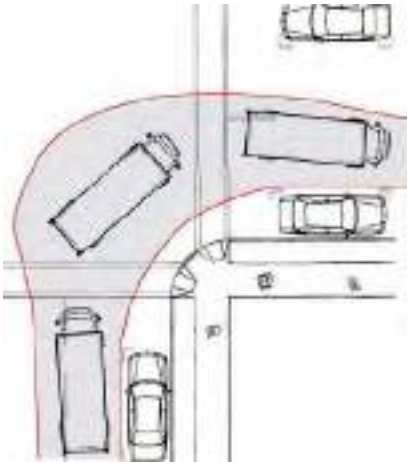


Fig 47. Accommodating an oversize vehicle

Design safe and comfortable sidewalks for pedestrian mobility. The design of sidewalks should also include ramps and tactile features in intersections and pedestrian crossings to facilitate accessibility to people with limited mobility.

In slope areas, innovative and inclusive design solutions (ramps, adequately dimensioned stairs, railings, inclined elevators, etc.) should be integrated to facilitate the movement of the elderly and accessibility of wheelchairs and those with impaired mobility

Fig 48. Inclined elevator on steep slopes

Source: https://en.wikipedia.org/wiki/Inclined_elevator#/media/File:-Cuneo_ascensore.JPG


Primary route of public transportati
Enhanced economic activity along t
Secondary green axes with public tr
Secondary roads
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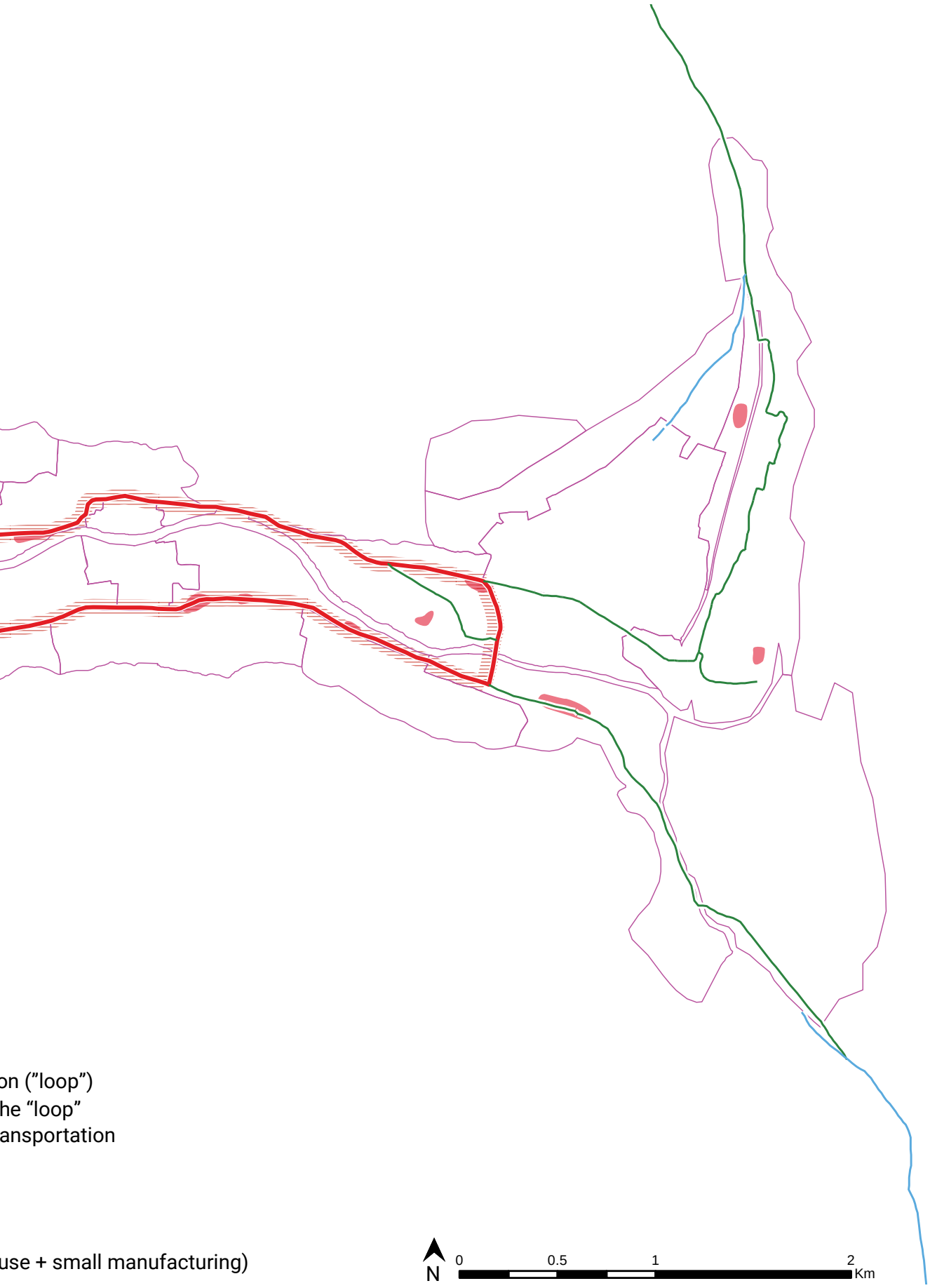
Commercial Activity Nodes (mixed



on (”loop”)
he “loop”
ansportation

use + small manufacturing)

Fig 49. Proposed routes for oversized vehicles in Khorog, UN-Habitat, 2023

S.3.5
CONSIDER EFFICIENT SNOW MANAGEMENT STRATEGIES IN STREET DESIGN

Street design should consider factors such as snow, ice and snow storage in order to make snow removal operations easy, efficient, and cost-effective. Specified standards for snow clearing are key to ensure a safe and reliable transportation network while protecting the environment and providing uninterrupted service to the community.

The following recommendations can help achieve better snow-clearing results:

- Design sidewalks to contain a buffer area where cleared snow can be stored along the road **(Fig.50)**. Boulevards, which usually have wider sidewalks, are an important snow-storage area, and result in reduced operational snow removal costs.

- Ensure proper grading to direct snowmelt towards roadways, and away from building entries and pedestrian zones to avoid slippery conditions during freeze-thaw cycles. Landscaping can also be used to direct snow drifts away from buildings entrances and public walkways, thus reducing the frequency of snow removal.

- Cleared snow usually contains contaminants such as salt and toxic compounds from vehicular tires. Therefore, snow storage should be located away creeks, rivers or natural areas. Site drainage plans should account for the run-off during freeze-thaw cycles.

- Select paving materials that are durable enough to withstand the harsh impacts of winter snow management and the corrosive effects of salt, as well as freeze-thaw cycles, while still being safe, slip-proof and easy to maintain.

- Plan for smaller snow storage areas with solar access, rather than one large shaded area, as the snow will melt faster. Balance the need for local snow storage with other considerations, such as walkability, aesthetics and parking.

- Explore seasonal parking bans where on-street parking would be limited to one side of residential streets during the winter.

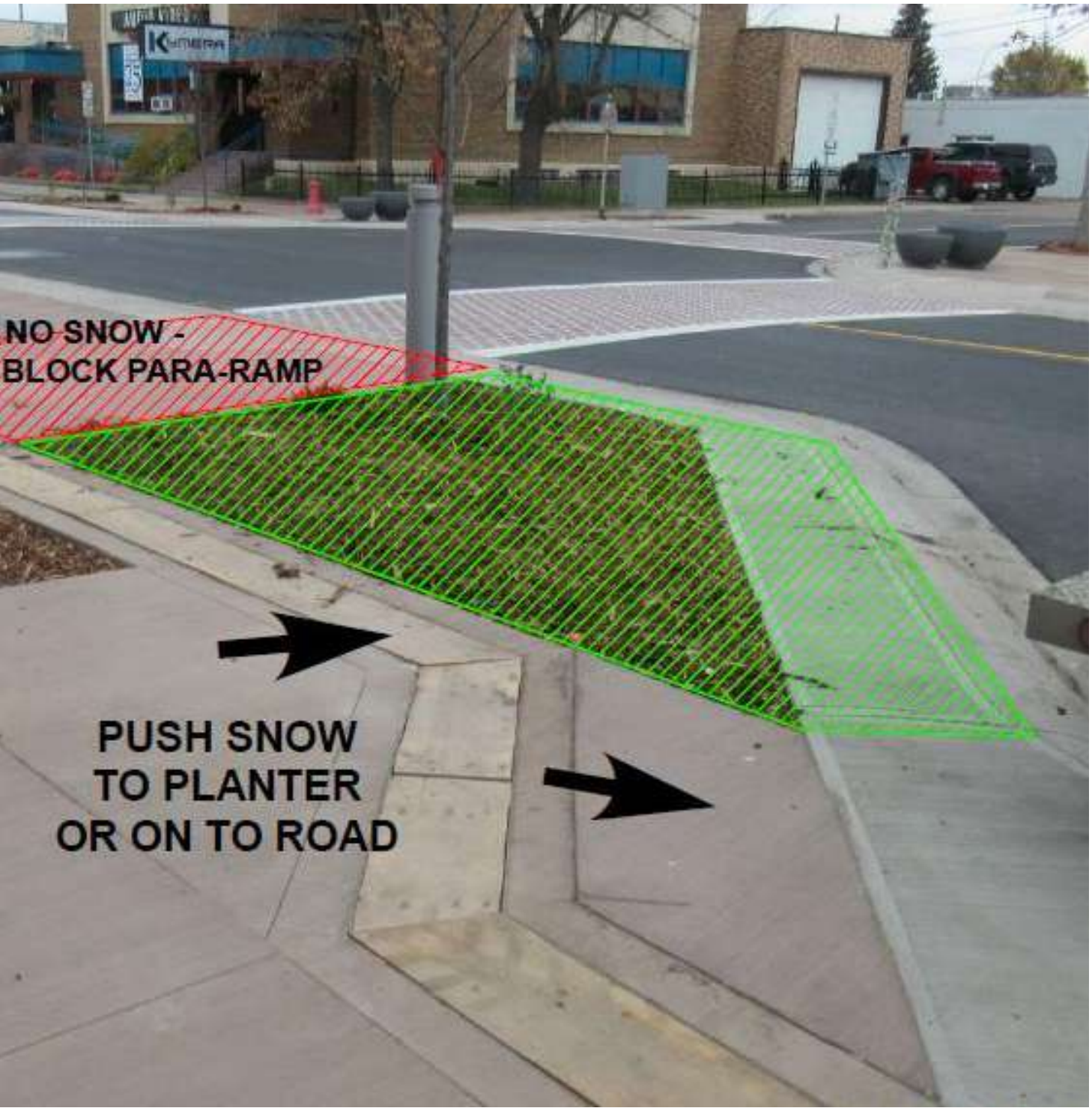


Fig 50. Snow removal strategies in street design, City of Leduc, Canada
Source: Snow removal design recommendations, City of Leduc

S.4
ADAPTED PARKING REQUIREMENTS

N.3.3
USE INNOVATIVE APPROACHES TO PARKING REQUIREMENTS

Many cities rely on a generic formula to establish minimum parking requirements with the objective to satisfy maximum demand for free parking. However, this approach can have serious consequences on the sustainability and cost effectiveness of urban projects. Generic parking requirements can create excess parking spaces that consumes valuable land, increase car ownership and discourage walking and cycling, lead to high environmental costs and jeopardies the quality and character of urban spaces.

Parking requirements should be context specific, and should take into consideration community-specific variables such as density, demographics, availability of transportation choices, type of development, etc. For instance, high-density mixed-use development might require less parking because services are usually within walking distance.

Alternatively, parking requirements can be established using methods that are better tailored to specific development project, and lead to increase availability from existing supply or limited expansion.

- **Shared Parking:**

- Mixed-use development attracts different types of users during different times of the day. This provides ample possibilities for sharing parking infrastructure between, for instance, an office building that has peak parking demand during daytime hours, and a restaurant whose demand peaks in the evening. City planners can use this model to reduce parking requirements and thus the development costs.

- **Transit zoning overlays:** This entails the reduction of minimum parking requirements in areas within a specified distance of transit nodes.

- **Land banking and landscape reserves:** In case where it is difficult to make clear parking demand projections, land may be reserved that can be converted to parking if demand is higher than expected or to serve future development. The set-aside land can be used as attractive public green space for the development of wider community. The city can reduce parking requirements to incentivise the creation of green areas.

- **Maximum Limits and Transferable Parking Entitlements:** Establishing maximum parking requirements in certain areas can be an effective way to control traffic flows, improve mobility, promote the use of alternative modes, achieve high environmental standards in the city, and enhance its livability.

Fig 51. Example of a Parking lot
Source: Photo by Michael Fousert on Unsplash

Transferable parking entitlements can be introduced to make maximum parking requirements more flexible. This entails that the "allowed number of parking spaces for a particular development are an "entitlement" that can be transferred or sold to another development if they are unused. Projects that require more parking can proceed, while those that need less parking can benefit by selling their rights, or negotiating shared parking agreements for their employees or customers." (Christopher V. Forinash et.al).

- **Decreasing demand:** Investment in affordable and high-quality public transport systems and car-sharing programs, the improvement of pedestrian and cycling infrastructure, and the promotion of mixed-use development models can reduce demand on cars and therefore decrease demand on parking.[9]

N.3.4
LOCATE PARKING STRUCTURES IN PROXIMITY TO THE ACTIVITIES THEY SUPPORT

- Parking spaces and structures should be located strategically to provide opportunities for other active uses.
- Parking structures should be located at a short walking distance from activity nodes to encourage walking and extend the hours of use.
- Locate disabled and visitor parking close to the parking entry and with visible and easy access to pedestrian paths.
- Ensure that parking entrance is visible and faces the street with off-street parking located at the rear of the site.

9 https://www.burlingtonvt.gov/sites/default/files/Agendas/SupportingDocuments/Smart%20growth%20alternatives%20to%20minimum%20parking%20requirements.pdf

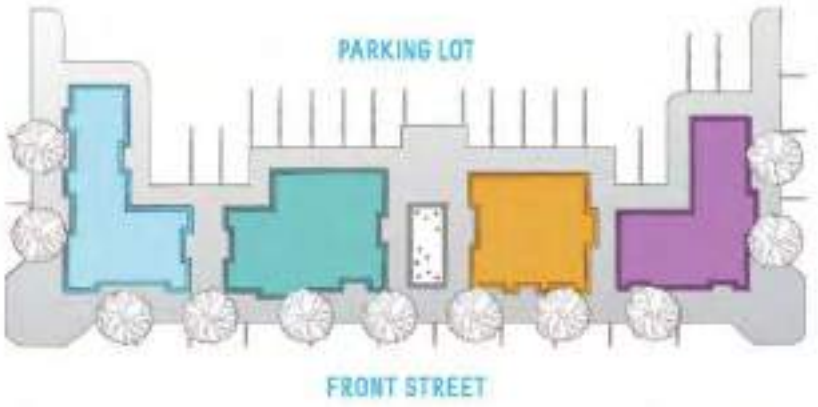


Fig 52. Parking lots should preferably be located in the rear of buildings

N.3.5
OPTIMISE ON-STREET AND PARKING LOTS DESIGN

The good management of on-street parking is important to maintain the quality of streets and traffic safety. Therefore, on-street parking should be restricted to short-term parking and parking spaces for disabled.

- Use vegetated curb extensions on-street parking as a buffer zone between pedestrian and traffic movement.
- Allocate controlled on-street parking bays for small delivery and service vehicles.
- Space should also be allocated to bicycle parking, especially close to public facilities, cafés and shopping areas.
- Set vehicle speed limits in those area in order to ensure safe parking and minimize conflict with other users.
- Where on-street parking is adjacent to on-road bicycle lanes, provide line-marking or a curb to separate mode spaces. Providing marked or curbed lanes and wider parking spaces allows better sightlines between a driver and cyclist when a car is exiting a parking space.
- Parking lots should preferably be located at the rear of sites **(Fig.51)**. Where a parking lot must be located between the building frontage and the street, visual connection should be maintained between

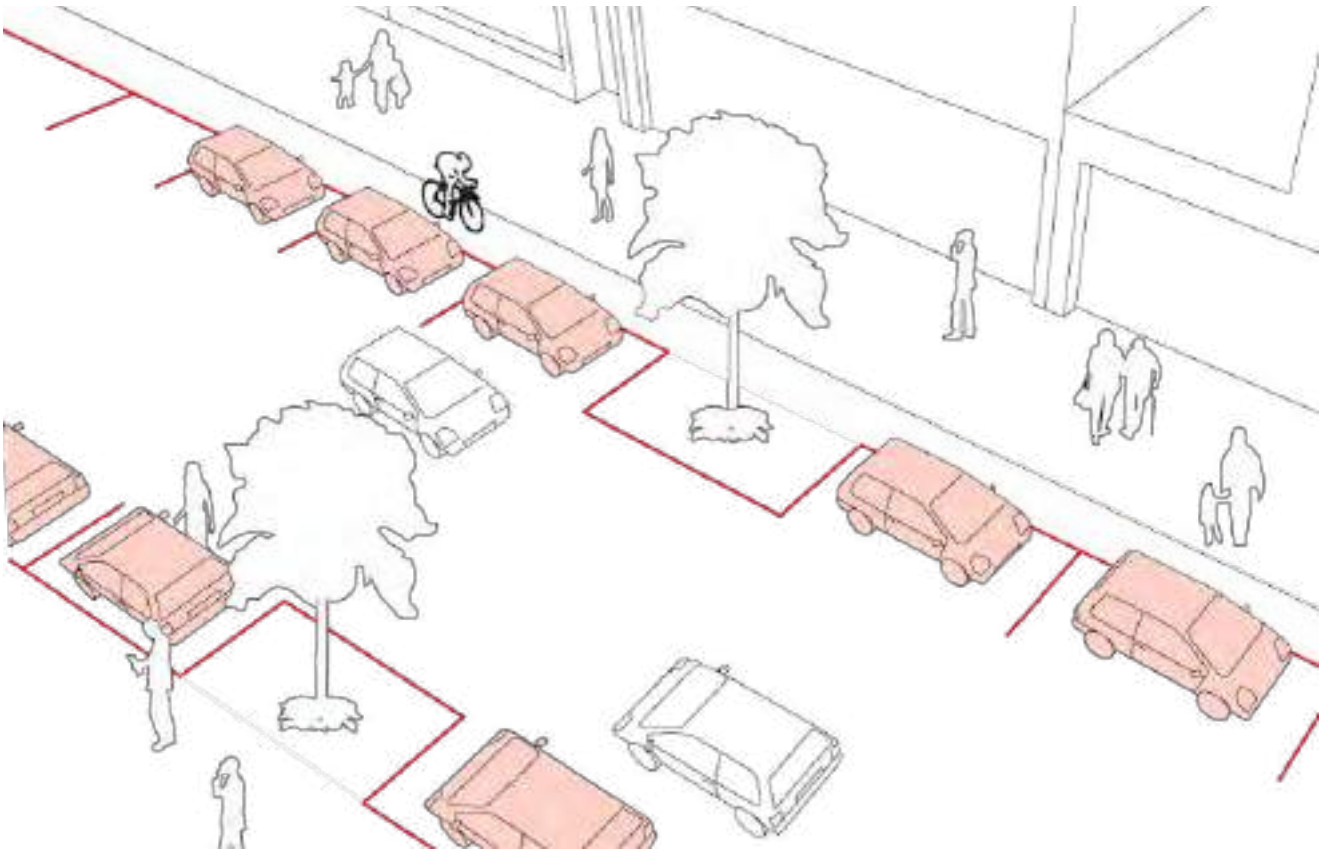


Fig 53. On-street parking design with vegetated curb extensions

Source: Victoria State urban design guidelines

N.3.6
ENSURE THAT PARKING SPACES ARE SAFE

the building and the street.

- A setback of up to 22m, which allows for two rows of 90 degree parking with single vehicle access way, landscaping along the street edge and pedestrian paths, will maintain optimal visual connection, whereas greater setbacks can compromise it.
- Arrange this setback to allow for future development options.
- Provide adequate pedestrian lighting and safe pathways between parking lots. Pathways should connect to the main entrances of buildings or to the sidewalks.
- Use seasonal on-street parking restrictions in winter, especially in narrow residential streets, in order to spare space for snow storage in areas with maximum sunlight. . On-street parking can be limited to one side of the street.
- Use landmark features at the entrance of parking lots to help guide drivers and pedestrians, especially when the ground is covered in snow.
- Ensure that visual connection is maintained between the street, buildings and parking spaces to maximize safety.

S.5 CONTEXT-ADAPTED STREETS

S.5.1 MINIMIZE THE STREET NETWORK'S FOOTPRINT IN STEEP SLOPE AREAS

S.5.2 DESIGN MULTIPLE ACCESS POINTS TO URBAN AREAS TO SECURE EVACUATION AND RESPONSE ROUTES

Fig 54. Example of split level driveways, UN-Habitat, 2023

Streets and long driveways should follow the contours of the natural terrain.

Streets and driveways could be provided that are narrow, single loaded, and/or split level in order to minimize slope disturbances **(Fig.53).**

Ensure that geological strata are directed away from the constructed road, otherwise cut and fill operation may lead to slope destabilization **(Fig.50)**

Any development area should be served by at least two access points. This will ensure that evacuation measures and disaster responses are ensured even if one of the access points is blocked. This principle can be combined with other mitigation measures such as solutions to minimize the streets footprints through split level, one-way streets in slope areas.

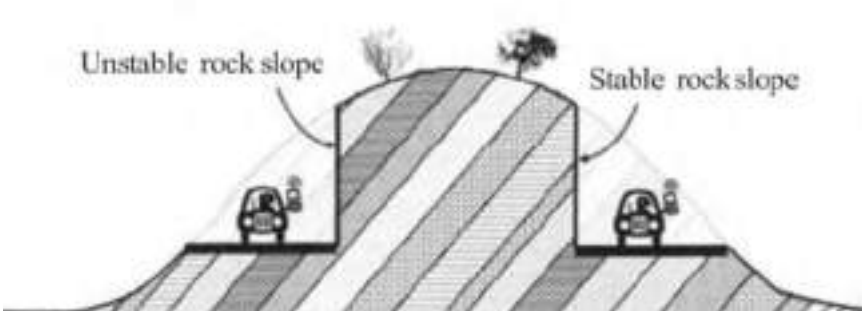


Fig 55. Cutting through slopes should avoid destabilizing it

S.5.3
DESIGN STREETS TO ALLOW FOR MAXIMUM SUNLIGHT IN WINTER

Khorog experiences long, cold winters every year, which increases the need for exposure to sunlight especially in outdoor spaces. Street orientation is a key factor in maximizing users' comfort through the control of shadows and sunshine exposure in different climatic conditions.

Shadow studies should therefore be conducted to determine the optimal street layout that allows the maximum number of streets to receive enough sunshine even during winter **(Fig.55).**

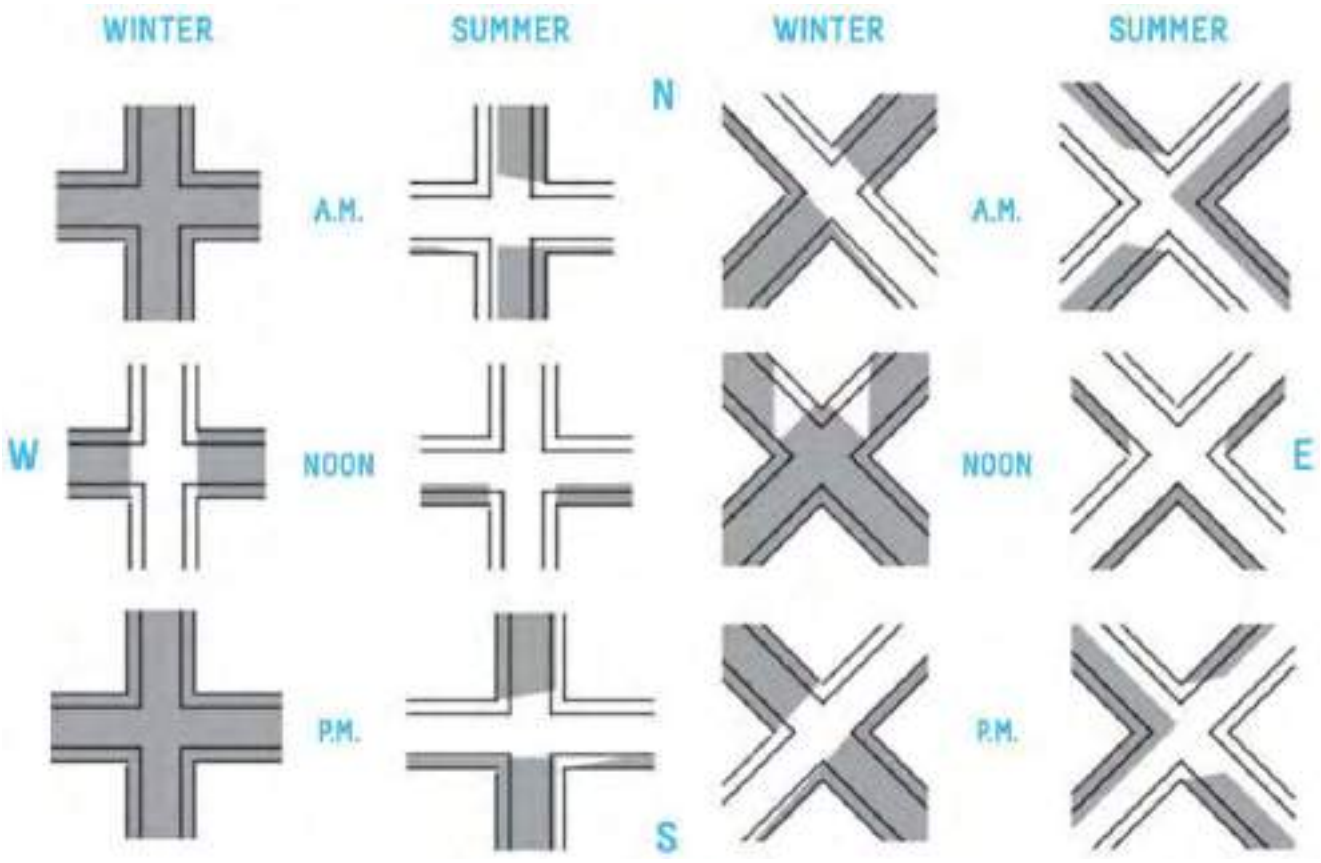


Fig 56. Demonstration of shadow cast study in summer and winter, with three-storey buildings (10m) and a building-to-building distance of 15m

Source: Edmonton Winter Design Guidelines 2018

GREEN/OPEN SPACE

Photo credit: https://www.jonathanceci.com/stono-river-preserve?itemId=pr7t1dk2tlhiatg5h5skrshs32lab7-jb4c6-k8hbb-kmlpn-6mf4y-yfpan

0.1.1
DESIGN GREEN/ OPEN SPACES TO BE MULTIFUNCTIONAL

Beside their recreational and environmental benefits, green open spaces can play a major role in the prevention and response to disasters, as well as the provision of crucial ecosystem services.

Open green spaces in Khorog should be designed to be multi-functional to serve a variety of purposes such as urban farming (food security), green infrastructure (integrated water recycling), recreation, temporary shelters, evacuation sites, etc. **(Fig.56)**

0.1.2
USE GREEN SPACES AS MITIGATION BUFFER ZONES IN HIGH-RISK AREAS

Green spaces such as parks, forests, and wetlands can absorb and slow down the flow of water, reducing the risk of flooding, it can stabilize the soil, reducing landslides. These buffer zones help reduce the impact of hazards on the population when they occur. In this regard, the sponge-city approach has been proposed in flood-prone areas in Khorog in the form of wetlands to reduce erosion and reduce flood risks along the river.

Other nature-based solutions such as afforestation are proposed to stabilise steep slopes in the northern and southern parts of Khorog using deep-rooted plants and trees together with engineered deflective and/or protective structures (for avalanches, landslides, and debris overflow).

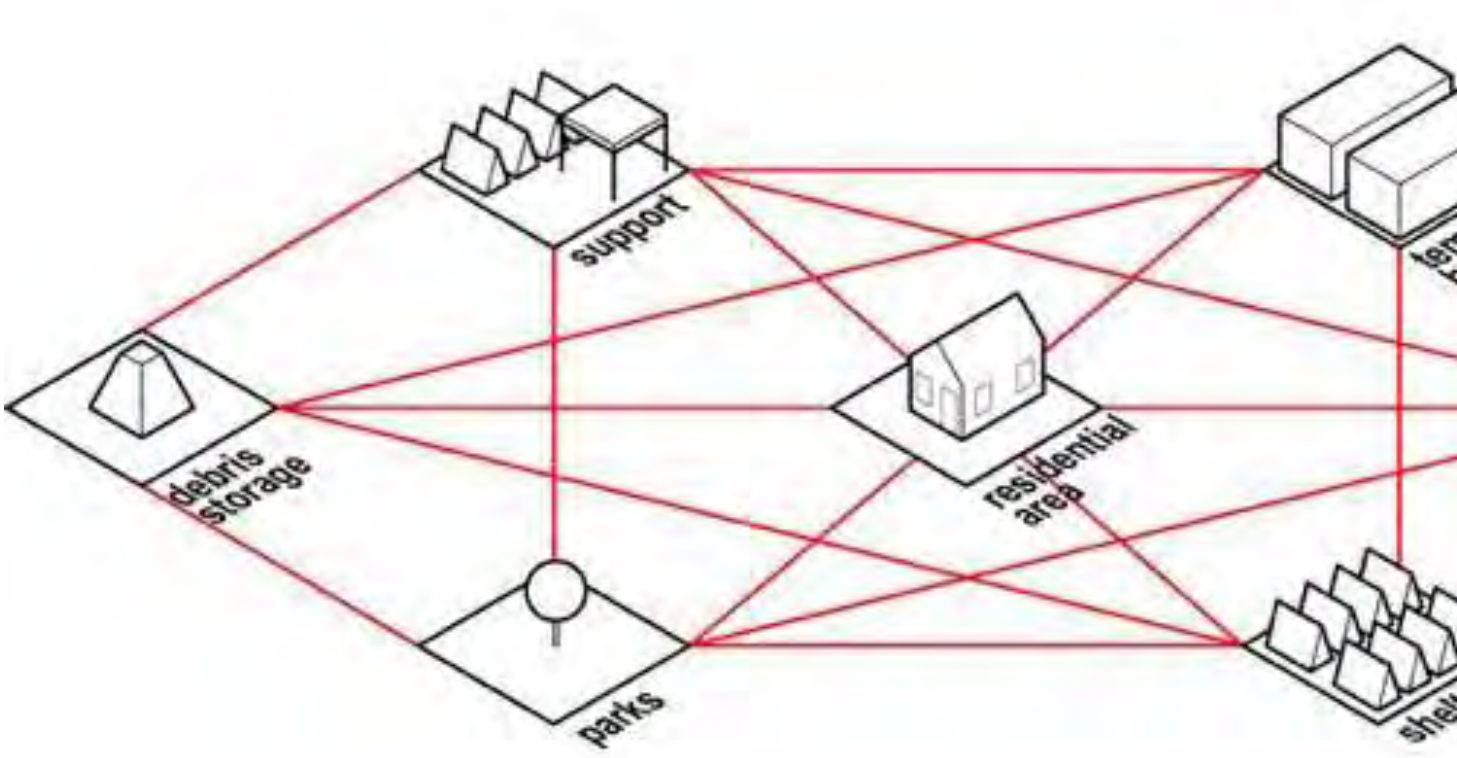


Fig 57. Multiple uses of open spaces in disaster-risk areas

Source: Florian Hendrik Liedtke 2020

0.1.3
USE LANDSCAPING AND OPEN SPACES TO COMPLIMENT NATURAL FEATURES

Preserving the cultural landscape of a city can help promote a sense of place and identity, while protecting historic sites and tradition. It can also have an economic benefit by attracting visitors and tourists drawn to the unique character of Khorog and its region.

The use of local flora can provide a range of benefits, including reducing water consumption, improving soil health, and supporting local ecosystems. Vegetation should not become a visual impairment; this could reduce the feeling of safety in the space **(Fig.57)**.

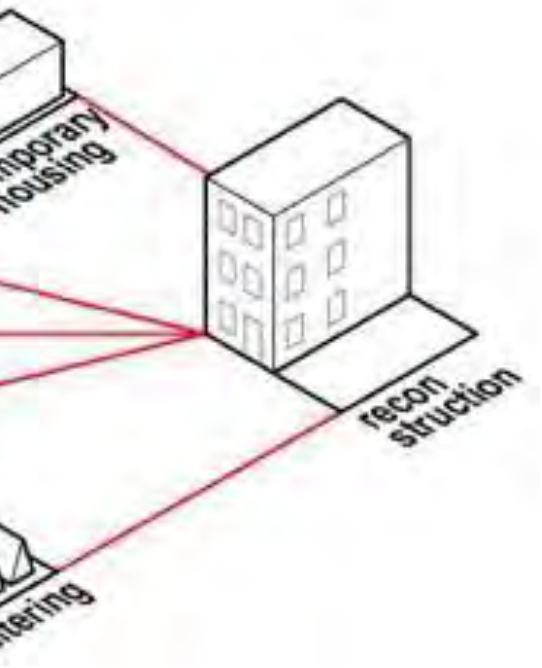
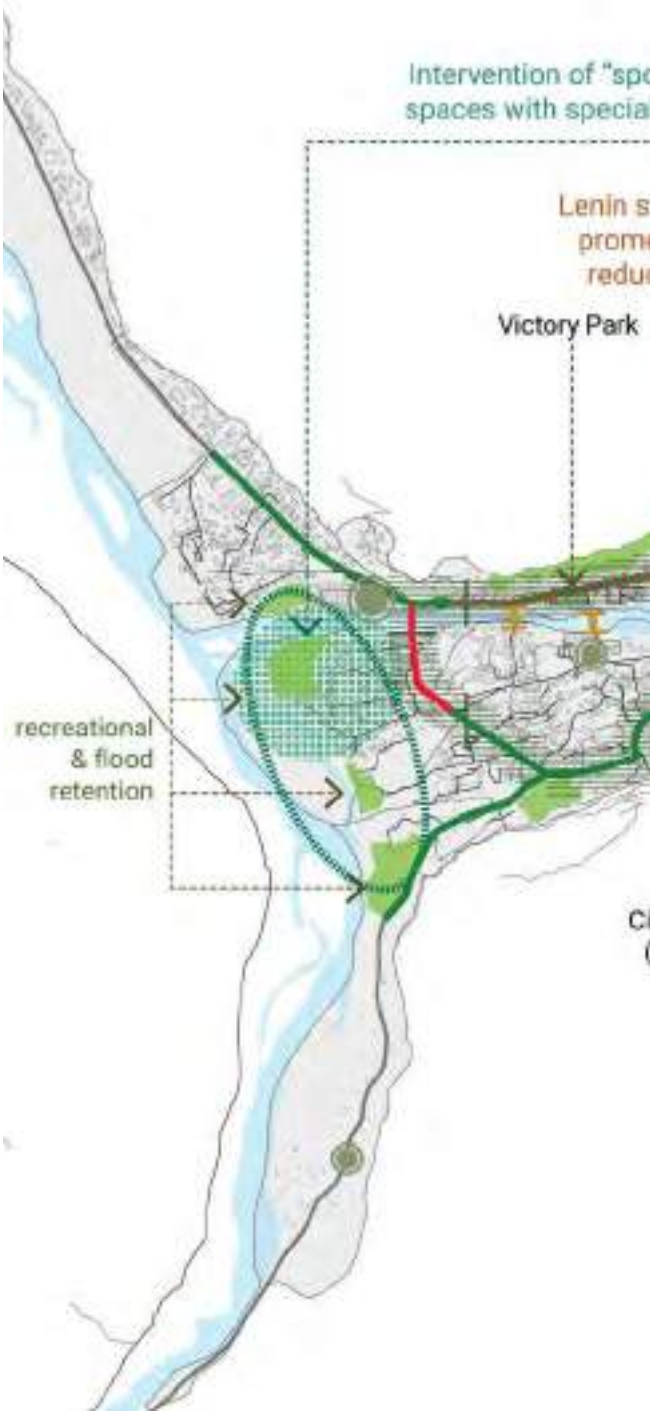


Fig 58. View corridor through the City Park in Khorog, UN-Habitat, September 2023

0.1.4
CREATE AND STRENGTHEN GREEN SPACE NETWORKS IN AND AROUND THE CITY

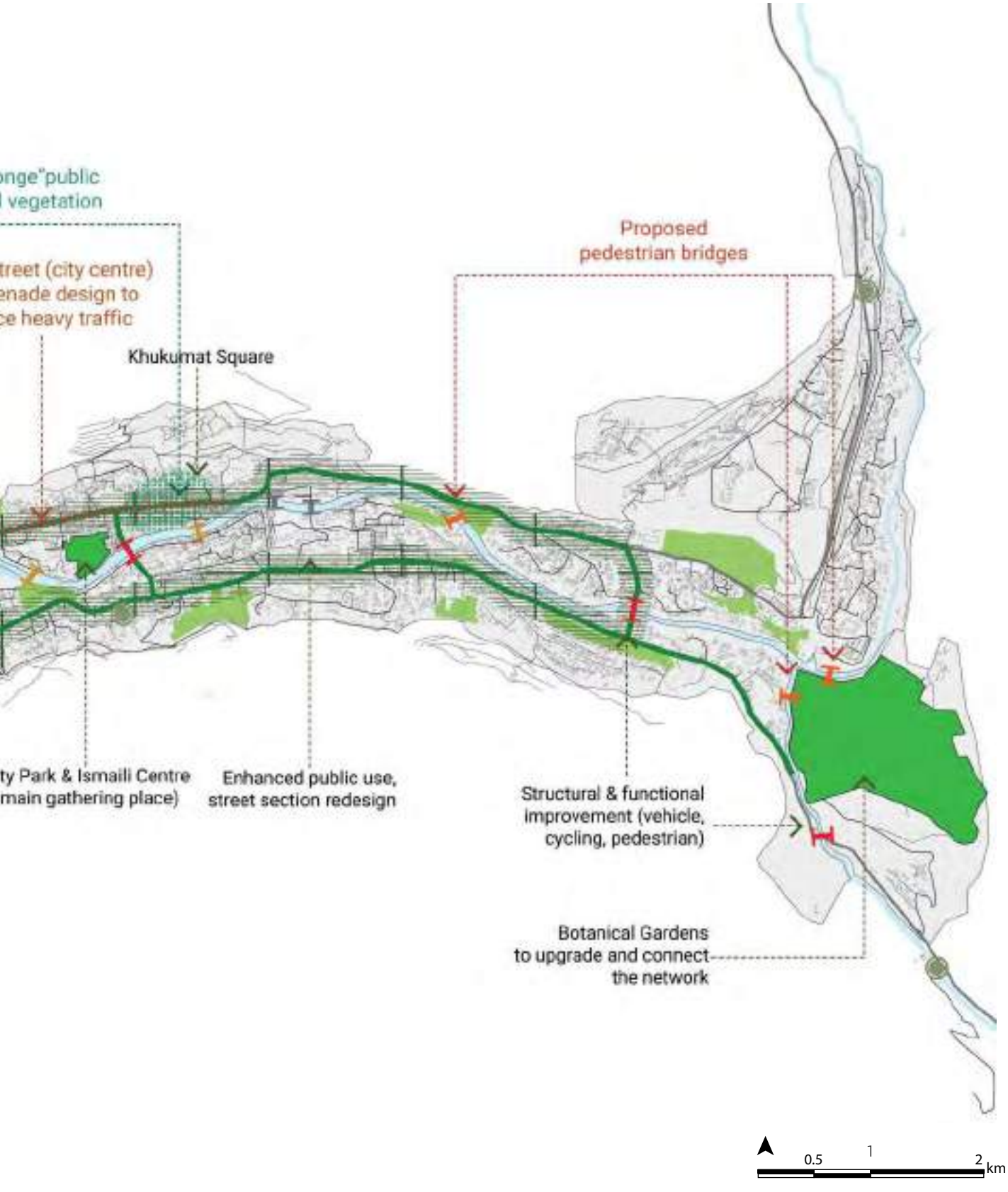
While the creation of green spaces is important, their potential can only be fully leveraged if they are designed to form larger green networks. Networks of green public spaces within and outside the urban perimeter can help to manage storm water, reduce heat islands, and sustain wildlife by building ecological connectivity between isolated green spaces and other ecological assets.

These urban and regional green networks can provide ecosystem services to the community. Achieving a level of integration and linkage between waterfronts, wetlands, urban parks, and regional natural assets can be a driver for economic development and contribute to the strengthening of tourism in Khorog.



- Mahalla boundary
- Major roads
- Secondary roads
- Tertiary roads
- Building outline
- Proposed pedestrian bridge
- Proposed Vehicle and Pedestrian Bridge
- Bus station upgrade
- Road section to be redesigned *(to include pedestrian and cycling ways, disability signs, plantation, drainage)*
- Redesigned "central loop"
- Areas to promote "sponge" public spaces
- Public spaces (pocket parks, recreation, urban agriculture)

Fig 59. Mobility Strategy for Khorog, UN-Habitat, 2023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l vegetation
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ce heavy traffic
Khukumat Square
Proposed
pedestrian bridges
ty Park & Ismaili Centre
main gathering place)
Enhanced public use,
street section redesign
Structural & functional
improvement (vehicle,
cycling, pedestrian)
Botanical Gardens
to upgrade and connect
the network
0.5
1
2
km

Fig 60. Trail in the Mountains
Source: AKDN 2023

O.1.5
DESIGN PUBLIC GREEN SPACES TO BE ACCESSIBLE AND INCLUSIVE

The design or upgrading of public parks and open green spaces should ensure accessibility for people of all ages, levels of physical ability, and people of different social and ethnic groups.

They need to be strategically located to ensure that all the city population is covered by the catchment areas of public green spaces at different scales and within walking distances. Green spaces should also provide possibilities for social encounters and cultural practices, as well as an attractive atmosphere to enjoy nature and fresh air.

Green/public spaces should preferably be located close to activity nodes and retail locations to contribute to the local economy and provide opportunities for warm-up breaks in cold weather.

Provide areas and comfortable seating for quiet pursuits. Seating areas are important for encouraging people, particularly the elderly, to use and enjoy local parks and open spaces.

O.1.6
DESIGN PUBLIC GREEN SPACES TO BE SAFE

Green public spaces can become a source of insecurity and nuisance if not maintained or poorly managed. The creation of parks and green spaces should include design and governance strategies to prevent the degradation of these spaces. For instance, planting, pathway and spatial arrangement of built elements, lighting, and way-finding graphics should promote visibility and passive surveillance. In crime-prone areas, landscape elements can be positioned to allow maximum cross-view, and time restrictions may be imposed on park use.

Special attention needs to be paid to the design of public space edges as people tend to gravitate to and occupy because they provide good vantage points to view activities within the space as well as to the surrounding area. Doors and windows of buildings should preferably overlook adjacent public spaces to provide opportunities for informal surveillance of the space.

Provide lighting in communal open spaces to support safe movement and evening use **(See O.1.10)**.

O.1.7
INTEGRATE THE RIVER FRONT IN THE OPEN SPACE NETWORK

Integrate the river front in the green and pedestrian network of the city, making it an attractive space that serves different users while connecting neighbourhoods and development sites to the water.

Open up paths and create view corridors to the river to maximise access to the waterfront and to re-engage the river as a key component of Khorog's public realm.

Use river buffer zones to develop promenades and create attractive and active public spaces **(Fig.58).**

Fig 61. Riverfront promenade in Khorog, UN-Habitat, September 2023

0.1.8
EMBRACE A FOUR-SEASON DESIGN AND TEMPORARY ACTIVITIES IN PARKS

Khorog experiences snowy cold winters and warm summers. The variation in seasonal weather conditions should be considered in the design of public spaces in order to ensure year-long use and provide opportunities to enjoy the city no matter the weather condition.

Therefore, the design of open spaces should include alternate uses of community gardens, outdoor pools, playgrounds and sport fields during the winter time at early stages of planning. Strategies to adapt existing park features for winter activities should also be developed.

Use natural features and topography such as slopes and hills to create hubs for winter leisure activity (tobogganing, sliding). Temporary, unique and playful events such as snow sculpture exhibitions can also be part of the seasonal use of open spaces.

Provide shelters, warming huts and wind blocks to offer protection from weather conditions. They can be placed in outdoor gathering spaces, and particularly where transit stops are located. The shelters should preferably include passive solar and aesthetic design to provide comfortable and pleasing seating opportunities to the community **(Fig.59)**.

Fig 62. Warming hut design,
Source: WINNIPEG WARMING HUTS V.2017

0.1.9 INTEGRATE DURABLE, COMFORTABLE AND AESTHETICALLY PLEASING STREET FURNITURE

Street furniture is an important component of the streetscape as it contributes to the qualification of collective spaces. It consists of physical objects such as benches, signposts, lighting, bike racks, dumpsters, bus stops, shelters, etc. Their design and configuration should be adapted to the specific needs of the city and the population without jeopardizing the safety or obstructing movements especially on sidewalks and crowded spaces.

Street furniture should be comfortable, protected and, preferably facing south in order to maximize exposure to sunlight for outdoor seating in winter. It should also include some kind of overhead protection from snow, rain, sunlight and wind when necessary.

Ensure that street furniture is robust and made of durable, comfortable and aesthetically pleasing materials that withstand different weather conditions. For instance, metal and stone can get very hot or cold, making it usually uncomfortable for users.

Ensure that street furniture is easy to maintain especially during winter.

Ensure that street furniture is carefully placed to avoid obstructing people's movement and emergency vehicles.

Consider the use of temporary and movable street furniture as they can add quality to public space and give more flexibility to users. Ensure that the use of temporary furniture is regulated to avoid possible movement obstruction **(Fig.60)**.

Fig 63. Example of seating possibilities through different types of urban furniture (permanent and temporary)
Source: New York City's privately owned public spaces

0.1.10 USE ADEQUATE LIGHTING TO INCREASE SAFETY AND IMPROVE THE QUALITY OF PUBLIC SPACES

Street lighting is undoubtedly one of the most vital components of public safety in cities. Appropriate lighting of streets and public spaces is directly linked to reduced crimes and property damage. It also contributes to improved traffic flow and drivers' comfort. Street lighting can also be used as a creative tool to regulate traffic speed, increase the feeling of safety, and beautify public spaces. However, the inadequate planning of street lighting can lead to just the opposite (Light pollution and discomfort, increased traffic speed, glare, increased greenhouse gas emissions, etc.).

The following design aspects should be taken into consideration during the development of street lighting strategies.

- Provide consistent, continuous lighting levels in public spaces, public transport stops and along pedestrian and bicycle paths, with a special emphasis on pedestrian crossings.
- Light the interiors of public transport shelters to the same level as their surrounding area and paths.
- Install lighting at building entrances and car parking vehicle exits.
- Use gradual transitions between pedestrian-lit streets and highly illuminated roads to reduce traffic speed. These

transitions signal drivers that they have entered a new zone, and automatically compels them to slow their speed. Furthermore, the lack of gradual transitions from over-lit areas can give the impression that the surrounding places are under-lit.

- Avoid infrequent large, single-point lights as they can cause glare and unilluminated patches, and are detrimental to people with visual impairment. Strong light sources result in deep shadows and can reduce local visibility and surveillance.
- Use lighting types that enable recognition of an approaching person's face from 10–15 meters away, and allow for better colour recognition of objects and surfaces.

Fig 64. Park lighting design
Source: https://litawards.com/winners/winner.php?id=2625&mode=win

0.1.11
PUBLIC SPACE SIGNAGE & WAYFINDING

The provision of clear, visible, and readable signage is essential to ensure proper orientation and safety of users.

Standard design for fonts, colours, materials should be used in all public space signage.

All signage must be made of durable, fully opaque and non-reflective materials. Texts must be highly contrasting with the background colour of the sign, and written in bold, non-narrow, and sans-serif fonts.

- Signage in public spaces should include:
- Entry plaques, which identify the area as part of the city's public space network using a standard logo.
- Orientation plaques indicating the names of walking loops, destinations, and distances.
- Users signage, indicating the users allowed to use the space or a pathway (pedestrian, cyclists, vehicles, etc)
- Information plaques that communicate the type of the public space (Ecological area, playground, etc.), the amenities provided, the entity responsible for its maintenance, and information on how to ask a question or file complaints.
- Site maps indicating the boundaries of the public space and other necessary elements for orientation (name of streets, landmarks, etc.)

0.1.12
INTEGRATE LOCALLY RELEVANT URBAN ART

Urban art adds character to public spaces and contributes to the strengthening of local identity. It can come in different forms, and serve aesthetic, cultural as well as weather protection functions (i.e. warming huts). Sculptures, artistic lighting, landscaping and fountains create a welcoming environment that enhances outdoor experience and engage the communities senses.

Ensure that public art is locally accepted and relevant so that people can easily interact with it.

0.1.13
USE LANDSCAPING TO MAXIMISE USER'S COMFORT

Create outdoor rooms using trees and vegetation to shelter areas from prevailing winds. Dense coniferous vegetation on an area's north-west side will help to block wind, while an open southern exposure will maximize solar access, warming the area **(Fig.62).**

Use landscaping to stop snow from drifting onto public walkways or trails. Berms and vegetation can also help to direct snow drifts away from building entrances, reducing the frequency of snow removal.

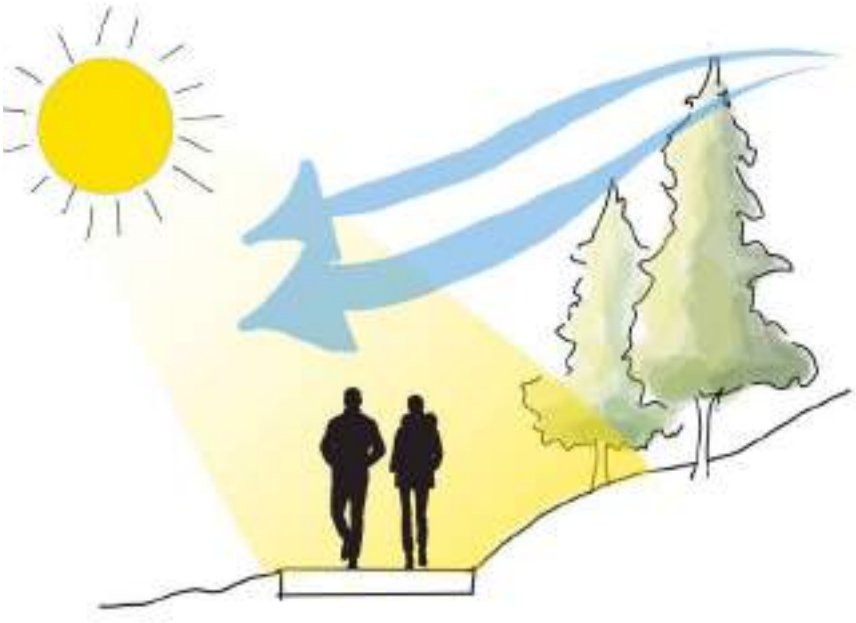


Fig 65. South-facing benches and wind blocks, such as coniferous trees, create comfortable, inviting spaces to linger in winter

Fig 66. View corridor through the City Park in Khorog

Source: https://ayerssaintgross.com/work/project/college-of-charleston-stono-preserve-master-plan/

Fig 67. Public performance of Tajik traditional music
Source: AKDN

0.1.14
CHOOSE NATIVE PLANT SPECIES THAT ENGAGE THE SENSES

Plant species should be carefully selected depending on their characteristics such as colour, fruit, resilience to extreme weather conditions or tolerance to salt and pollutants resulting from snow-removal operations.

Choose native and non-invasive species that create interesting landscapes year-round, taking into consideration winter and summer needs. Give priority to native deciduous trees that provide shadows in summer and allow for sunlight penetration during winter.

0.1.15
MAXIMISE THE PERMEABILITY OF SURFACES IN PUBLIC SPACES

Limiting hard surfaces reduces the volume of storm water run-off, which reduces pressure on urban drainage systems and waterways. It is recommended to limit the amount of paved surfaces of a new development.

At least 20% of public space surfaces should be covered by surfaces that can absorb water such as garden beds, lawn and other unsealed surfaces. [10]

Permeability (%) = Total pervious area x 100 /Total site area

Select appropriate landscaping for snow-storage areas. Vegetated areas that are used for snow storage are subject to damage and poor growth due to compaction and pollutants, and possibly poor drainage **(Fig.65).**

0.1.16 COST OF GREEN SPACES

The costs of design, implementation and maintenance of public and green spaces should be made explicit in order to mobilize sufficient funding resources to keep them viable. As green spaces are usually public assets without financial profits, their return on investment can come from climate mitigation and public health benefits.

Their maintenance should be planned for, funded, and systematically performed. Local stewardship and volunteer support can help with the upkeep, but maintenance can be systematically ensured by city taxes financing and creating job opportunities for local low skill employment.[11]

Establish a maintenance program for public spaces prioritising prompt identification, removal and repair of any signs of damage and misuse.

Fig 68. Design of permeable surfaces. Green Alley, Detroit
Photo credit: Peggy Brennan

10 Understanding the residential development standards, Victoria 2015 state government

11 World Bank 2021, A catalogue of Nature-Based Solutions for urban resilience

Source: AKDN 2023

BUILDING

Source: AKDN 2023

B.1.1
SHAPE THE BUILDING SCALE AND FORM TO SUPPORT THE EXISTING AND FUTURE CHARACTER OF THE AREA.

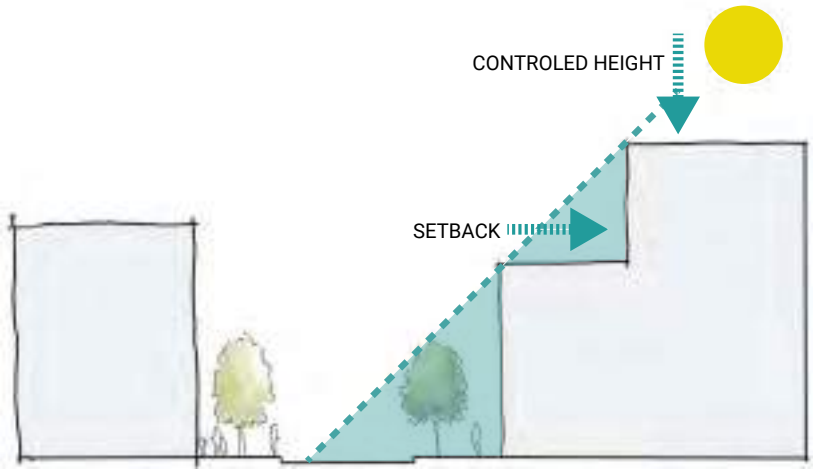


Fig 69. Building setbacks to optimal sunlight

Source: Based on Victoria State urban design guidelines

Mid-rise, high-density development provides an optimal model for the context of Khorog in terms of hazard mitigation, cost, social and environmental conditions.

1- Evacuation in times of disaster is usually easier and faster in low/mid-rise buildings

2- Construction and maintenance costs are lower than in High-rise buildings, which is reflected in the affordability of houses.

3- Low rise buildings provide a human scale to neighbourhoods, which encourages social conviviality and better connection to the street.

4- They can enhance the visual identity and view corridors.

5- In Khorog, optimal urban densities can be achieved with this model without requiring high-rise development.

High-rise buildings in Khorog are discouraged as they tend to create worse micro-climates. They also cause strong wind turbulences at the pedestrian level and cast long shadows on streets and public spaces.

It is therefore recommended that new development projects should follow the existing height patterns in the area in which they are located while reducing the negative impacts on adjacent properties such as blocking views, casting shadows on streets and public spaces for long periods of the day, wind downdraft, etc. **(Fig.66)**

B.1.2
FACING DISTANCES AND SETBACKS

- Determine suitable building setbacks and variations in building frontages to enhance the pedestrian experience, privacy and to allow sun access to key public spaces and pedestrian streets.
- Strategic setbacks can support active street frontages and vibrant pedestrian environments.
- Use setbacks to create sun traps and shelters from the wind. Reflected or radiated heat from surfaces within sun traps can provide year-round spaces for restaurant patios and retail.
- Use street width, building height and landscape design to create a sense of enclosure for street users. Consider designing the street wall, or podium for medium and tall buildings, to be no higher than the width of the road, ideally creating a 1:1 ratio.
- On sites that have commercial ground floors a 'zero' setback is often prescribed. This maintains a strong street edge and provides a direct relationship between the commercial ground floor uses, which are often shops, and the street.
- Locate and arrange the building to allow daylight and winter sun access to key public spaces and key pedestrian street spaces.

B.1.3
FIT AND TRANSITION

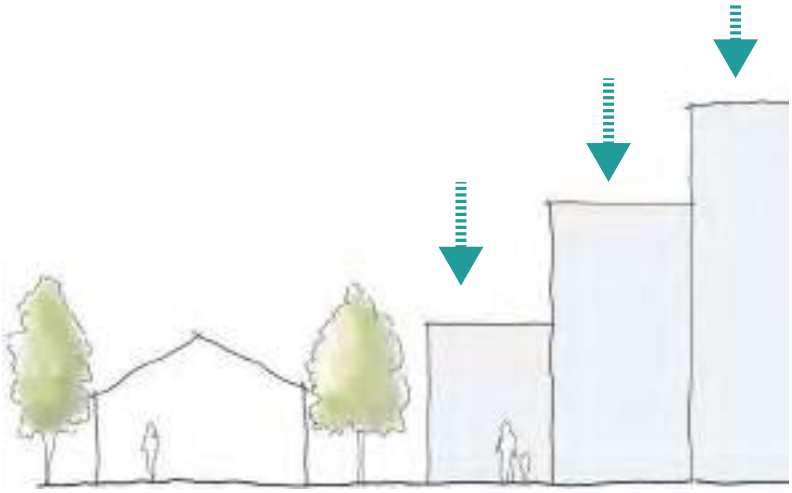


Fig 70. Building height transition

Source: Based on Victoria State urban design guidelines

Address the issue of how buildings interface with the adjacent sidewalk, street, and public realm with pedestrian connections, transparency, open spaces, and amenities.

- Ensure buildings fit within the existing or planned context and provide appropriate transitions in scale to buildings and open spaces.
- Provide a transition in scale from larger buildings to adjacent areas of smaller scale built form. A larger building can transition to a lower scale neighbour by placing smaller scale buildings at the interface, or by stepping down the building towards the interface edge **(Fig.67).**
- Accommodate taller structures on the north side of streets to avoid excess shadow-casting over sidewalks, patios and outdoor spaces.
- Define the boundary or transition between public space and private space without the need for high fences or barriers. A slight change in building level can provide a boundary definition between public and private space **(Fig.68).**

Fig 71. Example of transition between street and building

Source: Victoria State urban design guidelines

B.1.4
DESIGN BUILDINGS TO BE EARTHQUAKE RESISTANCE

Buildings in Khorog should conform to seismic resistance regulations and construction standards.

- In addition to geotechnical and seismic resistance studies that should be necessary in earthquake prone areas, the design of the structural system of a building must incorporate several important features:

- Stable foundations: In addition to being able to support the weight of the structure without excessive settlement, the foundation system must be able to resist earthquake-induced overturning forces and be capable of transferring large horizontal forces between the structure and the ground without excessive settlement or sliding. Foundation systems also must be capable of resisting both transient and permanent ground deformations without inducing excessively large displacements in the supported structures.

- Continuous load paths: A load path is a series of connected elements designed to deliver loads from their origin to the foundation. Structures that are properly tied together to provide a continuous load path are more resistant to damage.

- Regularity, stiffness and strength: Strong earthquake shaking will induce both vertical and lateral forces in a structure. The lateral forces that tend to move structures horizontally have proven to be particularly damaging. If a structure has inadequate lateral stiffness or strength, these lateral forces can produce large horizontal displacements in the structure and potentially cause instability.

- Buildings where one story has substantially less strength and stiffness than stories above (i.e. ground floors with less wall), is known as a weak or soft story irregularity. These types of structures should be avoided.

- A structure is considered regular if the distribution of its mass, strength, and stiffness is such that it will sway in a uniform manner when subjected to ground shaking. In this sense, asymmetry and irregular forms should be avoided as they are more vulnerable to torsion and other earthquake forces.

- Ductility and toughness: Ductility and toughness are structural properties that relate to the ability of a structural element to sustain damage when overloaded while continuing to carry load without failure. These are extremely important properties for structures designed to sustain damage without collapse. The measures used to achieve ductility and toughness in structural elements are unique to each construction material and to each type of structural system. Generally, ductility and toughness are achieved by proportioning the structure so that some members can yield to protect the rest of the structure from damage.

- Adequate separation/ distance from neighbouring construction: When buildings are affected by ground shaking, they sway from side to side. If adjacent buildings are not adequately separated and move out of phase with each other, they can slam into each other in an effect known as pounding. Pounding can cause local damage, and in more severe cases, lead to partial or total collapse. Structures should be set back from their property lines so that they will not intrude on the neighbouring airspace and potentially become a pounding hazard for adjacent structures.[12]

12 https://www.fema.gov/sites/default/files/documents/fema_p-749-earthquake-resistant-design-concepts_112022.pdf

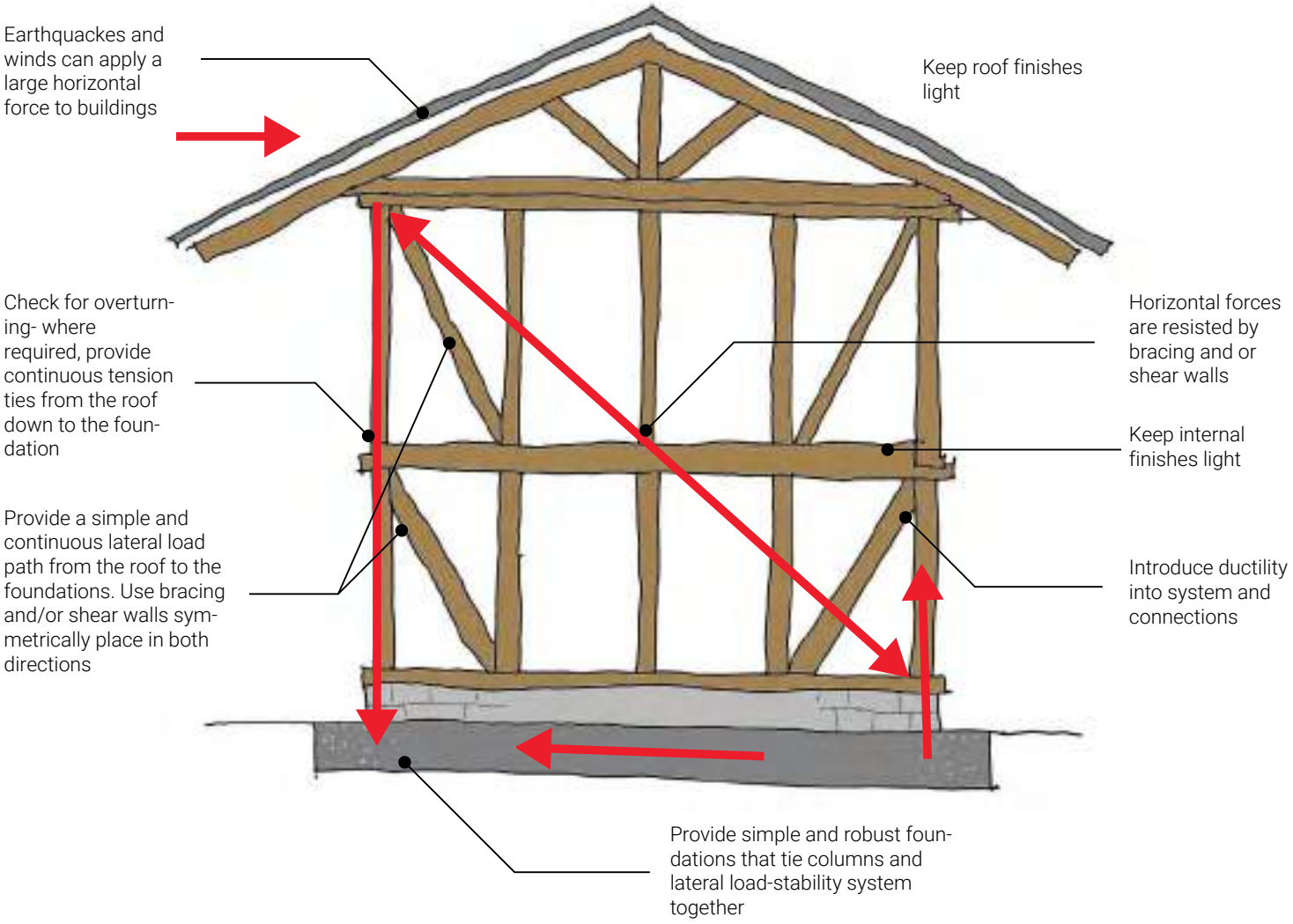


Fig 72. Measures for sensible earthquake resistance structure

Based on Sebastian Kaminski, Key points for a sensible earthquake load path for engineered bahareque housing

B.1.5

IN SLOPE AREAS, STABILIZE SLOPES USING PASSIVE AND/ OR ACTIVE METHODS TO REDUCE THE RISK OF ROCKFALLS, LANDSLIDES AND AVALANCHES.

Construction and land use in slope areas requires design and engineering measures. Generally, cuts and fills in slopes should be minimized as much as possible. Constructions should follow the slope and be built to help stabilize it **(Fig.70)**.

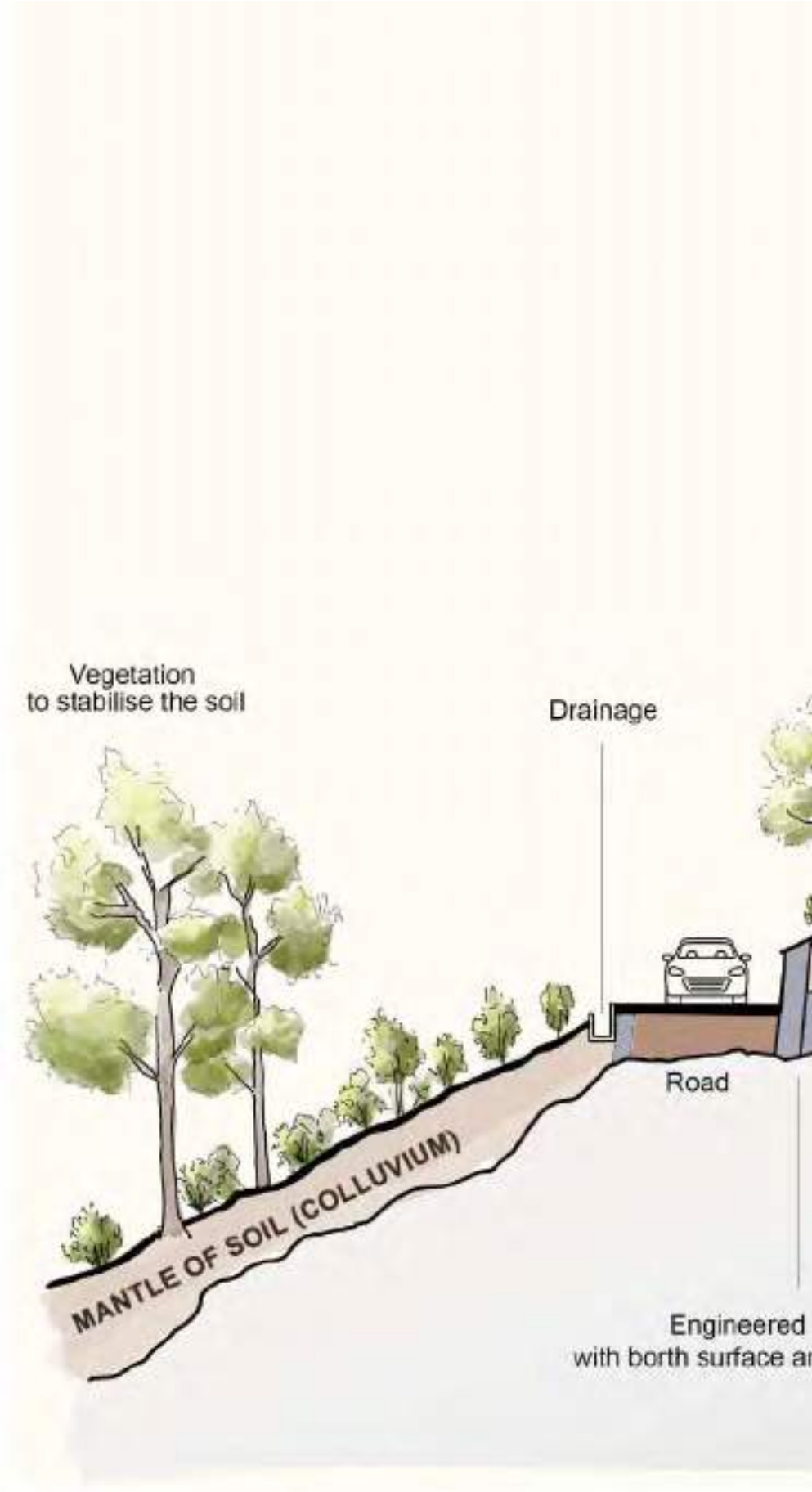
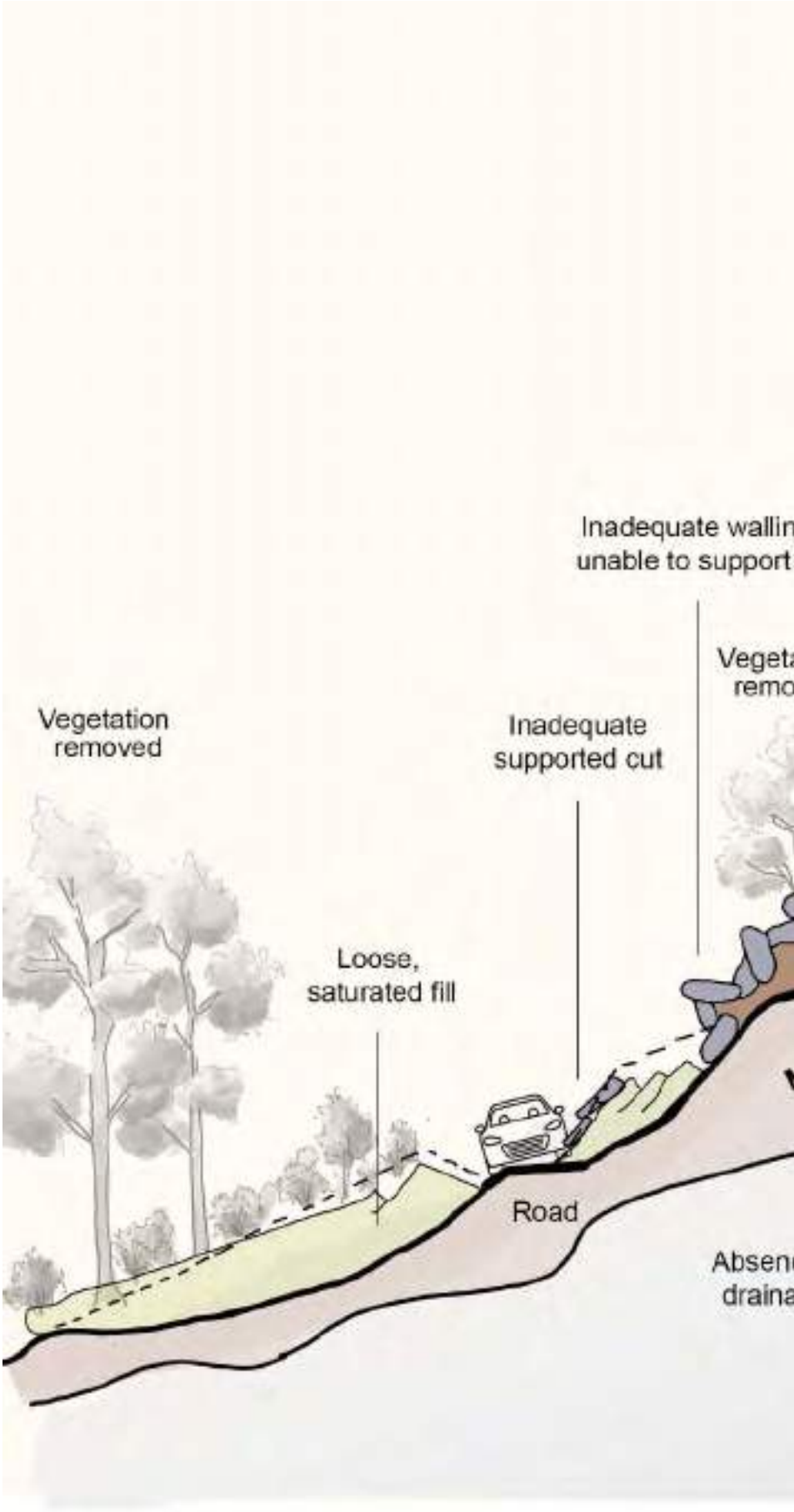


Fig 73. Mitigation measures for building construction on slopes, UN-Habitat, 2023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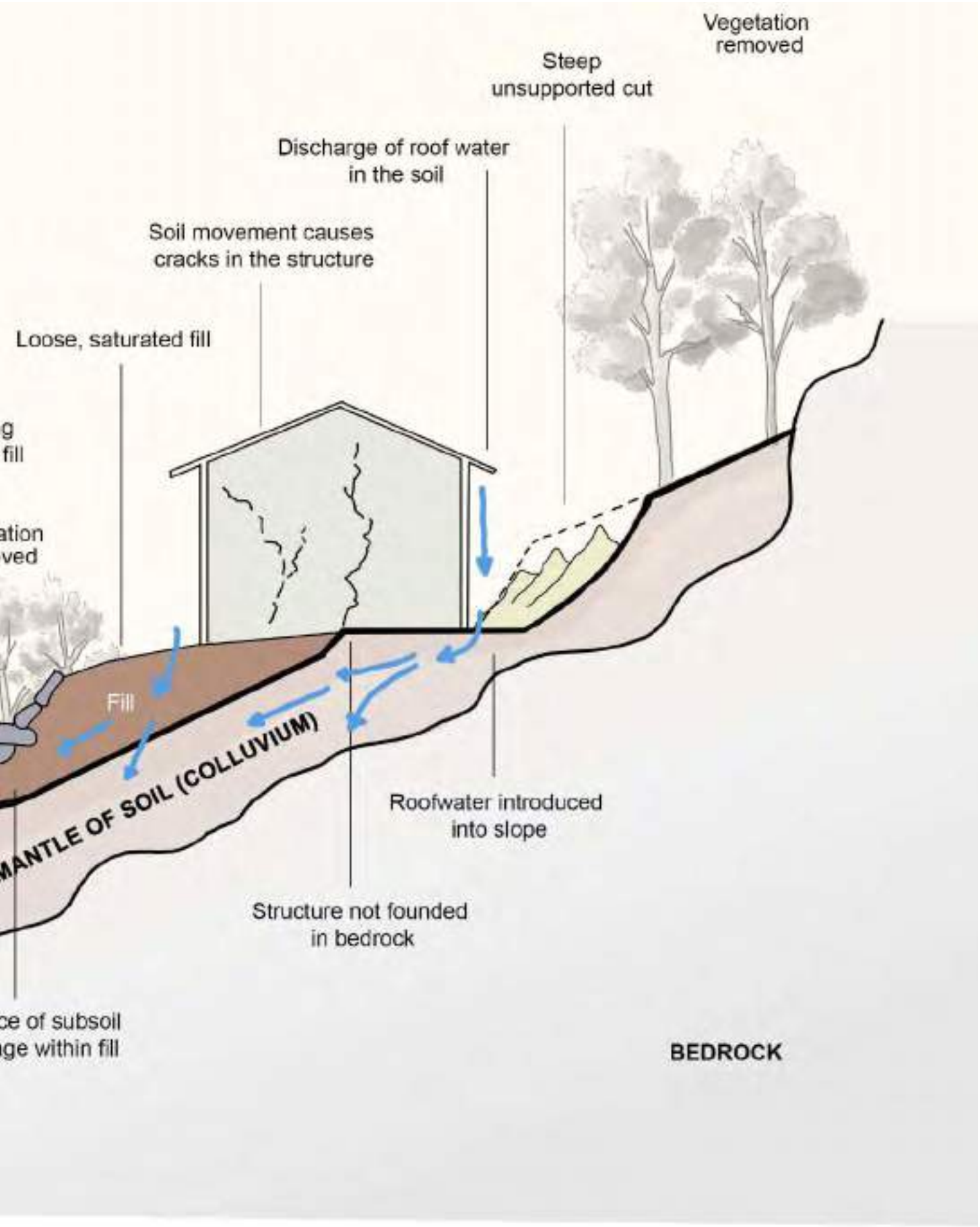

Fig 74. Hazards related to slope destabilisation and inadequate building construction on slopes, UN-Habitat, 2023

B.1.6
BUILDINGS SHOULD HOST MULTIPLE FUNCTIONS UNDER THE SAME ROOF

The diversity of building functions helps to define a neighbourhood's identity. For instance, retail on the ground floor, tertiary uses on the first floor and housing on the upper levels. However, not every building needs to have multiple uses or tenants, but each block and neighbourhood must.

Require energy efficient buildings with adequate insulation and use of passive building principles. Promote the retrofitting of those who are substandard.

B.1.7
ENCOURAGE MULTI-SCALE AND INTEGRATED GREEN SYSTEM SOLUTIONS IN BUILDINGS

Encourage the integration of closed systems for grey water recycling (Gravity-fed water systems, filtration, etc.), urban agriculture, and energy production (solar panels, windmills, geothermal energy) through small on-site infrastructure. This could ensure a certain level of independence in case of failure of the centralised systems **(Fig. 73).**

B.1.8
PROMOTE ACCESSIBILITY IN BUILDING DESIGN

- Ensure that buildings provide accessible entrances for all in accordance with principles of universal design (ensuring ramps with correct design and inclination (10%), tactile features, etc.).
- Buildings with 5 storeys or above are required to have well dimensioned elevators to guarantee access to disabled people and wheelchairs.
- In lower buildings, universal access must be provided in apartments on the ground floor.
- Public buildings and social facilities should follow accessibility regulations.
- To ensure convenient and safe circulation, universal access should be provided to all elements of the block and adjacent spaces, such as internal courtyards, semi-private community gardens, parking spaces, etc.

B.1.9
STRENGTHEN THE STREET-BUILDING INTERFACE

Use architectural elements such as canopies, arcades and building setbacks to provide protection from weather conditions and to allow street spaces to remain uncluttered.

This should be combined with adequate frontage designs that foster indoor-outdoor relationships between buildings and streets, and allow people to maintain visual connection to the sidewalk. A strong street interface creates a lively public realm and supports local businesses and economy **(Fig.72).**

Fig 75. Street arcade
Source: https://www.expedia.com/Padova.dx180616?-gallery-dialog=gallery-open

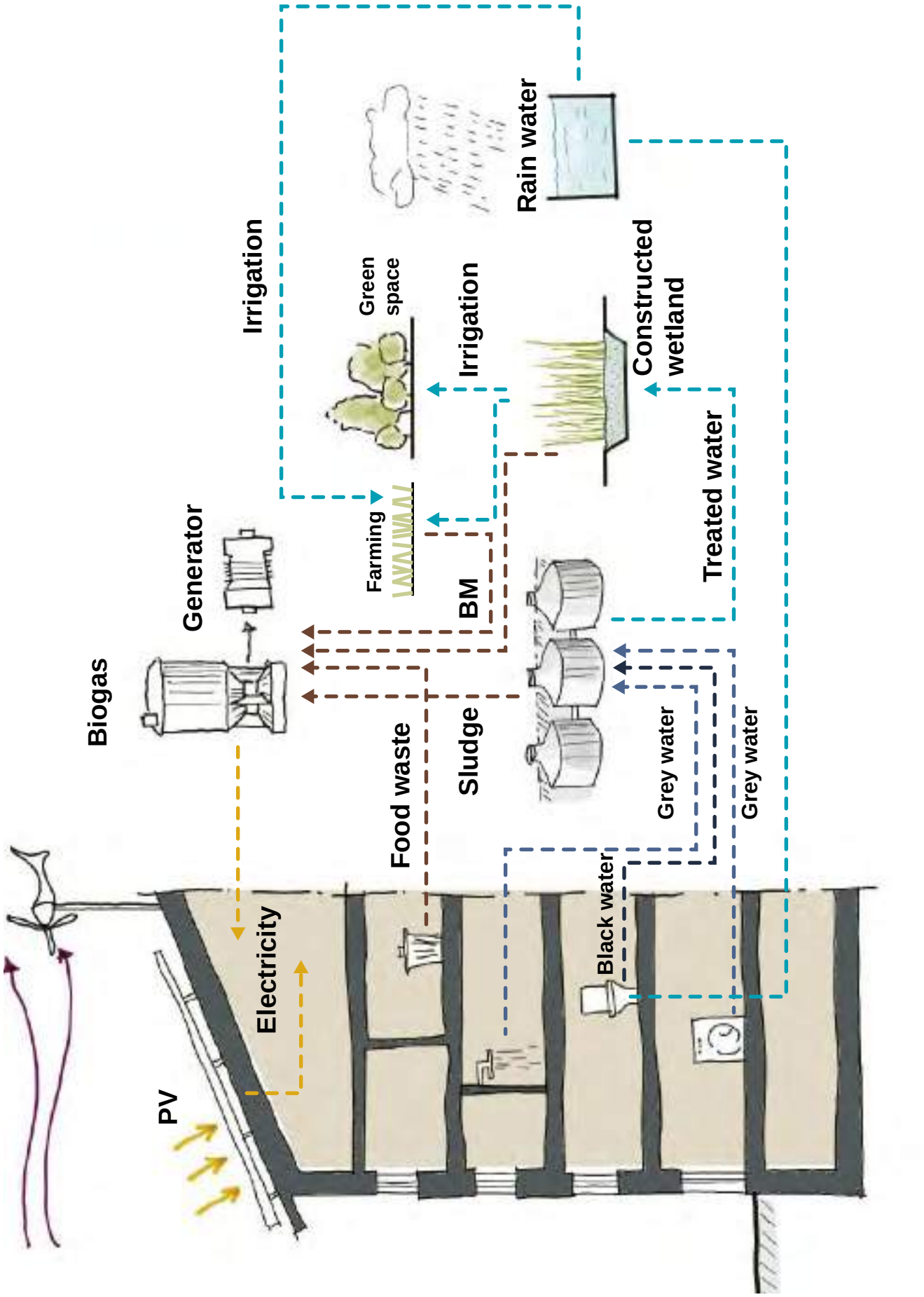

Fig 76. Integrated green solutions in architectural design, UN-Habitat, 2023

B.1.10
PROMOTE ROOFSCAPE STRATEGIES

Roof features, including colours, materials, and inclination angle, have a strong impact on the visual identity of the city. Currently, Khorog lacks a homogeneous and legible roofscape, which leads to a patchwork of inconsistent materials, colours and designs.

It is therefore recommended to develop strategies that promote roof designs and features that reflect the culture and construction traditions in Khorog.

Roof designs should also be regulated to provide maximum durability, wind and earthquake resistance, and prevent falling ice, snow and rainwater onto entrances and walkways.

The introduction of green roofs, where suitable, can ensure adaptation to climate change in urban areas and facilitate reducing urban heat islands. The Tajik legislation already incorporates provisions on green roof design and management, taking into account structural requirements of buildings and roofs.

B.1.11
PROMOTE HIGH-QUALITY URBAN & ARCHITECTURAL DESIGN

Promoting high-quality urban design and creative architecture is not only the task of planners and architects, but of the community as a whole.

Strategies that incentivise developers and individuals to invest in innovation and modern interpretations of Pamiri architecture should be developed and integrated in the city's development policy.

Provide room for experimentation and innovation with architectural styles and materials that take into consideration the local context.

For instance, the city can establish schemes to provide land to cooperatives constituted of city's residents willing to collectively build multi-family houses based on competition between best project proposals in terms of their architectural design, sustainability and resilience concepts.

Cities such as Tübingen, Germany, have been using this to boost creativity and develop highly sustainable and creative neighbourhoods.

Furthermore, the city can provide support for research and innovation on the reinterpretation and adaptation of Khorog's traditional building techniques to the changing social and economic conditions of Khorog. Projects on Pamiri Architecture, for instance, can help preserving the cultural and spiritual meanings of traditional architecture.

B.1.12
PRESERVE KHOROG'S ARCHITECTURAL HERITAGE

Architectural heritage is a irreplaceable asset that needs to be preserved and highlighted as a fundamental element of Khorog's culture, history and identity.

Heritage sites and buildings with significant historical, aesthetic and cultural value should be registered, restored and preserved based on collaborative programs between the city and the owners.

Use Pamiri architectural styles and materials to reflect the unique character and cultural heritage of Khorog. This can promote a sense of belonging, preserve local culture and enhance the aesthetic quality of the built environment and contribute to economic development.

This can include incorporating local vernacular architecture to the new buildings as well as integrating modern uses in historic ones or integrating them in new development projects.

Old industrial sites can also be preserved and re-purposed to reflect the site's transformations through time and showcase its identity.

The development of historical buildings needs continual communication between the different stakeholders in order to succeed, places of dialogue should be established between architects, planners and the communities; designs should be available publicly.

Fig 77. Interior of a Pamiri house
https://shortwayround.smugmug.com/Travel/Tajikistan/i-2KnBcdn/A

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UN-HABITAT

Habitat Planning

Aga Khan Agency for Habitat

RESILIENT KHOROG 2035

Integrated Spatial Plan for Environmental and Socio-Economic Resilience
Khorog, Tajikistan

Khorog Urban Planning Rules

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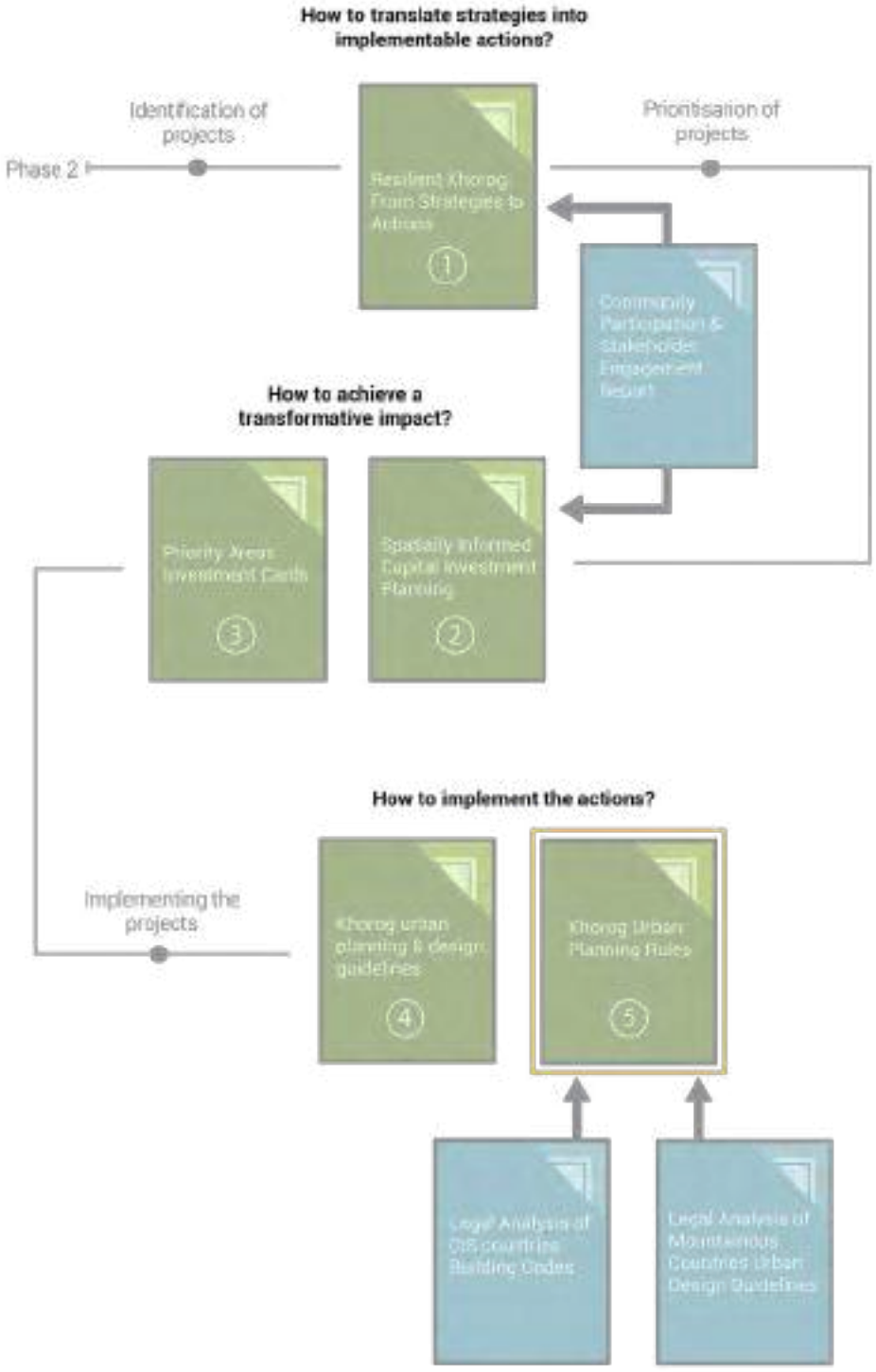


KHOROG

URBAN PLANNING RULES

Fig 1. View of Sharifobod and Nivodak Mahallas, UN-Habitat, September 2022

1

INTRODUCTION

1.1. INTEGRATED SPATIAL PLAN FOR ENVIRONMENTAL AND SOCIO-ECONOMIC RESILIENCE

UN-Habitat has partnered with the Aga Khan Agency for Habitat (AKAH) and the government of Tajikistan, through the Aga Khan Development Network (AKDN), to undertake the 'Integrated Spatial Plan for Environmental and Socio-Economic Resilience' in Khorog Tajikistan. UN-Habitat's Urban Planning and Design Lab (Urban Lab), in a collaborative process with other units and branches within the UN-Habitat Planning Finance and Economy Section and the Urban Practices Branch and with AKAH's Habitat Planning teams in Geneva and Tajikistan, aims to provide planning direction to improve resilience and social stability for existing communities and accommodate the increasing populations in Khorog in a sustainable way through:

1) developing strategies, masterplans, interventions, and regulations.
2) knowledge creation, capacity building, and guidelines.

More specifically, the project aims to provide environmental, legal, economic, spatial and infrastructure policies and projections, governance and management, recommendations for transformative projects, and planning and technical capacity building for stakeholders. The UN-Habitat, in concert with AKAH's Planning methods and advanced data collection and analysis, provide planning expertise, drawing on existing methodologies, toolkits, and best practices in a collaborative and integrated way to guide the growth of Khorog.

This project is one of several outcomes from an assessment of resiliency that was undertaken for Khorog in 2017 and 2018 by the Swiss State Secretariat for Economic Affairs (SECO) and Holinger, with partnerships from the international community that include the European Union for resilient infrastructure, the Government of Japan, the IFC and World Bank.

The work of UN-Habitat in collaboration with AKAH is part of The Khorog Urban Resilience Planning and Proof of Concept Initiative, supported by SECO to drive resilient infrastructure investment and access to basic public services, intended to reducing risk, ensure more reliable infrastructure and a safer environment. This will, in turn, improve economic growth and wellbeing. This project has been undertaken in parallel with other initiatives for Khorog, such as the EBRD and SECO funded phase 1 and 2 water infrastructure projects.

AKAH looks to UN-Habitat to support the Revised Town Planning process in a way that can ensure alignment of the town plan to UNDRR resilience principles and best practices. The integrated plan for environmental and socio-economic resilience in Khorog will integrate the disaster risk reduction approaches within the planning processes of identified projects.

1.2. REPORT ROLE & CONTEXT

The Khorog Urban Planning Rules (hereinafter referred to as "Rules", and/or "Document") have been developed to govern urban planning activities in Khorog, Tajikistan.

The Document outlines the fundamental prerequisites for urban design and growth within the city and pertains to both the creation of new edifices and the renovation of existing ones within the area. The Rules aim to enhance the city's resilience by setting a benchmark based on international best practices and standards applicable to the city's socio-economic context.

Furthermore, these Rules aim to set up precise goals and requirements on urban planning aspects in Khorog, while supporting developers, designers, urban planners, and local personnel in enhancing the city's sustainable urban development.

The document uses a specific colour coding with explanations to clearly understand which provisions are in line, defined differently, contradict Tajik's legislation, or are not covered by it. Also, the Document references the 2023 UN-Habitat Proposed Khorog Urban Design Guidelines (hereinafter referred to as "KUDG") as an innovative approach to conducting urban planning activities in mountainous cities, cites other UN-Habitat tools as well as mentions Aga Khan Development Network Green Building and Landscape Standards (hereinafter referred to as "AKDN Standards") to apply a holistic urban planning approach for Khorog.

Thus, the colour coding for the provisions is defined as follows:

COLOR CODING FOR THE PROVISIONS	
	In line with Tajik's legislation
	It is present in Tajik's legislation, though is defined differently
	Contradicts Tajik's legislation
	Not covered by Tajik's legislation
	Have already been updated using KUDG
	Have already been updated using UN-Habitat tools
	In line with AKDN Standards (Green Buildings or Landscaping)

The use of colour coding serves the purpose of informing the stakeholders (urban planners, legislators) of the origin of the provisions, i.e., whether they derive from Tajik's legislation or from international legal norms. This will allow them to discern which provisions are already enforceable, and which ones need amendments within the existing legislation.

Finally, the "Terminology", "References to Regulatory, and Technical Documents" and the "Article Text" columns serve as the base information for the Khorog Urban Planning Rules.

ARTICLE TEXT	CHANGES REQUIRED (NATIONAL LEGISLATION)	WORDING UNDER NATIONAL LEGISLATION	CHANGES REQUIRED (2021 DRAFT KHOROG URBAN PLANNING RULES)	AKDN STANDARDS	KUDG
TERMINOLOGY					
The Terms not specified in this document must be defined in accordance with the current urban planning-related documents of the Republic of Tajikistan, which include, among others, those referenced in the "Reference to Regulatory and Technical Documents" part of this document as well as in the Khorog Urban Design Guidelines, developed by UN-Habitat under the 2nd phase of the "Integrated Spatial Plan for Environmental and Socio-Economic Resilience, Khorog, Tajikistan" project.					
Communal Space (Garden) is a natural space managed by members of the local community where neighbours come together to plant flowers, fruit, vegetables, and herbs.			Not defined	N/A	No Information in KUDG
Density means intensity of people, jobs, housing units, total floor area of buildings, or some other measure of human occupation, activity, and development across a defined unit of area. In general terms, urban density describes the degree of concentration or compactness of people or development in a city.[i]	Defined differently under the Tajik legislation	According to the definition set in Annex 1 of the GNiP 30-01-2018: Building density is a characteristic of the degree of development of the territory of the functional zone, defined as the ratio of the built-up area to its total area, expressed as a percentage or the number of square meters of the area under buildings per hectare of the total area of the zone.	Not defined	N/A	In line with "Density" definition under KUDG (p.10)

i Hess, P. (2014). Density, Urban. In: Michalos, A.C. (eds) Encyclopedia of Quality of Life and Well-Being Research. Springer, Dordrecht. https://doi.org/10.1007/978-94-007-0753-5_698

External Expert is an individual or professional who has specialized knowledge, skills, or experience in a particular field or subject matter, but does not belong to any Mahalla or legal entity located in Khorog.	It is not covered by the **Tajik legislation**	Not defined	N/A	No Information in KUDG
Green Building is a structure that is designed, constructed, and operated in a manner that promotes sustainability, energy efficiency, resource conservation, and environmental responsibility.	It is not covered by the **Tajik legislation**	Not defined	N/A	There is a reference in KUDG, but not a specific definition
Green Roof is a roof which is partially or completely covered with a layer of growing medium, vegetation, and other vegetative structures and objects.	In line with the **SNiP 31-10-2021**	Not defined	N/A	There is a reference in KUDG, but not a specific definition
Local Flora, with regards to Khorog, this refers to the native plant species that naturally grow in the Pamir Region.	It is not covered by the **Tajik legislation**	Not defined	N/A	There is a reference in KUDG, but not a specific definition
Mixed-use development refers to development projects that comprise a range of compatible activities and land uses within the same area or building.	Adopted from **KUDG** The term is pending implementation into legislation by the **Tajik authorities**	Not defined	N/A	In line with *Mixed-use Development* definition under KUDG (p.11)
Naturally Hazardous Area in Khorog means a territory where any natural process that poses a potential threat to human life and property can take place. These could be for example rockfalls, landslides, avalanches, floods, earthquakes, and erosion.	Natural hazard forms a part of the "Emergency situation" term, defined under the 2004 Law on the Protection of the Territories from Natural and Man-Made Emergencies. The GNiP 30-01-2018 mentions that earthquakes, mudflows, floods, landslides, etc. form a part of "catastrophic natural phenomena" term. But, in general, the concept is not covered by the Tajik legislation	Not defined	N/A	No Information in KUDG

Parking spaces are designated areas where vehicles are parked or stored temporarily.	It is not covered by the **Tajik legislation**	Not defined	N/A	There is a reference in KUDG, but not a specific definition
Permeability means the extent to which an urban area enables/ allow for the movement of people by walking or cycling.[ii]	It is not covered by the **Tajik legislation**	Not defined	N/A	In line with *Permeability* definition under KUDG (p.11)
Pocket Park is a small outdoor space, size wise usually a few house plots or smaller, often located in urban areas surrounded by commercial buildings or houses, and with few public open spaces for people to gather and/or relax.	It is not covered by the **Tajik legislation.** Adopted from the **source**	Not defined	N/A	There is a reference in KUDG, but not a specific definition
Speed bump is a traffic calming device that is typically installed on roadways to reduce vehicle speeds and improve safety in specific areas.	It is not covered by **Tajik legislation**	Not defined	N/A	No Information in KUDG
The U-value, also known as thermal transmittance, is a measure of the rate of heat transfer through a material or assembly, typically expressed in units of watts per square meter per Kelvin (W/m^2K). It quantifies the amount of heat that passes through a structure, such as a wall, roof, or window, per unit area, per degree of temperature difference between the interior and exterior environments.	Specifically, the "U-value" definition is not defined in the **Tajik legislation**	Not defined	N/A	No Information in KUDG
Unstable soil means soil or ground conditions that lack stability, strength, or structural integrity, making them prone to movement, subsidence, or collapse.	It is not covered by the **Tajik legislation**	Not defined	N/A	There is a reference in KUDG ("to stabilize soil"), but not a specific definition

ii *National Transport Authority of Ireland. (n.d.). Permeability. Best Practice Guide. https://www.nationaltransport.ie/wp-content/uploads/2011/12/NTA_Permeability_Report_-_Web.08.20151.pdf*

Urban Gardening is a nature-based solution which takes place at communal spaces with the aim to supply fresh and healthy foods to urban dwellers, providing food security for the community and contributing to climate change mitigation and adaptation.[iii]	It is not covered by the **Tajik legislation**	Not defined	N/A	There is a reference in KUDG to "community gardening", but not a specific definition
Walkability is the extent to which the built environment supports and encourages walking by providing for pedestrian comfort and safety, connecting people with varied destinations within a reasonable time and effort, and offering visual interest in journeys throughout the network.[iv]	It is not covered by the **Tajik legislation**	Not defined	N/A	In line with "Walkability" definition under KUDG (p.12)
Working Group is a collaborative body formed by 12-15 local and external experts with the purpose of updating the detailed urban planning projects in Khorog.	It is not covered by the **Tajik legislation**	Not defined	N/A	No Information in KUDG

REFERENCES TO REGULATORY AND TECHNICAL DOCUMENTS

These Rules use references to the following regulatory and technical documents of Tajikistan:

AKDN Standards – Landscaping, Minimum Planning and Design Standards and Guidelines & Green Building Standards

GNiP 32-03-2012 – GNiP 32-03-2012 "Car Roads"

GNiP 35-01-2012 – GNiP "35-01-2012" Accessibility of Buildings and Constructions for People with Disabilities"

GNiP 23-03-2017 – GNiP 23-03-2017 "Lighting of Buildings, Constructions and Territories"

GNiP 30-01-2018 – GNiP 30-01-2018 "Urban Planning, Planning and Development of Settlements" of the Republic of Tajikistan

GNIP 31-01-2018 – GNIP 31-01-2018 "Residential Multi-Apartment Buildings"

KUDG – 2023 UN-Habitat Proposed Khorog Urban Design Guidelines

SNiP 2.05.03-84 – Russian SNiP 2.05.03-84 "Bridges and Pipes"[v]

SNiP RT 23-02-2021 – SNiP RT 23-02-2021 "Thermal Protection of Buildings"

SNiP 30-04-2021 – SNiP 30-04-2021 "Landscaping"

SNiP 31-10-2021 – SNiP 31-10-2021 "Roofs" 120.030.030.

Tajik Recommendations – Recommendations for the Development of Hilly Areas of the Republic of Tajikistan (2008)

TPC – 2012 Town Planning Code of the Republic of Tajikistan

iii *Cities and Regions Summit boosts nature and urban food solutions ahead of UN Environment Assembly. (n.d.). UN Environment. https://www.unep.org/news-and-stories/press-release/cities-and-regions-summit-boosts-nature-and-urban-food-solutions*

iv *UNEP. (n.d.). Chapter 5. Promote and celebrate walking and cycling. https://wedocs.unep.org/bitstream/handle/20.500.11822/40076/5_promote_walking.pdf?sequence=5*

v *Russian SNiP 2.05.03-84 "Bridges and Pipes" https://meganorm.ru/Data2/1/4294854/4294854744.pdf*

SECTION 1. GENERAL PROVISIONS					
CHAPTER 1. FIELD OF APPLICATION					
1.1 Development Basics These Khorog Urban Planning Rules (hereinafter referred to as "**Rules**", and/or "**Document**") are developed in accordance with the Article 29 of the Town Planning Code of the Republic of Tajikistan and other regulatory legal Acts. They also reference standards defined in 2023 UN-Habitat Proposed Khorog Urban Design Guidelines aiming to make the city compact, connected, inclusive, vibrant, and resilient considering the specifics of the mountainous terrain as well as AKDN Standards on Landscaping, Minimum Planning and Design, as well as on Green Building design to make urban planning in Khorog holistic.	This provision is in line with **Article 29** of the **TPC***	**Article 29** of the **TPC**: *The Rules for Development establish the procedure for the implementation of urban planning activities in the relevant territories and in settlements.* *Building rules are developed based on urban planning documentation and urban planning regulations for each territory in accordance with the requirements of the legislation of the Republic of Tajikistan.*	N/A	N/A	N/A
1.2 Key Aim of These Rules These Rules outline the fundamental prerequisites for urban design and growth within Khorog. They pertain to both the creation of new buildings and the renovation of existing ones within the area. Their aim is to enhance the city's resilience by setting a benchmark for the expected standard. Also, they aim to set up precise goals and requirements about urban planning aspects in Khorog, while aiding developers, designers, and local personnel in enhancing the city's sustainable urban development.	In line with **paragraphs 1-2** of the **GNiP 30-01-2018** (though not the exact wording is used)	**Paragraphs 1-2** of the **GNiP 30-01-2018:** *1. These urban planning norms apply to the design and construction of new and reconstruction of existing settlements (settlements) and set up the basic requirements for the planning and development of their territories, as well as suburban areas.* *2. The requirements of these norms are obligatory for all subjects of architectural and town-planning activities that carry out design and construction throughout the territory of the Republic of Tajikistan, regardless of the form of ownership and subordination.*	N/A	N/A	
1.3 Scope of Application Subject to the provisions in this document, it is imperative to adhere to the pertinent Tajik legislation.	N/A	N/A	N/A	N/A	

SECTION 2. GENERAL REQUIREMENTS FOR PLANNING AND DEVELOPMENT IN KHOROG				
Planning in Khorog should provide: • optimal placement and interconnection of functional areas; • rational structuring of territories in conjunction with the system of public centres, engineering, and transport infrastructure; • creation of several types of urban environment that meet the needs of various groups of the population; • effective use of the territory; • consideration of architectural and urban planning traditions, natural, climatic, and other local features; • protection of the environment, historical and cultural monuments.	In line with **paragraph 25** of the **GNiP 30-01-2018**	Not defined	N/A	C.1_Urban Continuity and Compactness

<table>
<tr><th colspan="5">CHAPTER 2. ZONING REGULATIONS</th></tr>
<tr><td>2.1 Zoning in Khorog

Zoning in Khorog should be in accordance with section 2 “Functional Zoning” of the GNiP 30-01-2018.</td><td colspan="2">Section 2 “Functional Zoning” of the GNiP 30-01-2018</td><td>N/A</td><td>N/A</td></tr>
<tr><td rowspan="2">2.2 Zoning in the Naturally Hazardous Area

The zoning of Khorog should be undertaken with consideration to the occurrence of natural hazards.

In areas that are susceptible to rockfalls, landslides, avalanches, floods, as well as erosion-prone areas, the 30-meters setbacks should be set up to prevent or minimize the potential exposure to hazardous events. Such designated setback areas may be used for the development of promenades, green spaces, sport and leisure facilities, and similar amenities.

While developing earthquake prone areas, sites with less seismicity should be used for the construction of buildings utilizing Tajik building code 22-07-2015 “Seismic Resistance Construction” and paragraph B.1.4 Design Building to be Earthquake Resistance of KUDG.</td><td colspan="2">In line with KUDG</td><td rowspan="2">N/A</td><td rowspan="2">C.6.2_Include Special Regulations and Zoning in Hazard-Prone Areas

O.1.2_Use Green Spaces as Mitigation Buffer Zones in High-Risk Areas</td></tr>
<tr><td>In line with Notes of Section 2 “Functional Zoning” of the GNiP 30-01-2018</td><td>Notes of Section 2 “Functional Zoning” of the GNiP 30-01-2018:

“Zoning of the territory of settlements should be provided considering the likelihood of dangerous and catastrophic natural phenomena (earthquakes, mudflows, floods, landslides, etc.) and reducing the degree of risk and ensuring sustainable operation. Parks, gardens, outdoor sports grounds, and other undeveloped elements should be placed in areas with the greatest risk.

If there are maps of seismic microzoning, functional zoning of the territory should be provided on the basis of microzoning according to seismicity conditions. At the same time, areas with less seismicity should be used for buildings construction using Tajik building code 22-07-2015 “Seismic Resistance Construction”.”</td></tr>
</table>

<table>
<tr><th colspan="6">CHAPTER 3. GENERAL REQUIREMENTS TO THE RESIDENTIAL DEVELOPMENT IN KHOROG</th></tr>
<tr><td rowspan="3">3.1 Density
The building density must be in accordance with the following norms for urban settlement zones of Khorog:
• central – 200-250 p/ha
• middle – 150-200 p/ha
• peripheral – 100 p/ha
The density of residential development should be done in an efficient manner which means that when calculating it, it is necessary to consider the proximity to the location of the following territories:
• adjoining territories, including playgrounds for children, recreation for adults, physical education, household purposes;
• landscaped areas;
• sites of educational institutions;
• sites of establishments and service enterprises;
• transport services (roadways, parking lots, garages).
For ways to achieve efficient density, refer to paragraph C.2 Efficient and Controlled Density of KUDG.</td><td colspan="2">Density parameters are in line with
Annex 5 of the GNiP 30-01-2018</td><td rowspan="3">Not defined</td><td rowspan="3">N/A</td><td rowspan="3">C.2_
Efficient and Controlled Density
C.2.1_
Target Densities Starting from 150 p/ha when Suitable</td></tr>
<tr><td>In line with Paragraph 62 of the GNiP 30-01-2018</td><td>Paragraph 62 of the GNiP 30-01-2018:
When designing structural and planning elements of residential areas, indicators of the density of residential development should consider, in addition to residential buildings, the location of the following areas:
• adjoining territories, including playgrounds for children, recreation for adults, physical education, household purposes;
• landscaped areas;
• sites of educational institutions;
• sites of establishments and service enterprises;
• transport services (roadways, parking lots, garages).</td></tr>
<tr><td>In line with KUDG</td></tr>
<tr><td>3.1.1 Density Limitations
Considering the rugged topography of Khorog, which has a direct impact on the delineation of safe and at-risk zones, densification should occur solely in the safe areas of Khorog.</td><td colspan="2">In line with KUDG
Not defined in Tajik legislation</td><td>Not defined</td><td>N/A</td><td>C.2.2_
Prioritize Densification in Defined Safe Areas for Development</td></tr>
<tr><td>3.2 Development in Naturally Hazardous Areas
The aim of this provision is to restrict and govern the development in naturally hazardous parts of Khorog, as it poses a threat to the well-being, safety, welfare of its inhabitants, steep slopes, poor soils, avalanche chutes, floodplains, dense forest, and areas along fault lines.
Development in Naturally Hazardous Areas should be considered subject to zoning regulations defined in paragraph 2.2 of these Rules.</td><td>Not defined</td><td>Not defined</td><td>Not defined</td><td>N/A</td><td>C.6_Urban Resilience
C.6.1_Include Hazard Consideration in All Urban Projects
C.6.2_Include Special Regulations and Zoning in Hazard-Prone Areas</td></tr>
</table>

3.2.1 Steep Slopes It is hereby mandated that the following relief levels be considered and adhered to for distinct types of development and land usage in Khorog: **Flat Relief (0-3%):** a. This relief level is generally suitable for all types of development and usage within urban areas. b. Any proposed development or land usage should conform to this flat relief requirement. **Low Complexity Relief (3-9%):** a. This relief level is adequate for medium-density residential development, as well as industrial and institutional purposes. b. Urban development proposals for medium-density residential, industrial, or institutional projects must adhere to this relief range. **Medium Complexity Relief (5-9%):** a. This relief level is suitable for moderate to low density residential development. b. Extreme caution must be exercised when considering the placement of any commercial, industrial, or institutional activities within areas of medium complexity relief. **Great Complexity Relief (15-30%):** a. This relief level is exclusively chosen for low-density residential purposes. b. Limited agricultural and recreational uses may also be considered within areas of great complexity relief. **Extreme Complexity Relief (over 30%):** a. No residential, commercial, industrial, institutional, recreational or infrastructure constructions should be places at the extreme complexity relief. b. In some cases, and subject to evaluation, the development of public open spaces can take place on the extreme complexity relief.	In line with **KUDG** Generally, in line with **paragraph 3.14** of the **Tajik Recommendations**	**Paragraph 3.14** of the **Tajik Recommendations:** • **flat relief** – an average slope for the minimum size of the territory (up to 50 m) is up to **3% (up to 1.5°)** – there is no significant impact on the structural organization of the development and on the constructive solution of houses intended for flat areas; • **low complexity relief** – slightly hilly, with an average slope according to the minimum size of the territory (from 50 to 200 m) varying from **3 to 9% (from 1.5° to 5°)** – mainly affects the placement of buildings and their constructive solution basement parts; • **medium complexity relief** – an average slope for the minimum size of the territory (from 50 to 200 m) varying from **9 to 15% (from 5° to 9°)** - affects both the structural organization of functional zones and the organization of streets, road network and system of community centres; leads to a reduction in the distances between main streets and roads and the size of structural elements; in some cases, anti-landslide measures are necessary; • **great complexity relief** – an average slope for the minimum size of the territory (over 200 m) **from 15 to 30% (from 9° to 15°)** – requires a radical change in the functional organization of development, the predominant use of special types of buildings designed for placement on steep slopes, applications most cases of anti-landslide measures; • **extreme complexity relief** – an average slope of **more than 30% (more than 15°)** according to the minimum size of the territory (over 200 m) – at the stage of experimental design is not subject to development or is flattened.	Not defined	N/A	C.6_ Urban Resilience C.6.1_ Include Hazard Consideration in All Urban Projects C.6.2_ Include Special Regulations and Zoning in Hazard-Prone Areas

3.2.2 Unstable Soils No physical development, specific use, or subdivision shall be allowed on unstable soil in Khorog.	Not defined in the **Tajik legislation**	Not defined	N/A	C.6_Urban Resilience C.6.1_Include Hazard Consideration in All Urban Projects C.6.2_Include Special Regulations and Zoning in Hazard-Prone Areas
3.3 Mixed-Use Development A mixed-use development is encouraged In Khorog, to attract people of different socio-economic backgrounds, foster internal capacity for creating new industries, activities, and livelihoods. Furthermore, such type of development helps to minimize the greenhouse gas emissions by reducing motorized transport usage and later lowering of transport, costs as well as to achieve a more efficient use of space and buildings On the territory of mixed development, it is allowed to locate the following: residential and public buildings, scientific institutions, educational institutions, business facilities, industrial enterprises, small enterprises for the processing of agricultural raw materials, and other production facilities (site area should be no more than 5 hectares) with non-flammable and non-explosive industrial processes; not creating noise, vibration, electromagnetic and ionizing radiation, pollution of atmospheric air, surface, and ground waters exceeding the established norms that do not require the construction of sanitary protection zones with a width of more than 50 m, access railway lines, and also do not create a large flow of trucks (no more than 50 vehicles per day).	Mixed-use development is in line with **paragraphs 69/72** of the **GNiP 30-01-2018**	Not defined	N/A	C.3_ Local Economy C.3.1_Use Urban Design as a Driver for Economic Development C.3.2_ Promote Mixed-Use Development to Generate Employment and Improved Quality of Life C.8.2_Ensure that Services are distributed Equitable and Accessible to All Residents N.2.1_Reduce the Amount of Single Function Blocks in the Neighbourhood

Also, where possible, the total floor area distribution should be as follows: • 40-60% for retail/service use, • 30-50% for residential use, and • 10% for public facilities.	Not defined under the **Tajik legislation** In line with **KUDG**		Not Defined	N/A	B.1.6_Buildings Should Host Multiply Functions under the Same Roof
3.3.1 Vertical Zoning To generate significant vehicle traffic, promote the relationship of buildings to urban spaces, enhance the use of public space and pedestrian environment in general in Khorog, it is required to assign ground floor of residential buildings for shops, offices, crafts, services, etc. The list of enterprises located on the ground floor is subject to limitations set by **paragraph 18** of **GNIP 31-01-2018**. The clear height from the floor to the bottom of the load-bearing building structures and / or ceiling (including from the bottom of the suspended ceiling) of public premises located in residential buildings may be taken equal to at least 4.2 meters.	Possible placement of apartments on the ground floor is indirectly covered in **paragraph 68** of the **GNiP 30-01-2018.** **Paragraph 18** of the **GNIP 31-01-2018,** regarding **large and the largest cities**, promote the public facilities on the ground floor not listed there.	**Paragraph 68** of the **GNiP 30-01-2018:** *Residential buildings with apartments on the first floors should be located away from red lines.* **Paragraph 18** of the **GNiP 31-01-2018**: *The following facilities are not allowed:* • *specialized stores of mosquito-chemical and other goods, the operation of which may lead to pollution of the territory and air of residential buildings; stores with the presence of explosive substances and materials therein; shops selling synthetic carpets, auto parts, tires and motor oils;* • *specialized fish shops; warehouses for any purpose, including wholesale (or small wholesale) trade;* • *all enterprises, as well as shops which work after 11 pm; consumer service establishments that use flammable substances (except for hairdressers and watch repair shops with a total area of up to 300 m²), baths and saunas (except for individual saunas in apartments and saunas with no more than 5 seats);* • *catering and leisure establishments with more than 50 seats, with a total area of more than 250 m² and with musical accompaniment;* • *laundries and dry cleaners (except for reception points, mini-laundries, and self-service laundries with a capacity of up to 75 kg per shift); automatic telephone exchanges with a total area of more than 100 m; public restrooms; funeral homes; built-in and attached transformer substations;* • *industrial premises (except for premises of "Б" and "Д" categories for the work of disabled people and older people, including: points for issuing work to do at home, workshops for assembly and decorative work); dental laboratories (except for dental offices), clinical diagnostic and bacteriological laboratories; dispensaries of all types; day hospitals of dispensaries and hospitals of private clinics; trauma centres, substations for emergency and emergency medical care: dermatovenerological, psychiatric, infectious diseases, and physiatry rooms for medical appointments; departments (rooms) of magnetic resonance imaging; x-ray rooms, as well as rooms with medical or diagnostic equipment and installations that are sources of ionizing radiation, veterinary*	Not defined	N/A	S.1.2_Promote Active Frontage on the Ground Floor or in Allocated Places Within the Identified Nodes

CHAPTER 4. STREETS				
4.1 Streets Categories The choice of category and the network of streets and roads of Khorog should be designed as a planned and ordered system of subordinate streets and roads of various functional purposes in accordance with **Annex 23** of the **GNiP 30-01-2018.** The mentioned categories of streets should optimize connectivity and maximize accessibility to all areas of Khorog. To achieve this, the city should, among others, be designed with bridges to encourage the continuation of movement by vehicles, pedestrians, cyclists.	In line with **paragraph 177** of the **GNiP 30-01-2018**	Not defined	N/A	C.4_Efficient Connectivity S.1_Active & Multimodal Streets S.1.1_Promote the Design of Multi Modal Streets
	The part about installation of bridges is generally defined under the **GNiP 32-03-2012** and the **SNiP 2.05.03-84**	Not defined		
4.2 Street Pattern Within the boundaries of Khorog, city roads should be laid through the undeveloped area, bypassing residential areas, public centres, recreation areas, zones of protection of territories of historical and cultural values, zones of sanitary protection of natural ecosystems, using the terrain as a natural barrier to the spread of noise (cuts, ravines, etc.) in a way to follow the contours of the natural terrain.	In line with **paragraph 178** of the **GNiP 30-01-2018**	Not defined	N/A	
	In line with **KUDG**			
4.3 Streets Parameters Design parameters of streets and roads of Khorog should be constructed following **Annex 24** of **GNiP 30-01-2018.**	In line with **paragraph 179** of the **GNiP 30-01-2018**	Not defined	N/A	N/A
4.4 General Street Accessibility Options The local streets should be equipped with ramps and stairs that improve the street network. Paragraphs 4.8 and 4.9 should apply here as well.	It is not covered by the **Tajik legislation**	Not defined	N/A	S.3_Inclusive & Safe Streets

4.5. Street Lighting When designing lighting for pedestrian streets, squares, and sidewalks, and placing lighting elements, both the visibility at night and daytime, and the safety of pedestrians, cyclists, and users of personal mobility equipment, should be ensured. When placing lighting elements, the maximum height of the stands for lighting should be determined by the lighting calculation; it is necessary to use low voltage and energy-efficient lamps that do not pollute the atmosphere (including those powered by solar panels). It is not recommended to use bare lamps and neon tube lighting. To illuminate the territory of pedestrian streets, squares, sidewalks, it is recommended to use calming and soothing, predominantly warm colour with automatic lighting controls to match the external daylight conditions. The placement of lighting fixtures on supports should be in accordance with regulatory requirements. It is necessary to provide the following types of lighting for pedestrian streets, squares, sidewalks, as well as other landscaping objects: • lighting focused on the main pedestrian and bicycle paths, squares; • illumination of the area of pedestrian esplanades; • additional lighting near transport intersections, at intersections of traffic and pedestrians, at public transport stops, in shaded places; • decorative lighting – architectural illumination of building facades, illumination of small architectural forms and other landscaping elements (paving, green spaces, advertising structures).	In line with **paragraph 26** of the **SNiP 30-04-2021**	Not defined	N/A	S.3.2_Enhance Safety Through Adequate Street Design
	Recommendation not to use specific lighting is not defined under the **Tajik legislation.** This provision is adopted from **Fernie (Canada) Document**	Not defined	In line with **subparagraph 6.2.1** of **paragraph 6.2** of **AKDN Standards (Lighting)**	

4.5.2 Normative Standards of Street Lighting The standards for street and road lighting in urban areas with consistent traffic and asphalt concrete pavement should be based on the specifications provided in **Table 13** of the **GNiP 23-03-2017**.	In line with **Table 13** of the **GNiP 23-03-2017.**		Not defined	Not defined	S.3.2_Enhance Safety Through Adequate Street Design
4.5.2.1 Street Lighting during Nighttime It is allowed to reduce the level of outdoor lighting at night of streets, roads, and squares in Khorog with a normalized average brightness of more than 0.8 cd/m^2 or an average illumination of more than 15 lux: • by 30% with a decrease in traffic intensity to 1/3 of the maximum value; • by 50% with a decrease in traffic intensity to 1/5 of the maximum value. It is not allowed to partially turn off the luminaires at night when they are arranged in a single row and one luminaire is installed on a support, as well as on pedestrian bridges, parking lots, pedestrian alleys and roads, internal, service, and economic and fire passages, as well as on streets and rural settlements roads.	In line with **paragraphs 75-76** of the **GNiP 23-03-2017**		Not defined	Not defined	
4.6 Structural Elements that Provide for the Comfort of Use, Safety and Security To create a safe environment in Khorog, the informative signage and traffic calming measures (speed humps) should be installed.	In line with **paragraph 66** of the **SNiP 30-04-2021.** Adopted from **Banff (Canada) Document.**	**Paragraph 66** of the **SNiP 30-04-2021:** *Elements of outdoor advertising, information and navigation should be placed along streets and roads, footpaths, on sites and in recreation areas for orientation in the urban environment. Lighting means of outdoor advertising, information and navigation should be used as an additional means for orienting pedestrians. The choice of installation sites for outdoor advertising, information and navigation means should ensure their visibility and unhindered pedestrian traffic. The composition of the means of outdoor advertising, information and navigation should include signs, steles, electronic displays, banners, information stands, markings.* In line with **paragraph 6.3** of **AKDN Standards (Landscaping)**	Not defined	N/A	
4.6.1 Signage Khorog should be equipped with clear and understandable signage placed along streets and roads, footpaths, on sites and in recreation areas for orientation in the urban environment. They shall be coordinated with the design of the building and site in terms of location, scale, materials, finishes and colours. The signage must guarantee unobstructed pedestrian traffic and visibility, offer unequivocal directions to diverse areas encompassing pedestrian paths, activity spaces, social interaction areas, and further serve to enhance awareness. Signs shall be kept to the minimum size and number needed to inform and direct visitors and residents. Lighting of all signs should be minimized, and indirect front-lit signs are encouraged wherever possible.					

4.6.2 Traffic Calming Measures On residential local streets, in front of educational facilities (universities, schools, kindergartens), speed humps with a minimum of 2.5 cm in height and a maximum of 10 cm should be installed.	It is not covered by the **Tajik legislation.** Adopted from the **Analysis**	Not defined	N/A	S.3.2_Enhance Safety Through Adequate Street Design
4.7 Street Permeability To maximize accessibility to all city areas, streets and roads in Khorog should be arranged on undeveloped territory, bypassing residential areas, public centers, recreation areas, protection zones of territories of historical and cultural values, zones of sanitary protection of natural ecosystems, using the terrain as a natural barrier to the spread of noise.	In line with **paragraph 178** of the **GNiP 30-01-2018**			
	In line with **KUDG**			C.4_ Efficient Connectivity
4.7.1 Dead Ends The design of the connectivity of the streets and roads of Khorog should take place in such a way as to avoid the creation of dead ends. If dead ends cannot be avoided, then at the end of their carriageways, it is necessary to arrange spaces with islands of 16 m diameter for turning cars and of at least 30 m when organizing a final point for turning public passenger transport.	In line with **paragraph 189** of the **GNiP 30-01-2018**	Not defined	N/A	C.4.1_Efficient Territorial Connectivity C.4.2_Maximize Road Connectivity
	In line with **KUDG**			

4.7.2 Pedestrian Crossings Khorog should be equipped with comfortable, direct and intuitive pedestrian crossings to facilitate pedestrian movement. On the main streets within the built-up area, it is necessary to provide pedestrian crossings equipped with ramps at an interval of 200-300 m.	In line with **paragraph 180** of the **GNiP 30-01-2018** Adopted using **KUDG**	Not defined	N/A	S.3.1_Prioritize Pedestrian Non-Motorized Mobility S.3.2_Enhance Safety Through Adequate Street Design
4.7.2.1 Lighting of Pedestrian Crossings Pedestrian crossings should provide people with a safe crossing of the carriageway and the ability to see obstacles and defects in the road surface. To warn drivers and pedestrians, it is recommended to use lighting of a different colour in the crossing area. The recommended average horizontal illumination levels for pedestrian crossings should be based on the values presented in **Table 16** of **GNiP 23-03-2017.**	In line with **paragraph 86** and **Table 16** of the **GNiP 23-03-2017**			
4.7.2.2 Pedestrian Crossings for People with Disabilities It is recommended to mark with yellow colour the traffic routes for pedestrians and people with limited mobility using wheelchairs. It is recommended to mark the axial strips with dotted lines, and the edge strips with solid lines.	In line with **paragraph 43** of the **GNiP 35-01-2012**			
4.8 Sidewalks Residential, mixed, public and landscape-recreational areas of Khorog should be provided with a continuous network of well-maintained sidewalks and zones, which includes sidewalks of streets, roads and driveways, footpaths on inter-street and inside object territories, alleys, boulevards, pedestrian streets and squares, ground and pedestrian crossings through transport routes, rivers, ravines, etc.	In line with **paragraph 204-205** of the **GNiP 30-01-2018**			

The organization of sidewalks should be formed considering the possibility of movement of persons with disabilities, people using wheelchairs, the elderly, children, other physically impaired people, citizens with baby carriages to the entrances of all residential and public buildings, to recreation areas, tourism and sports facilities. Pedestrian paths on inter-main areas should connect all the main objects and nodes of mass gravity of the population in the shortest directions.	In line with **paragraph 204-205** of the **GNiP 30-01-2018**	Not defined	N/A	S.3.1_Prioritize Pedestrian Non-Motorized Mobility
Stairs on footpaths should be duplicated by ramps, or duplicating pedestrian paths should be arranged, while the increase in travel distance in comparison with the shortest path should be no more than 1.3 times. With a lift height of more than 3 m, instead of a ramp, a duplicate path can be arranged.	In line with **paragraph 207** of the **GNiP 30-01-2018**			
4.8.1 Width of Sidewalks Sidewalks should be convenient for all street users and compatible with the character of the streets, providing space for walking, cycling, stopping, socializing, resting, turning around in a wheelchair. Their width should be considered according to the calculation, but not less than that specified in **Annex 24** of **GNiP 30-01-2018.**	In line with **KUDG**	Not defined	N/A	S.3.2_Enhance Safety Through Adequate Street Design
	In line with **paragraphs 177** and **209** of the **GNiP 30-01-2018**			
Elements of buildings that are situated adjacent to sidewalks and footpaths, such as canopies, consoles, installations, equipment, etc., along with urban equipment and the lower sections of tree crowns, should be elevated to a minimum of 2.5 meters above the pedestrian surface, which is the equivalent height of the pedestrian spatial module.	Adopted from the **Analysis (North Macedonian Document).** In Tajikistan, the applicable standard regarding the tree crowns is 2.1 m (**paragraph 205** of the **GNiP 30.04.2021**)	Not defined	N/A	

4.9 Accessibility for People with Disabilities Driveways, sidewalks, footpaths, and platforms shall adhere to safety conditions prescribed for persons with disabilities, physically challenged individuals, adults with prams, and other individuals with limited mobility. The paths designated for persons with disabilities shall be demarcated with road markings; it should include tactile-contrasting indicators and informative elements about the object not less than 0.8 m before such an object. If paths have the slope 3-6%, it is necessary to arrange horizontal sections at least 5 m long at least every 100 m. To ensure the safety of the movement of people with disabilities, the pavement of sidewalks, footpaths, ramps, and stairs, the use of bulk or coarse-grained materials is not allowed. They must be covered with solid, durable materials that do not allow slipping static, which coefficient of friction ranges from 0.5 (for walking surfaces) to 0.8 (for ramps) e.g. carpet, rubber, sheet or tiles, sheet vinyl and non-slip granules. The coating of concrete slabs and paving stones should have a joint thickness of not more than 0.01 m. With regards to the ramps, their slope should be 8% (1:12), their width – 1.5 m and they need to be equipped with two handrails. With a difference in floor heights on the paths of 0.2 m or less, it is allowed to increase the slope of the ramp up to 10%. In exceptional cases, it is allowed to provide screw ramps.	In line with **paragraphs 64-65** of the **SNiP 30-04-2021, paragraph 144** of the **GNiP 30-01-2018** and **paragraph 35** of the **GNiP 35-01-2012** Provision about the paths of 3-6% of slope is in line with **paragraph 188** of the **GNiP 30-01-2018** Ramps standards are defined in accordance with **KUDG** Ramps standards are in line with **paragraph 89** of the **GNiP 35-01-2012** **Paragraph 27** of the **GNiP 35-01-2012** defines materials that should not be used for pavement of sidewalks, footpaths, ramps, and stairs coverings. List of non-slipping materials and the coefficient is not defined under the **Tajik legislation**. Adopted from **1991 ADA Accessibility Guidelines (USA)** and **British Columbia (Canada) Document** Joint thickness standard under **paragraph 65** of the **GNiP 30-04-2021** is 0.01 m while under **paragraph 27** of the **GNiP 35-01-2012** it is 0.015 cm. **Paragraph 188** of the **GNiP 30-01-2018** defines that steep (more than 10%) short ramps, as well as longitudinal slopes of sidewalks and pedestrian roads of more than 5% are not allowed.	Not defined	Accessibility Considerations are addressed in **paragraph 5.3** of **AKDN Standards (Landscaping)**	S.3.4_Provide Innovative Solutions to Enhance Pedestrian Access, Especially for People with Limited Mobility

4.10 Cycling Lanes To promote cycling in Khorog, it is necessary to envisage a cycling infrastructure consisting of dedicated cycling lanes and parking spaces therefor.	**Paragraph 191** of the **GNiP 30-01-2018** specifies that cycling lanes should be established only if the traffic intensity is more than 50 bicycles per hour	Not defined	N/A	S.2.4_Integrate Safe Bike Lanes in Street Design S.1.1_Promote the Design of Multi Modal Streets
4.10.1 Typologies of Cycling Lanes Cycling lanes should be established: • **along low-traffic streets** aiming to create interconnected cycling environment between zones of residence, landscape and recreational areas, and the city center. Such cycling lanes should: o form a part of a street profile, be at road level and be specifically marked with a horizontal line, or o be located next to the carriageway, be at the level of the sidewalk (raised by 15 cm), and be specially marked with a horizontal line, or o be independent parts of the street profile, located between the carriageway and the sidewalk, with or without any fence (including green one) separating them. • **inside landscape and recreational areas.** While designing cycling lanes, streets with unfavorable slopes should be avoided. The maximum longitudinal slope of the cycling path should be 10%.	Types of cycling lanes are differently defined under the **Tajik legislation (separate** and **isolated)** Topic of unfavorable slopes is not covered by the **Tajik legislation** 30% and 40% are defined as standards for longitudinal slope under **Annex 24** of the **GNiP 30-01-2018**			

4.10.2 Parameters of the Cycling Lanes Along Low-Traffic Streets Parameters of the cycling lanes along low-traffic streets should be at least 1.2 m when driving in the direction of the traffic flow and at least 1.5 m when driving oncoming traffic. The width of the cycle lane arranged along the sidewalk must be at least 1 m.	Width of bicycle lanes is in line with **paragraph 192** of the **GNiP 30-01-2018**	Not defined	N/A	S.2.4_Integrate Safe Bike Lanes in Street Design S.1.1_Promote the Design of Multi Modal Streets
4.10.3 Parameters of the Cycling Lanes inside Landscape and Recreational Areas Parameters of the cycling lanes inside landscape and recreational areas should be at least 1.5 m.	It is not covered by the **Tajik legislation**			
4.10.4 Cycling Lane Surface It is recommended that bicycle paths are surfaced with materials that have been treated with binders, such as crushed stone, gravel, broken bricks, burnt rocks, and slag. If these materials are not available, a feasibility study should be conducted to determine if asphalt concrete or cement concrete could be used as suitable alternatives. Surface connection elements must be provided at the intersections of cycling lane markings. It is advisable to visually and tactilely highlight bike lanes using colour and/or different textured coatings. For operation in the evening, in addition to reflective marking elements, it is possible to arrange LED lighting.	In line with the **SNiP 30-04-2021** and the **GNiP 32-02-2012 (paragraph 152)**			

4.10.5 Parking Spaces for Bicycles In case of arranging bicycle parking space at the surface parking defined under paragraph 4.11, such one parking space for bicycles should be arranged for every 5 vehicle spaces required and be in a clearly designated, safe and convenient location. A safe parking location is defined as a location whereby activity around bicycle parking is easily observable, conveniently located to the bicyclist's destination, and adequately separated from motor vehicles and pedestrians. Surfaces around bicycle parking facilities shall be maintained, snow, mud, and dust free. When placing bicycle parking space along the sidewalks, they should be of the following parameters: • 0.8 m for placing one bicycle along the sidewalk; • 1.2 m for placing two bicycles (parallel) along the sidewalk; and • 1.8 m for placing the bicycles transversely on the pavement.	It is not covered by the **Tajik legislation**. Standards for parking spaces are adopted from the **North Macedonian Document**	Not Defined	N/A	S.2.4_Integrate Safe Bike Lanes in Street Design S.1.1_Promote the Design of Multi Modal Streets

4.11 Parking Space Parking space is a rectangular area that serves for the parking or idling of a motor vehicle with dimensions, space for access and maneuvering. It is located at an access road, underground or ramp that correspond to the relevant dimensions of the vehicle.	Definition is not provided by the **Tajik legislation.** Adopted from the **Analysis**	Definition from **paragraph 1** of the **GNiP 30-01-2018:** *Parking for cars is a building, construction (part of a building, structures), parking (multi-level parking) or especially open area intended for storage (parking) of cars* Underground parking is in line with **paragraph 83** of **Draft Khorog Urban Planning Rules**	Not defined	N/A	S.1.1_Promote the Design of Multi Modal Streets
4.11.1 Types of Parking Space On the territory of Khorog, considering the mountainous terrain and limited areas, the following types of parking spaces could be arranged: • on-street parking (short-term parking); • surface parking (in the open air or in public or private buildings either); • tuck-under parking (basements in the public space); • underground parking; • garages. The abovementioned types of parking spaces are applicable to: • cars; • motorcycles, motorbikes; • minibuses, buses. Moreover, at the entrances and exits from Khorog, it is necessary to equip on-street parking spaces for trucks and road trains. Dimension of such parking space should be regarded in accordance with paragraph 4.11.3. Illegal construction of parking spaces is not allowed.	Defined differently under the **Tajik legislation.** First three types of parking are adopted from **Jackson Document** Tajik legislation does not provide for establishment of separate parking spaces on entrances/exits to/from the city, though dimensions for trucks and road trains are adopted from **paragraph 220** of the **GNiP 30-01-2018**	Topic of illegal construction of parking is in line with **paragraph 152** of the **Draft Khorog Urban Planning Rules**			

4.11.2 Parking Spaces Elements On-street and surface parking space should be paved which shall include landscaped islands to avoid large expanses of asphalt and shall be screened from off-site, or their view substantially filtered by vegetation. Landscaping elements should be selected considering the safety of using parking spaces (including maintaining visibility), to increase the shading area, eliminate the likelihood of trees falling, damage to coatings by roots, pollution of cars with fruits, branches, etc. For shading parking lots, if there is a justification for the effectiveness and safety of use, it is allowed to use light-coloured awnings or canopies, installations with solar panels. Parking lots should be equipped with an off-site snow repository (2.5% of the total lot) and adequate drainage of the snow storage area to accommodate snowmelt. Each of them should be sensitive to the natural terrain and landscape. Access to parking spaces must be easy in all seasons.	Topic of vast expense of parking spaces avoidance is in line with **KUDG** Not defined under the **Tajik legislation.** Adopted from **Jackson Document** Landscaping of parking spaces is in line with **paragraph 227** of the **SNiP 30-04-2021** Drainage elements as mentioned in this provision are not defined under the **Tajik legislation.** Adopted from **Jackson Document**	Not defined	N/A	S.1.1_Promote the Design of Multi Modal Streets
4.11.3 Parking Space Dimensions The minimum dimensions of the parking space for the following vehicles categories should be: • for passenger vehicle – 2.5 x 5.5 m • for trucks – 3 x 8 m • for road trains – 3.5 x 20 m • for tourist buses – 3.5 x 15 m	In line with **paragraph 220** of the **GNiP 30-01-2018**			

4.11.4 The maximum distance of a pedestrian passage to a parking space should be considered with regards to **Annex 30** of **GNiP 30-01-2018.**	In line with **Annex 30** of the **GNiP 30-01-2018**	Not Defined	N/A	S.1.1_Promote the Design of Multi Modal Streets
4.11.5 Amount of Parking Spaces The minimum number of parking spaces must be considered with regards to **Annex 31** of **GNIP RT 30-01-2018** considering provisions of paragraph 4.11.2.	In line with **Annex 31** of the **GNiP 30-01-2018**			
The amount of parking spaces should not be reduced unless designated historic properties, cultural community centers unable to contain the number of parking spaces due to the existence of a historic resource.	Not defined under the **Tajik legislation.** Adopted from the **Analysis**			
4.11.6 Accessibility of Parking Spaces The parking space should be arranged at the same level as the sidewalk. In case the parking space is not arranged at the same level, refer to paragraph 4.12.2 to define the standards.	Not defined under the **Tajik legislation.** Adopted from the **North Macedonian Document**			
4.1.7 Parking on primary roads outside the areas provided for this purpose is prohibited.	Not defined under the **Tajik legislation.** Adopted from the **Charrat, Conthey, Monthey,** and **Saxon Documents**			
4.12 Parking Spaces for People with Disabilities At parking spaces located within the residential areas of Khorog, as well as near such other facilities and buildings of cultural and community services, trade, sports, catering, places of employment etc., it is necessary to allocate places for personal vehicles of people with disabilities. The minimum number of such places should be taken at the rate of 4%, but not less than one place with a total number of places up to 100.	In line with **paragraph 212** of the **GNiP 30-01-2018**			

4.12.1 Amount of Parking Spaces for People with Disabilities Near Medical Facilities Near facilities, servicing people with disabilities (e.g., hospitals, medical and recreation institutions, etc.), it is necessary to allocate at least 10% of places (but not less than one place) for personal vehicles of people with disabilities.	In line with **paragraph 213** of the **GNiP 30-01-2018** and **paragraph 41** of the **GNiP 35-01-2012**	Not Defined	N/A	S.1.1_Promote the Design of Multi Modal Streets
4.12.2 Location of Parking Spaces for People with Disabilities Parking spaces for people with disabilities should be located no more than 50 m from the entrances of nearby buildings (100 m from the residential buildings) and at the same level as a sidewalk or an accessible footpath next to it. In case they are not arranged at the same level as the sidewalk or an accessible footpath next to it, then the exit from the parking space should be provided along the sidewalk or ramp with a slope of not more than 5%, and in exceptional cases with a maximum slope of up to 8% and a minimum width of 1.4 m.	50 m standard is in line with **paragraph 213** of the **GNiP 30-01-2018** and **paragraph 42** of the **GNiP 35-01-2012** It is not covered by the **Tajik legislation.** Adopted from the **North Macedonian Document**			
4.12.3 Dimension of Parking Spaces The minimum dimensions of the parking space for the person with disabilities should be 3.5 m in width and 5.5 m in length.	In line with **paragraph 220** of the **GNiP 30-01-2018**			
4.12.4 Marking of Parking Spaces for People with Disabilities Parking spaces for people with disabilities should be marked with markings and a Disabled Parking Sign.	It is not covered by the **Tajik legislation.** Adopted from the **Fernie Document**			

4.13 Public Transport The transport infrastructure of Khorog should be formed as a unified communication system and with the aim at supporting other sustainable mobility options (cycling, walking, etc.).	In line with **paragraph 168** of the **GNiP 30-01-2018**	Not defined	N/A	
Public transport system of Khorog should be designed in a way to serve all city areas, especially socially and economically vulnerable ones.	In line with **KUDG**			S.1.1_Promote the Design of Multi Modal Streets C.5_Efficient Public Transport C.5.1_Design Public Transport Systems to Serve All City Areas, Especially Socially and Economically Vulnerable Ones C.5.3_Make Public Transport System, Support Other Non-Motorized Mobility Options
4.13.1 Types of Public Transport Among the types of public transport, the following are defined in Khorog: • buses • minibuses • taxis Such public transport typologies should be adapted to the natural specificities (narrow and curved roads) as well as the social and economic conditions of Khorog. Where possible, compact e-vehicles should be utilized.	It is not covered by the **Tajik legislation**. Defined according to **general knowledge.**			C.5.4_Design Public Transport System as a Driver for Economic Development C.5.5_Adapt Public Transport Systems to the Local Natural and Social Conditions

4.13.2 Public Transport Stops Public transportation stops must be situated within a reasonable walking distance that can be covered for 5 to 15 minutes.	In line with **KUDG**	Not Defined	N/A	C.5.2_Optimise Transit Timetables and Bus-Stops
4.13.2.1 Specifics of Public Transport Stops Public transport stops should be accessible for all citizens of Khorog and equipped with ramps (10%). They should be equipped with shelters that protect users from sun, wind, and rain as well as furnished with seating or places to lean.	Differently defined in the **Tajik legislation**. Adopted from the **Analysis**			
4.13.3 Bus stations and terminals for suburban bus routes should be in the central zone close to the shopping centers.	In line with **paragraph 171** of the **GNiP 30-01-2018**			
CHAPTER 5. LANDSCAPE AND RECREATIONAL AREAS				
5.1 This Chapter governs the open public spaces concept, defined in the legislative norms of the Republic of Tajikistan as "landscape and recreational areas." Further, the Rules will refer to the open public space category as **"landscape and recreational areas"** to follow the coherent nature of Tajik legislation.	In line with the **GNiP 30-01-2018**	Not defined	N/A	C.3_Neighborhood Development Resilience C.6.4_Use Nature-Based Solutions to Enhance the City's Social and Environmental O.1.1_ Design Green/Open Spaces to be Multifunctional C.1.4_Create and Strengthen Green Space Networks in and around the City O.1.5_Design Public Green Spaces to be Accessible and Inclusive
5.2 Landscape and recreational areas concept means undeveloped land or land with no buildings that are accessible to the public and are intended for: • organizing recreational activities; • performing environmental functions; • improving the state of the environment; • serving as a space for urban gardening; • acting as an evacuation site and a temporary shelter in case of natural hazard; • passing spare time, social interactions, and reunion of Khorog citizens. Landscape and recreational areas should form the natural frame of the settlement in the form of a single system of open and green spaces and have convenient pedestrian and transport links with residential and public areas.	The definition is adopted using **UN-Habitat Open Public Space concept** First 3 bullets are in line with **paragraph 132** of the **GNiP 30-01-2018** Urban gardening is not enshrined in the **GNiP 30-01-2018** and contradicts functional zoning **(paragraph 14-22 of GNiP 30-01-2018)**	**Paragraph 14** of the **GNiP 30-01-2018:** The territories of settlements, considering their primary functional use, are divided into residential (residential and public), industrial, landscape and recreational, transport and engineering infrastructure, agricultural use, and special purposes.		

5.3 The landscape and recreational areas concept includes the following three categories: • **areas of general use** composing of multifunctional and specialized parks, squares, boulevards, forest and meadow park areas, waterfronts, green areas of public centers of the city and district levels; • **areas of limited use** composing of green areas in residential buildings for everyday recreation of the population, including pocket parks, playgrounds for children, plantings on individual building sites, as well as greened recreation areas as part of industrial and mixed development areas, plantings on the territory of research, educational, medical, administrative, cultural and educational, sports facilities intended for a limited contingent of visitors; • **areas of special purpose** composing of decorative nurseries, plantings of sanitary-protective zones of enterprises, noise protection, wind protection, coastal and bank protection strips, cemeteries. Walking distance to any category of landscape and recreational area should be up to 15 minutes.	These categories of the "landscape and recreational areas" concept are in line with **paragraph 137** of the **GNiP 30-01-2018** Walking distance is in line with **KUDG**	Not defined	N/A	C.3_Neighbourhood Development C.6.4_Use Nature-Based Solutions to Enhance the City's Social and Environmental Resilience O.1.1_ Design Green/Open Spaces to be Multifunctional C.1.4_Create and Strengthen Green Space Networks in and around the City O.1.5_ Design Public Green Spaces to be Accessible and Inclusive
5.3.1 Accessibility of Landscape and Recreational Areas All types of landscape and recreational areas should be designed to have multiple access points to secure evacuation and response routes. The accessibility provisions outlined in paragraphs 4.8 and 4.9 should also be applicable in this case.	Is not covered by the **Tajik legislation**. In line with **KUDG**	Not defined	N/A	S.5.2_Design Multiple Access Points to Urban Areas to Secure Evacuation and Response Routes

5.4 Hazards Mitigation To act as mitigation buffer zones and as natural barriers for urban expansion, promenades, green spaces, sport and leisure facilities, and similar amenities should also be located in hazard areas.	Defined under **Footnote 2** of **paragraph 24** of the **GNiP 30-01-2018** + It is referenced in **paragraph 2.2 Zoning in Naturally Hazardous Areas** of **these Rules**	Not defined	N/A	O.1.2_Use Green Spaces as Mitigation Buffer Zones in High-Risk Areas
5.5 Landscape and Recreational Areas Greenery The level of greenery of landscape and recreational areas should be taken at least 8-12 m²/person depending on the terrain and extreme ground conditions as well as subject to provisions of **Notes** to **Annex 18** of **GNiP 30-01-2018**.	In line with **Annex 18** of the **GNiP 30-01-2018**	Not defined	N/A	N/A
5.6 Local Flora When determining suitable vegetation for Khorog, consideration should be given to the local flora that will fit better into the local landscape and ecosystems and promote the ecological approach and the sustainability of mountainous terrain. The species chosen must be of native local origin, adapted to the conditions of the environment. Also, irrigation of greenery should be carried out by subsoil irrigation and ground sprinklers.	Is not covered by the **Tajik legislation.** Principle of irrigation is in line with the **Tajik Recommendations**	Not defined	N/A	O.1.3_ Use Landscaping and Open Spaces to Compliment Natural Features
5.7 Application of landscaping technologies should take place subject to climatic zones and is defined in **Chapter 10** of **SNiP 30-04-2021** and they should cover at least 20% of any landscaping and recreational area.	In line with the **SNiP 30-04-2021**			N/A

5.8 All landscape and recreational areas should ensure safety for their users. To achieve this, such landscape and recreational areas are required to be buffered through accessible landscaping or architectural elements (shrubs, greenery, benches, etc.) from automobiles, utilities, and parking spaces but not to make them isolated or confined. The landscaping techniques should use three levels buffering depending on the source of pollution: the lowest plants, bushes and tall trees. The typologies of the greenery should be defined under paragraph 5.6.	Is not covered by the **Tajik legislation**	Not defined	N/A	O.1.6_Design Public Green Spaces to be Safe
5.9 Areas of general and limited uses should consider social dynamics and cultural specificities of Khorog community and Tajik heritage with a focus on a rocky mountainous environment to generate a strong relationship between people and place. Thus, coating materials, outdoor furniture, small architectural forms should be made of environmentally friendly and vandal-proof materials, they should not fade or overheat in the sun. It is possible to use light-coloured materials with an albedo coefficient of at least 0.3 when operating in the conditions of the cold season.	It is not covered by the **Tajik legislation.** Developed based on the **Analysis** and **KUDG** Materials topic is in line with **paragraph 228** of the **SNiP 30-04-2021**	Not defined	N/A	C.7_Context-Sensitive Design

5.10 Activation of Landscape and Recreational Areas of General and Limited Uses On the territories of the areas of general and limited uses it is encouraged to construct buildings and establishments subject to functional correspondence: catering establishments, exhibition halls, galleries, museums, clubs, theater, sports and cultural as well as commercial facilities to attract at all time users of every age, gender and ability and to make them feel welcome. To attract a more diverse group of people, these areas should also be furnished with urban amenities such as benches, child-friendly features like playgrounds and sports facilities, as well as other necessary amenities (toilets, water fountains, picnic tables, shade structures, etc.).	It is not covered by the **Tajik legislation.** Adopted from the **Analysis (Kyrgyz Document)**	Contradicts **paragraph 52** of **Draft Khorog Urban Planning Rules:** *It is not allowed to erect buildings and constructions that are incompatible with the protective, sanitary and hygienic functions of green areas and the purposes of organizing recreation for the population.*	N/A	N/A

5.11 Public Art To promote traditional Tajik historical heritage, culture, patterns and motifs, enhance Khorog public image as well as activate landscape and recreational areas of general and limited uses in general, it is recommended to establish public art therein. The following types of public art are applicable in Khorog: • stand-alone: sculptures, statues; • integrated: mosaics; • applied: murals, building-mounted sculptures. They should be physically and/or visually accessible as well as environmentally integrated in mountainous terrain of Khorog. Installation of public arts is subject to approval by the local government.	It is not covered by the **Tajik legislation** though there is an ongoing practice to use national elements on the buildings. In line with **KUDG**	Not defined	N/A	O.1.12_Integrate Locally Relevant Urban Art
5.12 Usage of Underused Land Where possible, and considering the security of the location, underused land should be temporarily used for the purposes of organizing a landscape and recreational areas.	It is not covered by the **Tajik legislation** In line with **KUDG**	Not defined	N/A	N/A

5.13 Urban Gardening In Khorog, to contribute to food security, promote increased access to agricultural extensions and the development of people's capacities as well as facilitate job creation by encouraging agriculture as an alternative source of income, urban gardening is permitted.	Urban Gardening is not enshrined in the **Tajik legislation** and contradicts functional zoning **(paragraph 14-22 of GNiP 30-01-2018)** N/A	Not defined	N/A	0.1.1_Design Green/Open Spaces to be Multifunctional
5.13.1 Any person who is engaged in urban gardening practices within an urban area of Khorog shall take measures to ensure that: • such cultivation of crops does not cause environmental degradation; • the use of chemicals and fertilisers does not cause pollution of ground water sources or surface water sources including dams, rivers, wells, aquifers or any other water source or damage to soils, grass, trees, plants or any other vegetative cover; and • such cultivation affects ecologically sensitive areas including the banks of any naturally defined stream or river, wetland, aquifer or any natural watercourse.				
5.13.2 Places for Urban Gardening In Khorog, urban farming can take place in communal spaces.				
5.13.3 Restrictions on Urban Gardening No person shall undertake urban gardening involving the use of pesticides along riverbanks, and all related hazardous lands (swampy areas, water sources or steep slopes) within the zone of thirty (30) metres from each side of the river bank and not less than fifteen (15) meters in streams.				

<table>
<tr><th colspan="5">CHAPTER 6. BUILDINGS</th></tr>
<tr><td>This chapter establishes key provisions of buildings directly related to the basics of urban planning and sets climate-responsive standards, without compromising the overall minimum standards of the construction sphere defined in Tajik legislation.</td><td>N/A</td><td>N/A</td><td>N/A</td><td rowspan="5">N/A</td></tr>
<tr><td rowspan="4">6.1 Types of Residential Buildings

To create a human-centric environment in neighborhoods that is affordable and easy to use, the buildings in Khorog must use local architectural styles, have shapes, colours, and fittings that harmonize with the surrounding constructions and be of the following typology:
• by number of storeys:
- low-rise buildings – 1-3 floors;
- mid-rise buildings – 4-5 floors;
- multi-storey buildings – not higher than 6 floors.

The clear height from the floor to the bottom of the load-bearing building construction and/or ceiling (including to the bottom of the false ceiling) in residential buildings should be at least 3 meters while the maximum building height should not be more than 20 m.
• by the number of apartments:
- single-family building;
- multi-apartment building.
• according to the availability of residential plots:
- manor house;
- non-manor house.

In compliance with regulatory requirements, it is mandatory that buildings be situated in a manner that aligns with the permissible load capacity, considering the gravitational forces exerted by structures at different elevations on the slope. Consequently, residential dwellings must be strategically located at the base of the incline. If it becomes necessary to place residential buildings on the slope, it is obligatory to systematically decrease the number of building floors in direct proportion to the increase in elevation, while diligently adhering to the limitations explicitly specified within this provision.

To mitigate potential isolation between the dwellings situated at the lower and upper regions of the slope, it is incumbent upon the responsible authorities to establish a network of urban streets and passages that interconnect the aforementioned categories of buildings within the jurisdiction of Khorog.</td><td>Types of buildings are in line with paragraph 57 of the GNiP 30-01-2018</td><td rowspan="4">Not defined</td><td rowspan="4">N/A</td></tr>
<tr><td>In line with KUDG</td></tr>
<tr><td>Floor height is defined in paragraph 31 of the GNiP 30-01-2018</td></tr>
<tr><td>Dependency between the number of floors and the location of the building at the bottom / top of the slope is defined in paragraph 3.28 of the Tajik Recommendations.</td></tr>
<tr><td>Restriction to construct isolated buildings is not defined under the Tajik legislation</td></tr>
</table>

6.2 Green Buildings Under the promotion of Khorog resilience, the designing of environmentally optimal buildings (green buildings) forms a significant part and aims to minimize the total environmental impact associated with all life-cycle stages of the building project and further exploitation of such building.	Though the **Tajik legislation** does not use "green buildings" terms, its norms still promote usage of the techniques applicable.	Not defined	Defined in **AKDN Standards (Green Buildings)**	N/A
6.2.1 Buildings Orientation & Insolation In Khorog, situated in the northern hemisphere, it is advisable to locate residential buildings on the south slopes. Additionally, it is recommended that the longest axis of the buildings be oriented in an east-west direction to capture as much solar gain as possible. The placement and orientation of residential and public buildings must ensure the continuous duration of insolation of the premises for at least 2.5 hours per day for the period from March 22 to September 22. The general coefficient for façade glazing applied in Khorog should be of 15%.	Though Tajik legislation does not define on which slopes the buildings should be located, the **Tajik Recommendations** enshrine that buildings should be located on slopes with an eastern or southeastern orientation. Topic of insolation is covered under the **GNiP 30-01-2018.** Part about longest axis of the building is adopted from the **Analysis (UNEP Document).** Percentage of façade glazing is defined under the **SNiP 23-02-2021 "Thermal Protection of Buildings"** building code.		In line with **3.3.Passive Design: Orientation** of **AKDN Standards (Green Buildings)**	

6.2.2 Construction Materials for Thermal Adaptation

In Khorog, with regards to the IB zone, which is characterized by moderately warm summers and moderately mild winters, it is imperative to ensure that buildings are adequately insulated. This can be achieved by, *inter alia*, using building envelope materials of the appropriate U-value:

- Walls: 0.12-0.15
- Floor: 0.08-0.12
- Roof: 0.10-0.12
- Windows: 0.8-1.0 (triple glazing)
- External doors: 1.0-1.2

To minimize transportation costs and carbon emissions and to preserve Khorog's unique character and cultural heritage, it is preferable to select construction materials for buildings from local suppliers.

Moreover, to optimize thermal performance of buildings, decrease energy consumption, and promote sustainable and climate-conscious design practices in Khorog, it is required to use the paint of light-colours which has the lowest absorption coefficient of solar radiation.

Though Tajik legislation does not establish a threshold for the U-value of materials, the **SNiP 23-02-2021** provides a formula for its calculation.

Usage of paint of light colours for external walls is adopted from the **Analysis (Kyrgyz Regulations)**

Obligation to use local materials is not defined in the **Tajik legislation.**

Not Defined

3.2. Passive Design: Adaptive Thermal Comfort of AKDN Standards (Green Buildings

3.8. Passive Design: Solar reflectivity

In line with paragraph 2 of A.3 Construction of AKDN Standards (Green Buildings)

C.7.1_Preserve the City's Visual Identity and Vernacular Urban Pattern

C.7.2_Preserve Natural Assets and Ecosystems

6.2.3 Natural Ventilation When designing the ventilation system for buildings in Khorog, it is imperative that such system be constructed using natural ventilation solutions in accordance with prevailing wind patterns to ensure adaptivity to the surrounding natural environment. To this end, it is recommended that the inlet be of a small size, while the outlet should be of a larger size to facilitate a better airflow.	Though Tajikistan uses the **SNiP 41-01-2003 "Heating, Ventilation and Conditioning" (2003)** which provides for possibility to use natural ventilation, there is no indication of prevailing wind patterns consideration.		Not Defined	In line with paragraph **3.6.Passive design: Natural ventilation** of **AKDN Standards (Green Buildings**	C.7.3_Work with Natural Features to Achieve Optimal Design Solutions
6.2.4 Roofs It is hereby recommended that roofing techniques employed in Khorog shall be conducted in a manner that ensures a balanced heat gain and return through the implementation of suitable insulation, sufficient attic space ventilation, and the utilization of reflective surfaces.	Partially covered in the **Tajik legislation**			Not Defined	B.1.10_Promote Roofscape Strategies
Insulation Regardless of the techniques (traditional, inversion, etc.) used for roofing in Khorog, preference should be given to modern efficient heat-insulating materials where the coefficient of thermal conductivity is 0.07 W/(m · C°) or less.	Not defined in the **Tajik legislation**. Adopted from the **Analysis (Uzbek Document)**				
Attic Space Ventilation Roofs shall be constructed in a manner that facilitates ventilation of the attic space, with a minimum clearance of 50 mm, for the purposes of reducing attic temperatures and removing excess moisture while providing adequate air circulation.	In line with **paragraph 190** of the **SNiP 31-10-2021**	**Paragraph 190** of the **SNiP 31-10-2021:** *The thickness of the ventilated gap is determined by calculation, but it must be at least 50 mm.*			
Surfaces To mitigate heat gain from roofs, light-coloured shades and materials with high solar reflectance index shall be utilized for roofing in Khorog.	Not defined under the **Tajik legislation**				

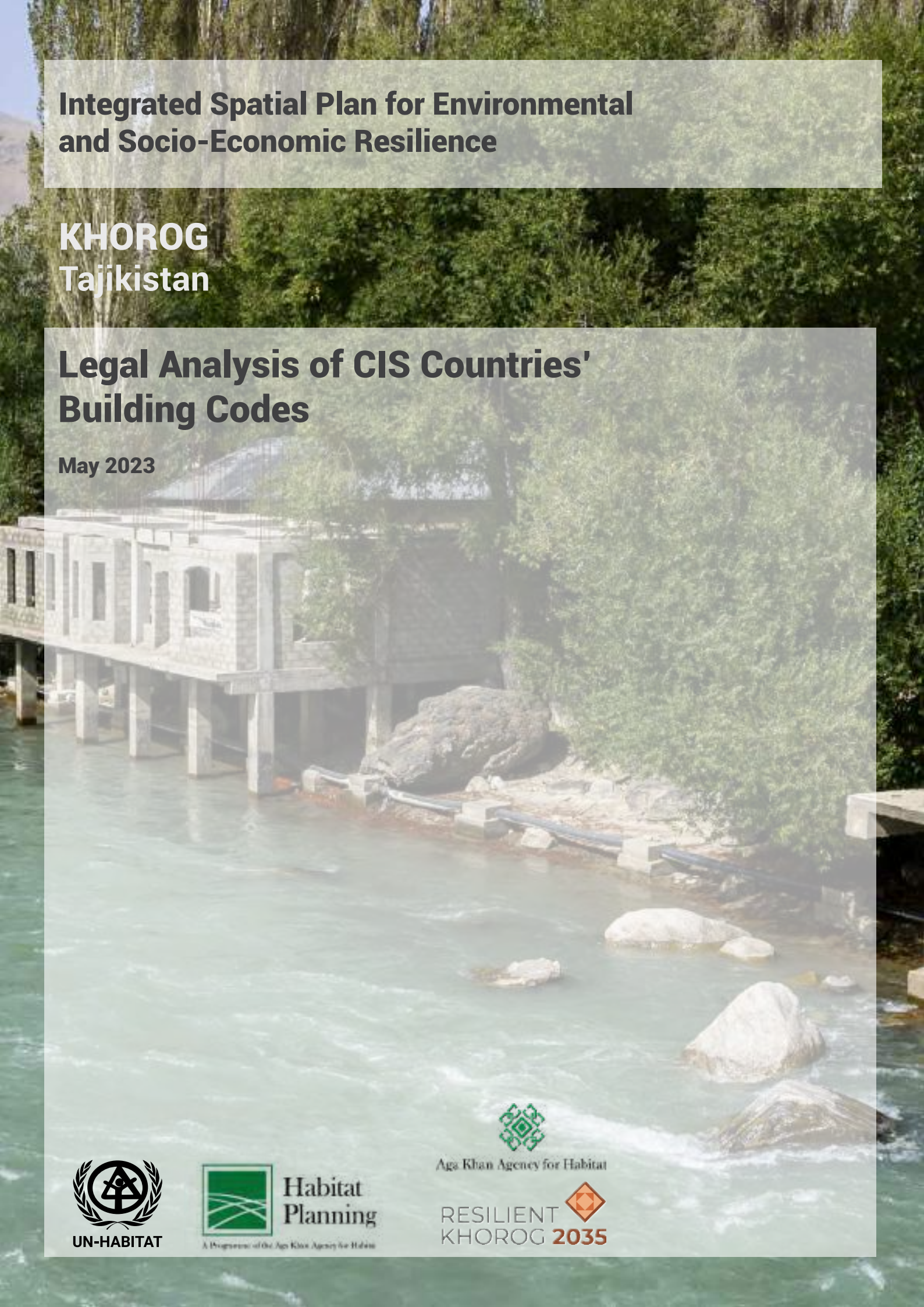
6.2.4.1 Green Roof In Khorog, the active use of the roof surfaces of residential and public buildings for the arrangement of sites (roofs in operation) is encouraged to manage the volume of stormwater that comes from rain or melting snow that doesn't soak into the ground and to facilitate reducing urban heat islands to cool urban areas.	In line with **KUDG**	Not defined	Not defined	N/A
	In line with **paragraph 3.19** of the **Tajik Recommendations**			
6.2.4.2 Green Roofs Application Green roofs can be used on roofs with a slope of 1.5 to 3% and where there is a technical floor, the volume of which can be used to store inventory, spare containers, boxes, fertilizers and other materials, and equipment for automated watering of plants. When designing a green roof on an existing building or structure, the bearing capacity of all structures is checked, as well as the condition of the layers of the roof itself.	In line with the **SNiP 31-10-2021 "Roofs" 120.030.030**			
6.2.4.3 Green Roofs Landscaping Landscaping of green roofs could take place through: • direct planting of the lawn in which it acts as a waterproofing carpet. There it is necessary to use materials that are resistant to germination by plant roots and the effects of fertilizer chemicals. The norms recommend the use of woody shrubs and trees with a flat-rooted root system. • roof gardening meaning planting plants in flowerpots. For a green roof, it is necessary to provide for additional loads both from the substrate in a wet state (700 kg/m^3) and from small architectural forms: plants and trees in tubs, decorative ponds, fountains.				
6.2.4.4 Structural solutions for green roofs and technical characteristics of the materials used are provided in option 3 of Annex 11, and landscaping elements and landscaping objects are defined in Annex 12 of SNiP 31-10-2021.	In line with the **Tajik legislation**			

6.3 Adaptation of Buildings in Khorog to Natural Hazards When constructing new buildings, it is recommended to offload the upper portions and load the base of the incline. The reduction of building stories in the progression of the incline should correspond to the increase in elevation. Construction on the slope must proceed in a bottom-up manner, follow the slope and be done subject to paragraph 3.2. For ways to achieve the stabilization of slope, refer to **paragraph B.1.5 In Slope Areas, Stabilize Slopes using Passive and/or Active Methods to Reduce the Risk of Rockfalls, Landslides and Avalanches** of **KUDG.**	In line with **paragraph 3.28** of the **Tajik Recommendations**	Not defined	Not defined	B.1.5_ In Slope Areas, Stabilize Slopes using Passive and/ or Active Methods to Reduce the Risk of Rockfalls, Landslides and Avalanches
SECTION 3. DECISION-MAKING PROCESSES IN KHOROG				
CHAPTER 7. POWERS OF STATE BODIES				
7.1 Powers of state bodies in Khorog should be considered in line with relevant Tajik legislation.	Content of **Chapter 4. Power of State Bodies** of the **Draft Khorog Urban Planning Rules** should apply here		N/A	N/A
CHAPTER 8. COMMUNITY PARTICIPATION				
8.1 Aim of the Community Participation While deciding on urban planning matters affecting Khorog, under the auspices of local government (Department of Architecture and Urban Planning of the Executive Body of State Power of Khorog) and through the representatives of local self-governments and legal entities forming a working group, the community participation should take place. Community participation in Khorog is done through the Working Group and aims to update the detailed urban planning projects.	Public participation mechanism on direct involvement of community members / stakeholders into urban planning matters **is enshrined though not enforced under the Tajik legislation** (meaning there is no legal provisions (regulations) which define the way to involve public). All work on the local level is carried by the Department of Architecture and Urban Planning of the Executive Body of State Power of Khorog.	**Article 8** of the **TPC** defines that *"one of the main requirements for urban planning activities is the provision of conditions* **for the participation of citizens, public organizations in the discussion and decision-making in urban planning"**. Nevertheless, **this mechanism is not enforced in Tajikistan.**	Not defined	N/A	N.1.3_Engage Communities early on in the Design Process

8.2 Election of a Working Group Members Community participation should be implemented through the working group mechanism consisting of 12 to 15 stakeholders elected from Khorog *Mahallas* and/or legal entities located in Khorog and chaired by a *Jamoat* representative based on the principle of change of power meaning that every six months one representative from each *Jamoat* chairs the working group. Re-election of working group members takes place once every 5 years.	Developed based on the analysis done by UN-Habitat during the 1st phase of "Integrated Spatial Plan for Environmental and Socio-Economic Resilience Planning", Khorog, Tajikistan	Not Defined	N/A	N.1.3_Engage Communities early on in the Design Process
8.3 Requirements for Working Group Members Each delegated member of the working group should be either a natural person with education, and/or expertise of at least 5 years or legal entity with the main field of occupation in: o urban planning, o geography, o architecture, o environmental science, o economic, o law, o data analysis, o (civil) engineering, o geographic information systems (GIS), o social studies, o project management. Both natural persons and legal entities should stand up for the principles of collaboration and teamwork while deciding on matters effecting urban planning in Khorog.	Developed using **UN-Habitat Our City Plans Toolkit**			

8.4 Responsibilities of Working Group Members Within the composition of the working group, the fulfillment of the subsequent roles is mandated for its members: 1. **Project lead (equivalent to Jamoat chair)** – oversees the entire planning process, guides team members, stays informed about ongoing activities and deliverables, and handles communication with higher-level authorities and external organizations. 2. **Project manager** – takes charge of driving and monitoring the management process, ensuring the team successfully accomplishes objectives and delivers on time, while also being accountable for the budget, meeting deadlines, and engaging all relevant stakeholders. 3. **Urban planner** – provides guidance for the technical development of the project, which includes preparing plans and studies, creating and interpreting maps and diagrams, formulating policy guidelines and recommendations, facilitating participatory activities with stakeholders and the community, and processing gathered data to inform the planning project. 4. **Urban design and architecture specialist** is responsible for conducting the physical design of the project, utilizing their expertise in architecture and design software to develop design concepts, as well as site, architecture, and construction plans. 5. **Spatial analysis specialist** conducts the spatial analysis of the project, identifies and processes geospatial datasets, elaborate maps using Geographic Information Systems (GIS) software, and translates the analysis into findings and reports. 6. **Urban economy specialist** performs urban economic analysis, economic modelling, and demographic analysis, develop strategies on issues such as local economic development, spatial agglomeration, demographic and economic trends, integrated land use, urban infrastructure and transportation, housing, and local government finance. 7. **Urban legislation specialist** guides the compliance of planning policies, regulations, and guidelines established in the urban area of study and facilitate the legal aspect of the planning process.	Developed using **UN-Habitat Our City Plans Toolkit**	Not Defined	N/A	N.1.3_Engage Communities early on in the Design Process

8. **Participatory processes expert** provides expertise on designing and implementing participatory processes, strategies and activities, incorporating and engaging different stakeholders. 9. **Communication expert** provides expertise on designing and implementing the communication strategy. 10. **Risk reduction and climate planning specialist** provides expertise on urban resilience, risk reduction actions, and climate adaptation and mitigation strategies. 11. **Housing specialist** provides expertise on housing and inclusive community development at different urban scales. 12. **Transport and mobility specialist** provides expertise on transportation systems and sustainable urban mobility strategies. 13. **Social inclusion specialist** provides expertise on inclusive policies, engagement of vulnerable groups, social housing, inclusive slum regeneration strategies and fair land management regulations. If any expertise mentioned in items 3-13 is found to be deficient, it is recommended/ enforced to extend invitations to external experts.	Developed using **UN-Habitat Our City Plans Toolkit**	Not Defined	N/A	N.1.3_Engage Communities early on in the Design Process
8.5 Working Group Functions Each year of its operation term, the working group works on a detailed urban planning project of a specific area in Khorog. **8.5.1** Each member of the working group from items 3-13 of paragraph 8.4 should under the **substantive capacity**: • conduct desk research activity on matters of their expertise applicable to a specific (defined) area of Khorog; • collect and/or produce data needed for the analysis of a specific (defined) area of Khorog; • interpret the data gathered to understand current urban needs of a specific (defined) area of Khorog; **8.5.2** Under the **organisational capacity**, all member of the working group from items 3-13 of paragraph 8.4 of the working group should: • gather once every 6 months to propose and discuss their findings on a specific (defined) area of Khorog; • over the next 6 months consolidate all the findings into a final report with recommendations to be included in the detailed urban planning projects of a specific (defined) area of Khorog. Final report is subject to signature by the project manager. Project lead should submit a final report with recommendations to be included into the detailed urban planning projects of a specific (defined) area of Khorog for consideration of the Department of Architecture and Urban Planning of the Executive Body of State Power of Khoro**g.**	Developed using **UN-Habitat Our City Plans Toolkit**	Not Defined	N/A	N.1.3_Engage Communities early on in the Design Process



Integrated Spatial Plan for Environmental and Socio-Economic Resilience

KHOROG
Tajikistan

Legal Analysis of CIS Countries' Building Codes

May 2023

UN-HABITAT

Habitat Planning

A Programme of the Aga Khan Agency for Habitat

Aga Khan Agency for Habitat

RESILIENT KHOROG 2035

Integrated Spatial Plan for Environmental
and Socio-Economic Resilience
Khorog, Tajikistan

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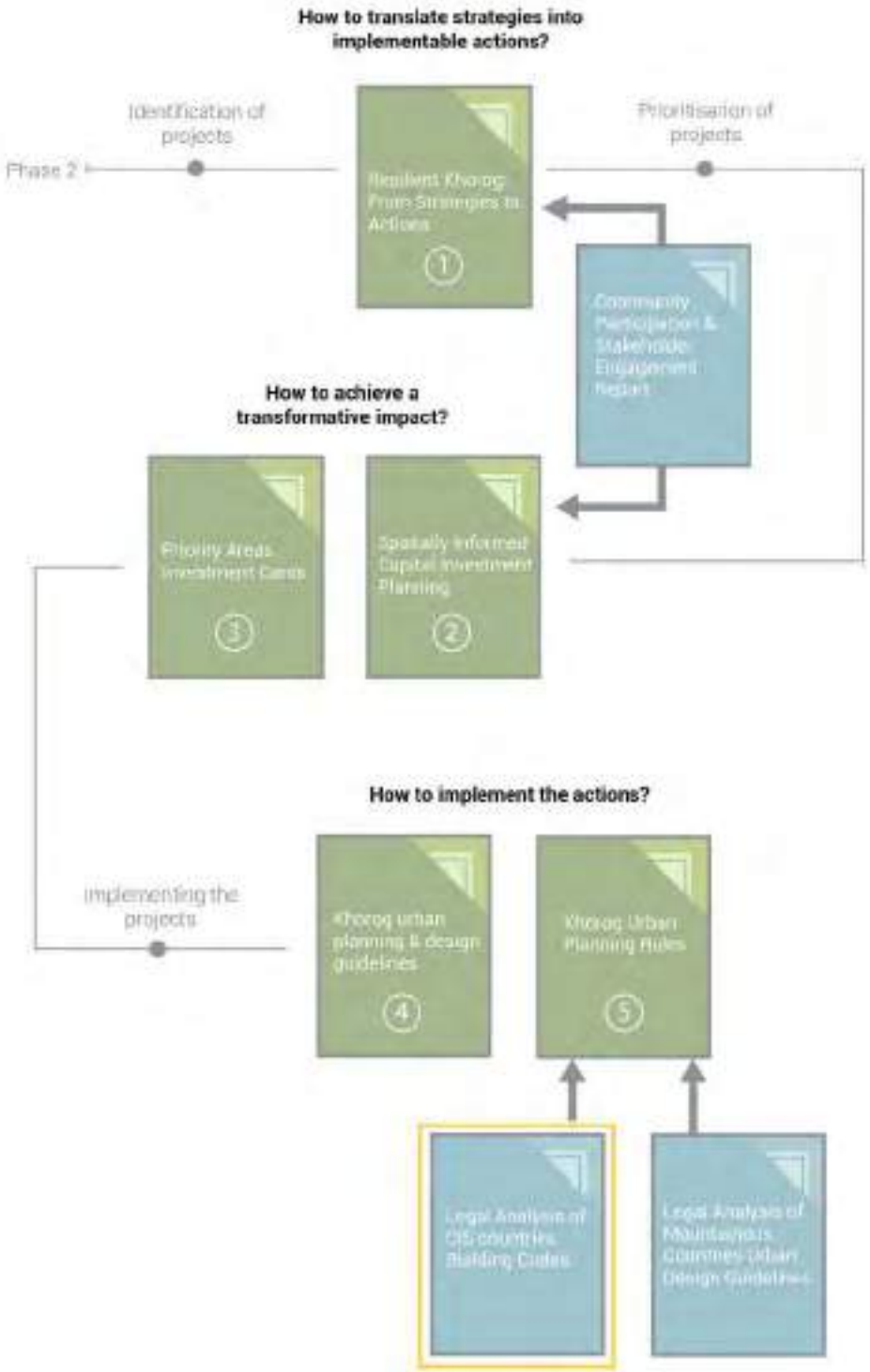
Aga Khan Agency for Habitat

RESILIENT KHOROG 2035

Habitat Planning

Integrated Spatial Plan for Environmental
and Socio-Economic Resilience

Legal Analysis of CIS Countries' Building Codes



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LIST OF ACRONYMS

CG	Construction Guidelines
CIS	Commonwealth of Independent States
EEU	Eurasian Economic Union
GNiP	Urban Planning Codes and Rules
GOST	Interstate Standards
HDD	Heating Degree Days
ICG	Interstate Construction Guidelines
ICS	Industry Construction Standards
ISO/IEC	International (Regional) Construction Standard
KUDG	Khorog Urban Design Guidelines, developed by UN-Habitat under the 2nd phase of the "Integrated Spatial Plan for Environmental and Socio-Economic Resilience, Khorog, Tajikistan" project
MSN	Interstate Building Norms
MSP	Interstate Codes of Practice for Design and Construction
NDC	Nationally Determined Contribution
SCS	State Construction Standards
ShT	Specifications for Building Products, Structures and Materials
SN	Building Codes
SNiP	Building Codes and Rules
SP	Building Rules
SPPS	Codes of Practice for Design and Construction
SRI	Solar Reflectance Index
STO	Standards of Public Associations
STP	Standards of Enterprises (Associations) of the Construction Complex
TR	Technical Regulations
UNEP	United Nations Environment Programme
UN-Habitat	United Nations Human Settlements Programme
USSR	Union of Soviet Socialist Republics, Soviet Union

LEGAL ANALYSIS OF CIS COUNTRIES' BUILDING CODES

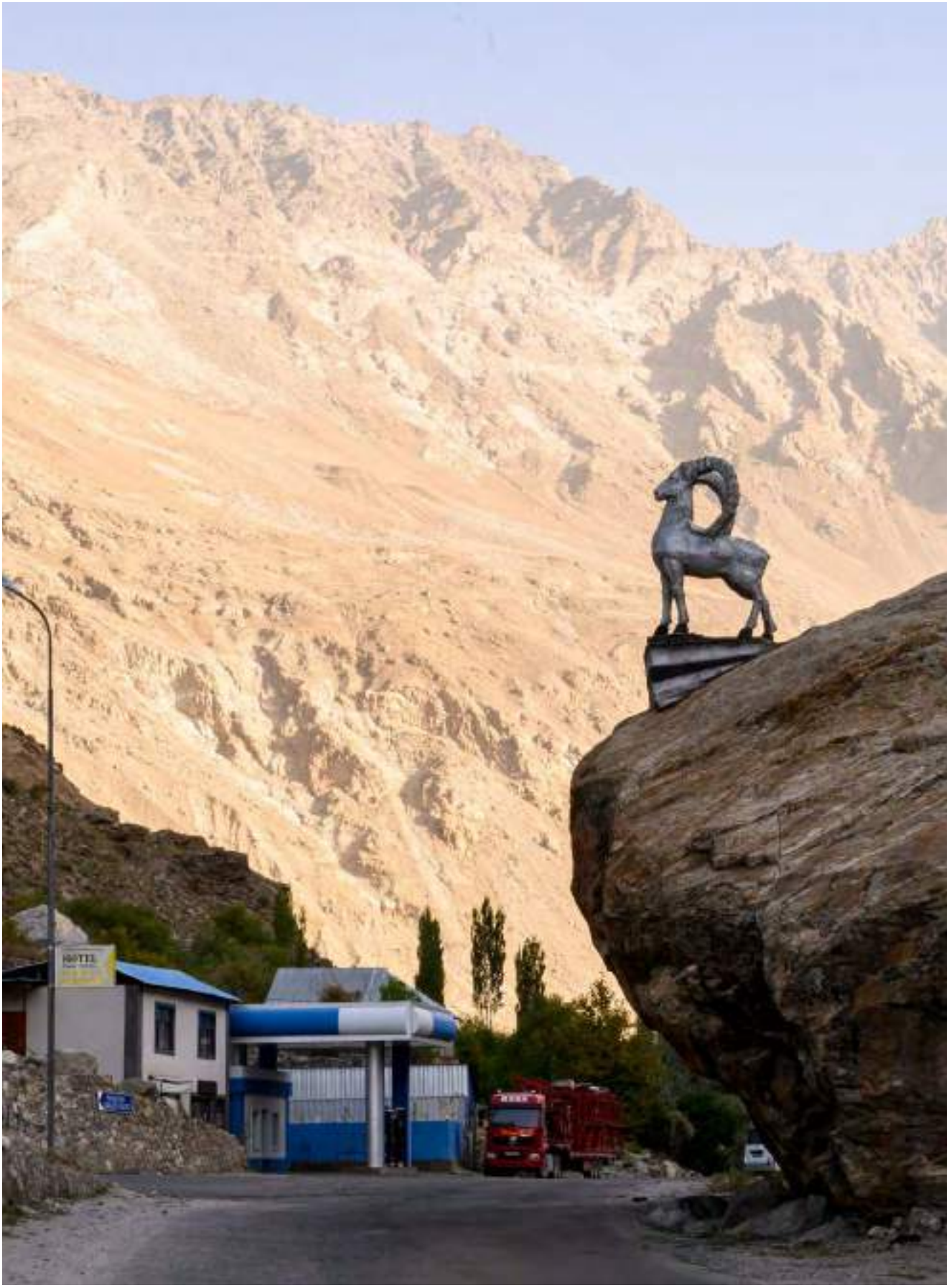

Fig 1. View from one of Khorog's Mahallas, UN-Habitat, September 2022

EXECUTIVE SUMMARY

From 2020-2021, UN-Habitat in collaboration with the Aga Khan Agency for Habitat and the government of Tajikistan, through the Aga Khan Development Network, launched and completed the 1st phase of the project "Integrated Spatial Plan for Environmental and Socio-Economic Resilience" in Khorog, Tajikistan. The project was based on a holistic assessment of resiliency that was undertaken for Khorog in 2017 and 2018 by the Swiss State Secretariat for Economic Affairs, with partnership from the members of the Khorog Resilience Investment Programme that includes the European Union for Resilient Infrastructure, the government of Japan, the International Finance Corporation, and the World Bank.

The objective of the project was to strengthen the environmental, legal, economic, spatial, and infrastructure policies and projections, to conduct transformative planning and technical capacity-building projects for stakeholders. From the legal perspective, and by applying the Urban Law Module of the Law and Climate Change Toolkit – an online resource aimed to help countries put in place the legal frameworks necessary for effective domestic implementation of the Paris Agreement and its Nationally Determined Contributions, UN-Habitat analysed the current Tajik legislation and provided the recommendations that would contribute to the inclusion of climate change issues into the planning laws and regulations of Tajikistan at both the national and the local level.

The 2nd phase of the project aims to develop transformative neighborhood projects based on the analysis and plans developed in the 1st phase within the urban design scope and with a legislative aspect focusing on reviewing the inter alia building codes. Thus, this document comprehensively analyzes the building codes and regulations of Tajikistan and provides a comparative analysis of the building codes of the Commonwealth of Independent States (CIS) countries, namely Armenia, Azerbaijan, Belarus, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, and Uzbekistan using UN-Habitat and UN (United Nations) Environment Programme methodologies. In doing so, the report identifies best practices that can be applied to the design and construction of buildings in Khorog.

Chapter 1 provides a historical perspective on the development of building codes and regulations in the CIS countries, tracing their genesis from soviet building regulations and their gradual evolution into the contemporary standards observed in CIS countries. It is noted that despite significant similarities between the building codes and regulations of the CIS countries, there are still differences attributed to the varying geographic and climatic conditions. In this way, the analysis benefits from the overview of CIS countries' geography and climate peculiarities.

Chapter 2 presents an assessment of building codes in CIS countries from a regulatory standpoint and using the UN-Habitat methodology. The primary emphasis is on evaluating the alignment of documents (primary and second legislation as well as building codes) with the five fundamental principles of the methodology: (age of building codes, uniformity or differentiation of application, scope for local materials, resource-efficient measures, and consideration of small/low-cost housing). After evaluating these five principles, the provisions that are established in the CIS countries' legislation and those that are absent were identified. Furthermore, this chapter examines not only the regulations specified in the climate section but also reviews a broad range of primary and secondary laws in CIS countries.

Chapter 3 offers an examination of building codes in CIS countries through the lens of climate responsiveness, utilizing the UN Environment Programme methodology, which comprises the following components: building site, orientation, configuration and layout, natural ventilation, roofs, as well as thermal adaptation and materials for thermal comfort. The objective is to establish the most effective procedures from countries that were bound by a shared legal history for 70 years, to trace their origins to pertinent Soviet regulations, to assess their compatibility with global recommendations, and finally to identify the applicable procedures to be applied in the city of Khorog.

Succinctly, the document presents a summary of recommendations that can be applied to both Tajikistan, from a regulatory perspective, and to the city of Khorog, from a climate standpoint.

Fig 2. New building being constructed in Khorog, UN-Habitat, September 2022

1

INTRODUCTION

For nearly 70 years, the contemporary Member States of the CIS have been connected by a common legal history. During this period, they not only created and established different legal standards, but they progressed into the full implementation of these.

Particularly in the field of construction, which was regarded as a pivotal sector of the national economy, the 15 republics, covering an area of 22.4 million square kilometers, adhered to identical construction standards, thus taking the various climates of the countries into account. With climates ranging from cold to temperate, the republics were therefore divided into 14 distinct climatic regions ranging from very cold where the temperature in January reaches -50°C and 2°C in July to very hot, dry where in January the lowest indicator ranges between -4 to 4°C and in July starts at the point of 30°C.[1]

This chapter offers a comprehensive account of the genesis of Soviet building regulations and their gradual evolution into the contemporary standards observed in CIS countries. Additionally, it outlines the distinctive geographic and climatic attributes of each nation. This is performed with the objective of correlating the subsequent analysis presented in Chapters 2 and 3 with the specific climatic conditions of each respective country.

1 *Climate of the USSR. Regionalizing and statistical parameters of climatic factors for technical purposes (1980).* https://files.stroyinf.ru/Data2/1/4294851/4294851952.pdf

1.1. GENERAL OVERVIEW OF BUILDING CODES: FROM THE USSR TO PRESENT

The standardization process in construction in the CIS countries traces its origins to 1954, specifically with the introduction of the Building Codes and Rules (SNiP). Before this year, there were no comprehensive regulatory documents which could govern and specify the minimum agreed levels of safety for the structures and buildings of the Soviet Union (USSR).

The SNiP of 1954[2] was binding, and its goal was to improve the quality and reduce the cost of construction by introducing rational building design standards and progressive building measures, as well as rules for the production and acceptance of construction work. All of these reflecting the best construction experience. This SNiP was composed of four chapters, namely:

1. Building Materials, Parts, and Structures
2. Construction Design Standards
3. Rules for the Production and Acceptance of Construction Work
4. Estimated Norms for Construction Work

2 *Building Design Regulations. (1954).* https://norm-load.ru/SNiP/old-snip/snip_54/6-10.htm

The SNiP was further substituted by the document of 1962[3], which preserved the content of the previous SNiP document but included amendments on requirements to the design specifications.

Nonetheless, the milestone in the construction sphere was the SNiP dated 1974 "System of Regulatory Documents"[4] which substituted the first three chapters of the 1962 SNIP (SNiP I-A.1-62, SNiP II-A.1-62, and SNiP III-A.1-62) and defined the following four chapters:

1. General provisions including regulatory documents system and construction terminology (SNiP I-1-74

2. Design standards which contain requirements for general design issues (building climatology and geophysics, fire safety standards, building heat engineering), planning and development of cities, towns and rural settlements, residential and public buildings, and structures, etc.

3. Rules for the Production and Acceptance of Work

4. Estimated Norms and Rules (with the Application of Collections of Estimated Norms).

The next SNiP under the USSR standardization in construction dated 1982 and was called SNiP 1.01.01-82.[5] The document defined: the main regulatory tasks in construction, the types of regulatory documents, the requirements for the content of regulatory documents, the procedure for reviewing and amending regulatory documents, and the responsibility for the development and compliance with the requirements of regulatory documents, as well as the organization of control over compliance with the requirements of regulatory documents.

Over time, the system of SNiPs became quite extensive, encompassing not only general provisions, but also design standards, rules for production, delivery, and acceptance of work, as well as meteorological norms and rules.

After the collapse of the Soviet Union, the then Soviet members and now current members of the CIS began to adopt their own standards. These States started to uniform principles and rules of construction, unifying the regulatory framework into the design and construction field, as well as into the codes of practice.

Table 1 shows the documents relevant to the CIS countries, with color-coding indicating the categories to which the documents analyzed in Chapters 2 and 3 belong.

3 *Building Design Regulations II-A.1-62. (1962).* https://files.stroyinf.ru/Data2/1/4293788/4293788154.pdf

4 *System of Regulatory Documents I-1-74. (1974).* https://files.stroyinf.ru/Data2/1/4293791/4293791439.pdf

5 *System of Regulatory Documents in Construction 1.01.01-82. (1982).* https://files.stroyinf.ru/Data2/1/4294845/4294845118.pdf

Country	REGULATORY DOCUMENTS															
	STATE										INDUSTRIAL		OTHER			
	SCS[6]	GNiP[7]	ICS[8]	CG[9]	SPPS[10]	SN[11]	SNiP[12]	SP[13]	TR[14]	Other			GOST[15]	MSN[16]	MSP[17]	Other
Armenia[22]	N/A	N/A	N/A	N/A	N/A	N/A	✓	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A
Azerbaijan[23]	✓ AzSTN	N/A	✓ SSAZ	N/A	N/A	N/A	✓ AzDTN	N/A	N/A	Former All-Union and Republican Norms Construction Estimates and Prices Technical Specifications (TSAZ) Enterprises Standards (MS) Standards of Scientific and Technical and Engineering Institutions (ETMCS)	N/A		✓	✓	✓	N/A
Belarus[24]	✓	N/A	N/A	✓	N/A	✓	✓	✓	✓	Sanitary Rules and Norms Technical Codes of Good Practice Preliminary SCS Guide to SN Guide to SNiP	N/A		✓	N/A	N/A	ISO/IEC[31]
Kazakhstan[27]	N/A	✓	N/A	✓	✓	✓	✓	N/A	✓	Sanitary Rules and Norms Departmental Norms Technological Maps Construction Estimates and Prices Regulatory and Technical Guides Technological Design Standards Normative Documents on Standardization	N/A		✓	✓	✓	N/A
Kyrgyzstan[23]	✓ KMS	N/A	N/A	N/A	✓ MSN	✓	N/A	✓	✓	Departmental SN (VSN KR)	STO[24]		✓	✓	✓	SN, SP and TR of EEU
Moldova[25]	N/A	N/A	N/A	N/A	N/A	✓	✓ SNiP / NCM	N/A	N/A	Former All-Union and Republican Norms Russian Sanitary Rules and Norms Guide to SNiP	N/A		N/A	N/A	N/A	ISO IEC[29]
Russia[27]	N/A	N/A	N/A	✓ RDS	✓	N/A	✓	N/A	N/A	Sanitary Rules and Norms Russian GOST Territorial SN	STP[28]	STO [29]	✓	✓	N/A	N/A
Tajikistan[30]	✓ ST ChT	✓[31]	✓ STS ChT	✓ KhRS ChT	✓ MK ChT	N/A	✓ SNiP / MKS ChT	N/A	✓	N/A	STP[32]	ShT[33]	N/A	N/A	N/A	I CG[34] / ISO IEC[35]
Turkmenistan[26]	N/A	N/A	N/A	N/A	N/A	✓ SNT	N/A	N/A	N/A	TSK	N/A		✓	N/A	N/A	N/A
Uzbekistan[27]	N/A	✓	N/A	N/A	N/A	✓ ShNK	N/A	N/A	N/A	Sanitary Rules and Norms Manuals Departmental SN (INK)	N/A		N/A	✓	✓	N/A

Table 1. Regulatory Documents in Construction in CIS Countries

SCS[6] , GNiP[7] CS[8], CG[9], SPPS10 , SN[11] , SNiP[12], SP[13], TR[14], INDUSTRIAL GOST[15], MSN[16], MSP[17], Armenia[18], Azerbaijan[19], Belarus[20], ISO/IEC[21], Kazakhstan[22], Kyrgyzstan[23], STO[24], Moldova[25], ISO IEC[26], Russia[27], STP[28] , STO[29], Tajikistan[30], [31], STP[32], ShT[33], I CG[34], ISO IEC[35], Turkmenistan[36], Uzbekistan[37]

6 State Construction Standards (SCS) = Государственные Стандарты в Области Строительства
7 Urban Planning Codes and Rules (GNiP) = Градостроительные нормы и правила (ГНиП)
8 Industry Construction Standards (ICS) = Отраслевые Стандарты в Области Строительства
9 Construction Guidelines (CG) = Руководяшие Документы в Строительстве
10 Codes of Practice for Design and Construction (SPPS) = Своды Правил по Проектированию и Строительству (СППС)
11 Building Codes (SN) = Строительные Нормы (СН)
12 Building Codes and Rules (SNiP) = Строительные Нормы и Правила (СНиП)
13 Building Rules (SP) = Строительные Правила (СП)
14 Technical Regulations (TR) = Технические Регламенты (ТР)
15 Interstate Standards (GOST) = Межгосударственные Стандарты (ГОСТ)
16 Interstate Building Norms (MSN) = Межгосударственные Строительные Нормы (МСН)
17 Interstate Codes of Practice for Design and Construction (MSP) = Межгосударственные Своды Правил по Гроектированию и Строительству (МСП)
18 The list cannot be deemed exhaustive owing to the unavailability of information.
19 AzDTN 1.1-1 "Construction Normative Documents System. Basic Provisions. Development, Approval, Registration, Expression and Design of Construction Norms". (2000). https://arxkom.gov.az/qanunvericilik/normativler/rehberedici-ve-metodiki-senedler/azdtn-11-1-1-tikinti-normalari-islenmesi-qaydalari
20 List of Technical Regulatory Legal Acts in the Field of Architecture and Construction in force on the Territory of the Republic of Belarus. (2009) https://dnaop.com/html/32562/doc-perechenytehnicheskih-normativnyh-pravovyh-aktovv-oblasti-arkhitektury-i-stroitelystvadejstvujushhih-na-territoriirespubliki-bel subject to changes introduced by http://mas.gov.by/ru/news_ru/view/chetyre-novye-stroitelnye-normy-opublikovany-na-natsionalnom-pravovom-internet-portale-1228/
21 International (Regional) Construction Standards (ISO/IEC) = Международные (Региональные) Стандарты (ИСО/ЭК) в Области Строительства
22 Guiding Document in the Construction of the Republic of Kazakhstan. RDS RK 1.01-01-2014. "The Procedure for the Development, Coordination, Approval, Registration and Enforcement (Suspension, Cancellation) of State Standards in the Field of Architecture, Urban Planning And Construction". (2015)
23 Order "On approval of the Regulations on the System of Regulatory Documents in Construction No. 13-нпа. (2018). http://cbd.minjust.gov.kg/act/view/ru-ru/200252?cl=ru-ru
24 Standards of Public Associations (STO) = Стандарты Обшественных Объединений (СТО)
25 The list cannot be deemed exhaustive owing to the unavailability of information // Catalogul documentelor normative în construc ii. (2021). http://www.ednc.gov.md/upload/61/Catalogul_Documentelor_Normative_in_constructii_2021_Editia_I.pdf
26 International (Regional) Construction Standards (ISO/IEC) = Международные (Региональные) Стандарты (ИСО/ЭК) в Области Строительства
27 SNiP 10-01-94 "System of normative documents in construction. Basic principles". (1995). https://docs.cntd.ru/document/5200307
28 Standards of Enterprises (Associations) of the Construction Complex (STP) = Стандарты Предприятий (Объединений) Строительного Комплекса (СТП)
29 Standards of Public Associations (STO) = Стандарты Обшественных Объединений (СТО)
30 MKS ChT 10.01-2005 "System of Regulatory Documents in Construction. Main Provisions"
31 Though this standard is not defined under MKS ChT 10.01-2005 "System of Regulatory Documents in Construction. Main Provisions" document, they are still applied.
32 Standards of Enterprises (Associations) of the Construction Complex (STP) = Стандарты Предприятий (Объединений) Строительного Комплекса (СТП)
33 Specifications for Building Products, Structures and Materials (ShT) = Технические Условия на Строительные Изделия, Конструкции и Материалы (ШТ)
34 Interstate Construction Guidelines (ICG) = Межгосударственные Руководяшие Документы в Области Строительства (МРД)
35 International (Regional) Construction Standards (ISO/IEC) = Международные (Региональные) Стандарты (ИСО/ЭК) в Области Строительства
36 The list cannot be deemed exhaustive owing to the unavailability of information.
37 ShNK 1.01.01-09 "System of Regulatory Documents in Construction Main Provisions". (2009). https://mc.uz/wp-content/uploads/2020/12/shnk-1.01.01-09-rus.pdf

1.2. GENERAL OVERVIEW OF COUNTRIES' GEOGRAPHY, CLIMATE, WEATHER

The variability in the geography, climate, and weather of the CIS countries is caused by the geographical location and topography of these countries, as well as fluctuations in weather conditions resulting, among others, from the impact of climate change.

According to geographical data, the CIS is situated across Asia comprising the Central Asia region and Eastern Europe. Out of these countries, seven are geographically landlocked, while Azerbaijan and Kazakhstan have territory that borders the Caspian Sea. Russia's geographical terrain encompasses the Arctic Ocean in the North, the Atlantic Ocean in the West, and the Pacific Ocean in the East. Additionally, it shares borders with the Baltic, Caspian, and Black Seas to the south.

In terms of mountainous terrain, Tajikistan has the highest percentage with more than 93% of the territory occupied by mountains, followed by Kyrgyzstan with 90%. The following countries have a lower but still considerable proportion of mountainous terrain: Armenia, where 77% of the territory is mountainous, Azerbaijan with approximately 60%, Belarus and Russia with an equal proportion of 30%, and Turkmenistan with 11%. The countries with the lowest percentage of mountainous terrain are Kazakhstan with only 6.3%, Uzbekistan with 3.8%, and Moldova which is considered a low-lying country and has no real mountain systems. [38]

The defined geographical conditions directly influence the climate of countries. Thus, **Tajikistan's** climate is characterized by aridity, extreme temperatures, and significant intra-annual and regional variability which is driven by the country's position at the intersection of atmospheric circulations. Annual mean temperatures vary from 17°C in the south, to -6°C in the lower Pamirs.[39] **Kyrgyzstan's** climate is as diverse as its topography, where the settlements located in the valley-sub-mountain zone (900-1,200 meters) experience hot summers, temperate and snow-free winters, and minimal precipitation, while the ones located in high-mountain (3,000-3,500 meters) zone usually have moderate climate with warm summers and cold, snowy winters.[40] **Armenia** features a highland continental climate, characterized by significant fluctuations between summer highs (June to August) and winter lows (December to February). The country's diverse topography results in considerable variations in climate, ranging from arid to sub-tropical and cold, high mountains. More mountainous areas experience even cooler temperatures, with prolonged snow cover.[41] **Azerbaijan** boasts a diverse climate, with nine of the world's eleven climate zones represented across its various regions. The country features semi-arid regions in its central and eastern areas, temperate zones in the north, continental zones in the west, as well as tundra zones. This results in significant variations in both average annual temperature and precipitation across the country. Typically, mountainous regions experience greater levels of precipitation and cooler temperatures than the drier and hotter central lowlands and Caspian Sea coast.[42]

The climate of Belarus and some parts of European Russia is characterized as humid continental, while Russian Siberia experiences a subarctic climate, and the polar regions have a tundra climate. The winters range from cool to frigid, with the coldest temperatures occurring in Siberia. Summers range from warm in the steppes to cool along the Arctic coast.[43] Turkmenistan is primarily characterized by a cold semi-arid climate, and its topography is dominated by the Karakum desert. Due to its continental location, the summers are typically hot, long, and dry. The northern parts of the country generally experience colder, longer winters with more snow, and shorter, relatively milder summers. Conversely, the southern regions have milder winters, with average temperatures well above freezing point, and experience the hottest summers.[44]

With regards to countries where a flat or rolling terrain predominates, Kazakhstan experiences an extreme continental climate, with long, hot summers and cold winters. However, there are two exceptions to this topography: the very low-lying areas located by the Caspian Sea in the west,

38 *Information about the mountainous terrain of CIS countries is retried from: http://dbpedia.org*

39 *Climatology: Tajikistan. https://climateknowledgeportal.worldbank.org/country/tajikistan/climate-data-historical*

40 *Climatology: Kyrgyzstan. https://climateknowledgeportal.worldbank.org/country/kyrgyz-republic/climate-data-historical*

41 *Climatology: Armenia. https://climateknowledgeportal.worldbank.org/country/armenia/climate-data-historical*

42 *Climatology: Azerbaijan. https://climateknowledgeportal.worldbank.org/country/azerbaijan/climate-data-historical*

43 *Climatology: Russia https://climateknowledgeportal.worldbank.org/country/russian-federation/climate-data-historical*

44 *Climatology: Turkmenistan https://climateknowledgeportal.worldbank.org/country/turkmenistan/climate-data-historical*

and the Altay Mountains, which reach altitudes of up to 7,000 meters, located on the eastern border with China and Kyrgyzstan.[45] Uzbekistan experiences an arid and continental climate, which is characterized by significant temperature fluctuations within days and between seasons. Most of the country's terrain, accounting for 79% of its area, is flat and features either semi-desert steppes or desert zones. In the far west, desert areas have emerged due to the Aral Sea's drying. Meanwhile, the remaining southeastern regions have a continental climate.[46] Finally, the climate of Moldova is moderately continental which is distinguished by relatively mild winters with limited snow, long warm summers, and low humidity. The warm climate persists for approximately 190 days in the country.[47]

In conclusion, the topography of a region plays a critical role in shaping the local climate. The earth's varied topography results in significant differences in temperature, precipitation, and other climatic factors that contribute to distinct weather patterns and ecosystems. The presence of mountains, deserts, and water bodies can significantly impact the amount of sunlight and heat absorbed by the region, resulting in variations in temperature and humidity. Similarly, the shape and slope of the land can influence wind patterns, leading to unique climatic zones that shape the vegetation and wildlife in an area. Consequently, topography and climate are crucial considerations when developing building codes and standards.

Moreover, the topography of a region affects the site selection, foundation design, and materials used in construction. Climate plays a vital role in the design of buildings to ensure they are energy-efficient, sustainable, and resilient to natural hazards.

Since climate change poses a significant threat to the built environment, building codes must evolve to incorporate more sustainable and resilient designs. Therefore, Chapters 2 and 3 provide an analysis of CIS countries building codes using regulatory and climate-responsive perspectives to identify the best practices which could be applied to the city of Khorog and to Tajikistan in general.

45 *Climatology: Kazakhstan.* https://climateknowledgeportal.worldbank.org/country/kazakhstan/climate-data-historical

46 *Climatology: Uzbekistan* https://climateknowledgeportal.worldbank.org/country/uzbekistan/climate-data-historical

47 *Climatology: Moldova.* https://climateknowledgeportal.worldbank.org/country/moldova/climate-data-historical

2

ANALYSIS OF BUILDING CODES THROUGH THE REGULATORY PERSPECTIVE

Building codes and regulations should be locally relevant and should be adaptable, especially in countries with different climates, rainfalls, and temperatures. Adequate building safety regulations should be tailored to local needs, adapting to a risk profile, building culture, availability of materials, and income level. In this view, to adapt the best practices to Khorog in particular, and Tajikistan in general, UN-Habitat used the Planning Law Assessment Framework, which is a quick self-assessment tool that aims to identify the strengths and weaknesses of an urban planning legal system.

This Framework allows for the analysis of the building codes and regulations of CIS countries which are incorporated in Chapter 3 by the following components:

1. Age of Building Code
2. Uniformity or Differentiation of Application
3. Scope for Local Materials
4. Resource-efficient Measures
5. Consideration of Small/Low-Cost Housing

2.1. AGE OF BUILDING CODE

Building codes should be periodically reviewed considering their effectiveness in delivering safe and resilient housing, meaning they should incorporate new knowledge related to the experience of building performance in construction materials and practices. UN-Habitat's methodology outlines five indicators (0-10 years; 10-20 years; 20-30 years; 30-50 years; no building code) to assess the relevance of building codes. Nevertheless, since in CIS countries, the building codes do not constitute a unified document and are developed separately to govern each topic, further review will help define an average age period for each country's building codes.

The Armenian building codes date back to the beginning of the 21st century. Among the analyzed ones, the earliest building code dates back to 2004 (IV-12.02.01-04 Heating, Ventilation and Air Conditioning) which substituted the previous construction norms of the Civil Code IV-12.02.01-00 "Heating, Ventilation and Air Quality Improvement" of 2000. In 2014, two building codes (31-01-2014 Residential Buildings Construction Standards and 30-01-2014 Urban Construction. Planning and Construction of Urban and Rural Residential Houses) terminated the relevant Soviet norms while in 2020, the same took place

with 31-03-Public Buildings and Constructions.[48] The next milestone was in 2016, with the adoption of building code RACN 24-01-2016 "Thermal Protection of Buildings" which partially substituted norms of II-7.02-95 "Construction Thermophysics of Building Envelope Constructions". On average, Armenian building codes were reviewed over a period between 5 to 30 years.

Among the **Azerbaijani** building codes**,** the earliest review took place in 2001 with the adoption of AzDTN 2.6-1 State Urbanization Norms and Rules "Planning, Construction and Improvement of Urban and Rural Settlements". They substituted those of 1989.[49] The next building norms among those reviewed were enforced in 2017 (Design Norms Heating, Ventilation and Air Conditioning) which invalidated the one of 1991. In 2021, the AzDTN 2.7-2 "Residential Buildings" terminated those of 1989.[50] The latest update took place in 2022 with the substitution of SNiP II-3-79 "Building Heat Engineering" by Design Standards AzDTN 2.12-4 "Thermal Protection of Buildings". Consequently, the review period of Azerbaijani norms varies from 5 to 40 years.

Belarus experienced a thorough review of building codes from 2019 to 2021, which reviewed Technical Codes of Good Practice previously applied. At the time of the revision, Belarus no longer applied Soviet norms, but was still in the process of adopting European standards.[51] Thus, in 2019, Belarus revised SN 4.02.03-2019 "Heating, Ventilation and Conditioning" as well as SN 3.02.01-2019 "Residential Buildings" and SN 3.02.02-2019 "Public Buildings", which date back to 2003 and 2018, respectively. In the year 2020, the norms of 2006,[52] 2008,[53] 2010,[54] and 2013[55] were revised while in 2021 the building code SN 2.04.02-2020 "Buildings and Constructions. Energy efficiency" was introduced for the first time. Therefore, norms of building codes in Belarus have undergone a review on average from 10 to 20 years. The only document Belarus has not reviewed and is still being applied – Sanitary Rules and Norms "Hygienic Requirements for Providing Insolation to Residential and Public Buildings, and Residential Building Territories" dates to 2008.

Kazakhstan's building regulations have also undergone review. In 2015, SP RK 3.02-101-2012 "Residential Buildings" and SP RK 3.02-107-2014 "Public Buildings and Structures" building codes entered into force. These versions, which dated back to 2007 and 2009 respectively, were then updated.

In 2012, 6 years after the 2009 version, the Code of Rules of the Republic of Kazakhstan SP RK 4.02-101-2012 "Heating, Ventilation and Air Conditioning" was updated. Furthermore, in 2015, 7 years after its previous version of 2013,[56] the SN RK 3.01-01-2013 "Urban Planning. Planning and Development of Urban and Rural Settlements" was updated. In 2022, SP RK 2.04-107-2022 "Design of Thermal Protection of Buildings" substituted the norms of 2013. This shows that a review of the analyzed building codes in Kazakhstan took place from 0 to 20 years. The document that has not been revised and that continues to apply is the SanPiN 3.01-077-00 "Sanitary Norms and Rules for Providing Insolation to Residential and Public Buildings and Residential Areas" which is from 2000.

Kyrgyzstan has partially reviewed its building regulations after declaring its independence. Thus, its building code MSN 3.02-04-2004 "Residential Buildings" has not been reviewed after its adoption, in 2004 respectively, though there are plans to do so57 as it was done in 2013 with SNiP KR 23-01:2013 "Building Heat Engineering (Heat Protection of Buildings)" which terminated the norms of 2009. SN KR 30-01:2020 "Planning and Building of Cities and Popular Points of City Type" having entered in force in 2020, substituted the previous document of 2016. The latest building code which has undergone review after more than 30 years is called SN KR 41-04:2022 "Heating, Ventilation and Conditioning" and that was done in 2023. Thus, to sum up, the building codes in Kyrgyzstan have either undergone a thorough

48 *Armenian 31-03-Public Buildings and Constructions substituted Soviet SNiP 2.08.02-89 "Public Buildings and Constructions".*

49 *SNiP 2.07.01-89 "Urban Planning. Planning and Development of Urban and Rural Settlements"*

50 *SNiP 2.08.01-89 "Residential Buildings"*

51 *П. (2022b). Новые строительные нормы по основам проектирования строительных конструкций утверждены в Беларуси. In primepress.by. https://primepress.by/news/kompanii/novye_stroitelnye_normy_po_osnovam_proektirovaniya_stroitelnykh_konstruktsiy_utverzhdeny_v_belarusi-45639/*

52 *SP 2.04.01-2020 "Construction Heat Engineering".*

53 *SN 3.01.03-2020 "Planning and Development of Settlements"*

54 *SP 2.04.02-2020 "Thermal Protection of Residential and Public Buildings. Energy Indicators"*

55 *SN 5.08.01-2019 "Roofs" (2020)*

56 *Академия Государственного управления при президенте Республики Казахстан. (n.d.). Строительство административного здания акимата Жандосовского сельского округа. https://repository.apa.kz/bitstream/handle/123456789/522/Строительство%20акимата%20Жандосовского%20с.о..pdf?sequence=2&isAllowed=y*

57 *В Бишкеке обсудят обновление национальных строительных норм с повышенными стандартами энергоэффективности. (2022). Новости Кыргызстана - КНИА «Кабар». https://kabar.kg/news/v-bishkeke-obsudiat-obnovlenie-natcional-nykh-stroitel-nykh-norm-s-povyshennymi-standartami-energoeffektivnosti/*

review after the Soviet time, or their review is pending. Thus, the average review period varies from 5 to 30 years.

Moldova is the country that has either introduced updated norms or keeps applying the Russian ones. In 2006, after a fifteen-year period, the NCM E 04.01-2006 "Thermal Protection of Buildings" was approved to become a national regulation. The same took place with the following building regulations which, after over a twenty-year period, in 2015 and 2018 NCM C.01.08-2015 "Residential Buildings" and NCM C.04.03-2015 "Roofs. Design Standards" as well as NCM C.01.12:2018 "Public Buildings" have been adopted. At the same time, SNiP 2.07.01-89 "Urban Planning. Planning and Development of Urban and Rural Settlements" of 1989, SNiP 2.04.05-91 "Heating, Ventilation and Conditioning" of 1991, and Russian Sanitary Rules and Norms SanPiN 2.2.1/2.1.1.1076-01 "Hygienic Requirements for Insolation and Sun Protection of Premises of Residential and Public Buildings and Territories" of 2001 are keep being applied without being adapted to Moldovan context. Overall, the age of building codes in Moldova varies from 15 to 30 years.

Russian norms have undergone review since the Soviet times and served as a basis for other countries' regulations. Thus, for example, in 2003, the SNiP 23-02-2003 "Thermal Protection of Buildings", SNiP 31-01-2003 "Residential Buildings" and SNiP 41-01-2003 "Heating, Ventilation and Conditioning" have been developed, though having undergone the latest review in 2013, 2016 and 2021 respectively.

The same is with SNiP SN 31-06-2009 "Public Buildings" which though dating 2009, has undergone review in 2022. SNiP 2.07.01-89 "Urban Development: Urban and Rural Planning and Development" though tracing Soviet times, have undergone review in 2017. SanPiN 1.2.3685-21 "Hygienic Standards for Ensuring the Safety and (or) Harmlessness of Environmental Factors for Humans" was eventually developed in 2021 based on the norms of 2001 Sanitary Rules and Norms SanPiN 2.2.1/2.1.1.1076-01 "Hygienic Requirements for Insolation and Sun Protection of Premises of Residential and Public Buildings and Territories". Consequently, each document of the specific area underwent review and adaptation to the current building realities in the country with a frequency from 5 to 10 years.

Tajik building codes are divided into those which have undergone a review right after the Soviet times and since then have not been updated and the ones which were reviewed severally, and those adopted from other countries, particularly Russia. The first category includes MKS ChT 31-02-2007 "Public Buildings and Facilities" enforced in 2007 which substituted norms of 1989. The second group is composed of documents dated 2018 and 2021. In 2018, the norms GNiP 31-01-2018 "Residential Multi-Apartment Buildings" and GNiP RT 30-01-2018 "Urban Planning, Planning and Development of Settlements" were adopted by substituting norms of 2012 and 2015 respectively. Moreover, in 2021, the SNiP 31-10-2021 "Roofs" 120.030.030 and the SNiP RT 23-02-2021 "Thermal Protection of Buildings" replaced the norms of 2010 and 2009 accordingly. SNiP 41-01-2003 "Heating, Ventilation and Conditioning" of 2003 falls under the third category, meaning they were directly adopted from Russia. Thus, the norms valid in the country are updated approximately at a frequency from 5 and 15 years.

In **Turkmenistan**, the least updated building code dates 1994 and is called SNT 3.05.02-94 "Heating, Natural Ventilation, and Air Conditioning" while the latest reviewed is of 2019 – SNT 2.08.02-19 "Public Buildings and Structures". In 2008, the SNT 2.07.01-08. "Urban Planning: Planning and Development of Cities and Towns" was adopted, while in 2015, two building codes (SNT 2.08.01-2015 "Residential Buildings" and TGK 2.03.10-01 "Roofs") have been reviewed. In this regard, the age of building codes varies from 5 to 20 years.

In the case of **Uzbekistan**, although the country does not apply Soviet norms, it still uses building norms from the end of the 20th century, namely "Heating, Ventilation, and Air Conditioning" which date back specifically to 1996. Furthermore, the building code KMK 2.01.04-97 "Construction Heat Engineering" which dates back to 1997, was updated in 2011. In 2003, the ShNK 2.07.01-03 "Urban Planning. Planning for the Development of Urban and Rural Settlements Territories" was adopted though it was revised later in 2009. 2006 marked the adoption of ShNK 2.08.01-05 "Residential Building". Furthermore, the following building codes were adopted: GNiP 2.08.02-09 "Public Buildings" Guidelines for the Design of Roofs; Roofs of Energy Efficient Buildings and Sanitary Rules; and Norms for Design, Installation, and Maintenance of Residential Buildings in Climatic Conditions. Consequently. These building

codes were adopted in the years 2011, 2012, and 2016, respectively. The review period for Uzbekistan ranges from 10 to 20 years. Overall, a considerable number of building codes have been modified to replace the Soviet standards, but as we will see in Chapter 3, some principles from the Soviet era still influence the updated regulations.

In general, the building codes examined in this analysis for CIS countries were usually reviewed every 5 to 40 years, which means that the review mechanism did not have a specific frequency. In addition, this mechanism, although still in place, is continuous but not sufficiently comprehensive.

2.2. UNIFORMITY OR DIFFERENTIATION OF APPLICATION

UN-Habitat[58] promotes the implementation and enforcement of building codes at the local level, which should be based on the tenets of the national regulations. However, with respect to the CIS countries and their building codes analyzed in this document, they are exclusively national in nature and set country-wide standards with direct application at the local level.

However, among the countries analysed, only Tajikistan,[59] Russia,[60] and Uzbekistan[61] provide for the possibility of applying building codes based on territorial criteria. Thus, Tajikistan calls those norms that could be applied to specific territories as a Provincial Normative Document in Building Construction. Their main idea is to provide for the necessary socio-economic and technical provisions for specific territories that are not laid down in national building codes and regulations or are provided as recommendations. In Russia, these documents are called Territorial Building Codes and are mandatory for use within the respective territories. They recommend provisions that consider natural, climatic, and social characteristics, national traditions, as well as economic opportunities of the republics, territories, and regions of the country. These are usually adopted by the executive authorities of the relevant federal subjects.

As part of their provisions, the regulations include standards for thermal insulation, heat supply, and water supply in Moscow, as well as regulations on thermal insulation and energy consumption for residential and public buildings in the Sakhalin region.[62] The same terminology is used in Uzbekistan, providing for the possibility to establish territorial building codes exclusively for the autonomous Republic of Karakalpakstan.

Consequently, local jurisdictions of the three countries can envisage the establishment of a regulation based on territorial basis. They could establish some individual regulations, detail the national document, or provide recommendations. However, it is not a commonly observed practice to have such regulations, and therefore, in the CIS countries, territorially adhered building codes are, with some exceptions, generally non-existent.

2.3. SCOPE OF LOCAL MATERIALS

Building codes should allow and encourage the use of locally available materials and construction techniques. It is fundamental to develop a building code suitable to local, social, and economic conditions that facilitates the safe use of locally sourced materials and building practices.[63]

This approach has been specified in the Soviet 1955 Building Norms and Rules "Building Materials, Parts and Constructions".[64] These standards and rules encouraged the use of local raw materials for the manufacture of building materials. The building code of 1962 "Building Materials, Products, Constructions, and Equipment"[65] stipulates that it is necessary to use, as much as possible, local building materials such as gypsum, gypsum-slag, slag-concrete, gas-ash-concrete, gas-and foam-silicate, and similar materials instead of the wooden parts of the building.

Modern norms of CIS countries do not establish such requirements. In some building codes (e.g., Collection of Estimated Prices for Building

58 UN-Habitat. (2018). Planning Law Assessment Framework. https://un-habitat.org/sites/default/files/download-manager-files/1531834456w-pdm_Planning%20Law%20Assessment%20Framework.pdf

59 Tajik MKS ChT 10.01-2005 "System Of Regulatory Documents in Construction. Main Provisions". (2005)

60 Russian Building norms and rules SNiP 10-01-94 "The System of Regulatory Documents in Construction. Basic Provisions". (1995). https://docs.cntd.ru/document/5200307

61 ShNK 1.01.01-09 "System of Regulatory Documents in Construction Main Provisions". (2009). https://mc.uz/wp-content/uploads/2020/12/shnk-1.01.01-09-rus.pdf

62 Territorial Building Codes. https://gostbank.metaltorg.ru/tsn/

63 UN-Habitat. (2018). Planning Law Assessment Framework. https://un-habitat.org/sites/default/files/download-manager-files/1531834456w-pdm_Planning%20Law%20Assessment%20Framework.pdf

64 Soviet Building Norms and Rules "Building Materials, Parts, and Constructions". (1955). https://files.stroyinf.ru/Data2/1/4293787/4293787381.pdf

65 Soviet Building Code "Building Materials, Products, Constructions, and Equipment". (1962). https://files.stroyinf.ru/Data2/1/4293777/4293777740.pdf

Materials, Products and Structures" building codes), there used to be a calculation of the cost of using local building materials. For example, in Kazakhstan, in 2004, the price of using local building materials was calculated in the regions of its territory.[66] Based on this, there was a possibility to choose between imported and local building materials. However, in the building codes of the analysed CIS countries, there is no obligation or any kind of incentive to use exclusively local materials.

2.4. RESOURCE-EFFICIENT MEASURES

The use of resource-efficient measures in building construction means the use of "green building practices". The goal is to reduce greenhouse gas emissions using both sustainable design and building materials.[67] This could be achieved by applying climate-sensitive practices, which are extensively discussed in Chapter 3.

2.5. CONSIDERATION OF SMALL/LOW-COST HOUSING

UN-Habitat's methodology promotes the consideration of low-cost options for small/low-cost housing, by subsidizing specific materials, promoting fast-track approval, and/or providing specific housing typologies. Nevertheless, and within the framework of the documents analyzed in Chapter 3, there is no separate definition of the standards applicable to low-cost housing.

Among a wide range of documents, only Kazakhstan enshrines the low-cost housing standards in its building code ST RK 3.02-03-2012 "State Social Housing" of 2015. It defines functional requirements, as well as performance requirements in the form of minimum parameters and qualities of social housing. Thus, the standards of social housing should not be lower than any of those defined in the legislation, namely natural and artificial lighting, noise protection, thermal protection of buildings, and building accessibility for people with disabilities, etc.

Other CIS countries enshrine social housing in their legislation to different extents. Tajikistan, in the 2022 Housing Code, guarantees and regulates the issue of social housing in a separate chapter. This chapter implies the provision of housing under a social rental agreement to those in need. However, there are no detailed standards for such social housing yet. Turkmenistan, in its 2013 Housing Code,[68] also enshrines social housing. In Moldova, the 2015 Law "On Housing" No.75 under a separate chapter, defines general and specific provisions on social housing where, for example, the living space for social housing is set at 9 square meters per person.[69]

In Russia, the topic of economy-class housing is disclosed in the Methodological Recommendations for Establishing the Characteristics of Economy-Class Housing in Relation to Residential Buildings, the Construction of which is Carried out using Federal Budget Funds.[70] Though they are not mandatory, but of a recommendatory nature, they establish that the recommended area of apartments for a 1-room apartment should be between 28 and 45 square meters, where a living room should occupy not less than 14 square meters, the bedroom – 8-10 square meters, and the kitchen – 6 square meters. For the construction of such houses, it is necessary to use environmentally friendly building technologies and materials and build in such a way that, if the established requirements for the internal microclimate of the premises and other living conditions are met, the efficient and economical use of energy resources during its operation is ensured. In Kyrgyzstan, as of January 2023, the discussion of the draft law "On social housing" is ongoing.[71]

Thus, on technical level of the building code, only Kazakhstan enshrines standards for low-cost housing. Other countries discussed above also provide for the establishment of social housing standards, though only on the basic law level.

66 *Сборник сметных цен на строительные материалы, изделия и конструкции (СН РК 8.02-04-2002, СН РК 8.02-04С-2004). (n.d.).* https://online.zakon.kz/Document/?doc_id=30777002&pos=1;-16#pos=1;-16

67 *UN-Habitat. (2018). Planning Law Assessment Framework.* https://un-habitat.org/sites/default/files/download-manager-files/1531834456w-pdm_Planning%20Law%20Assessment%20Framework.pdf

68 *Жилишный кодекс Туркменистана. (1996).* https://mejlis.gov.tm/ru/zakonodatelstvo/kodeksyi/374-iv

69 *Law "On Housing" No.75. (2015).* https://lege.md/ru/o_zhile/st-13

70 *Methodological Recommendations for Establishing the Characteristics of Economy Class Housing in Relation to Residential Buildings, the Construction of which is Carried out using Federal Budget Funds. (2010).* https://docs.cntd.ru/document/902209114

71 *Кызы, Г. М. (2023, January 20). В Кыргызстане предлагают создать фонд, предоставляюший в аренду жилье малоимушим. 24.kg.* https://24.kg/obschestvo/256225_vkyirgyizstane_predlagayut_sozdat_fond_predostavlyayuschiy_varendu_jile_maloimuschim/

3

ANALYSIS OF BUILDING CODES THROUGH THE CLIMATE-RESPONSIVE PERSPECTIVE

Climate-responsive architecture is centered on designing buildings that work in harmony with the local climate, not despite it. The design of climate-responsive buildings should reflect the weather conditions in the precise area where the building is constructed, utilize the data on the region's weather patterns, and account for factors like seasonality, the intensity of the sun, wind, rainfall, and humidity.[72] In general, and according to the UN Environment Programme methodology,[73] the following facts should be considered when designing high-performance buildings:

- Building Site and Orientation
- Building Configuration and Layout
- Natural Ventilation
- Roofs
- Thermal Adaptation
- Materials for Thermal Comfort

The following chapters will analyze the building codes of CIS countries based on the categories above.

72 *Malekafzali, A. (n.d.). The Future of Architecture: Climate-Responsive Design. https://www.sageglass.com/sites/default/files/the_future_of_architecture-_climate-responsive_design_0.pdf*

73 *United Nations Environment Programme (2021). A Practical Guide to Climate-Resilient Buildings & Communities. Nairobi.*

3.1. BUILDING SITE AND ORIENTATION

To adapt to increasing temperatures and to mitigate overheating, a building's performance can be significantly impacted by its location[74] meaning its orientation in relation to the path of the sun and the prevailing wind in a specific region. To achieve good orientation, the most important factors to consider are:

- region climate.
- true north and sun angles for the site or building.
- the optimum building design for its applicable climate zone.
- the effects of climate change.[75]

On the USSR territory, the foundations for the orientation of buildings were enforced in 1938 with the adoption of the Temporary Norms for the Construction Design of Residential Buildings where for the first time, the so-called design temperatures to determine the required resistance to heat transfer of external walls were included enshrined. In 1948, the Norms for the Design of Residential Buildings were adopted. This norm classified the territory into five regions[76]. Moreover,

74 *United Nations Environment Programme (2021). A Practical Guide to Climate-Resilient Buildings & Communities. Nairobi.*

75 *Orientation | YourHome. (n.d.). https://www.yourhome.gov.au/passive-design/orientation*

76 *Orientation | YourHome. (n.d.). https://www.yourhome.gov.au/passive-design/orientation*

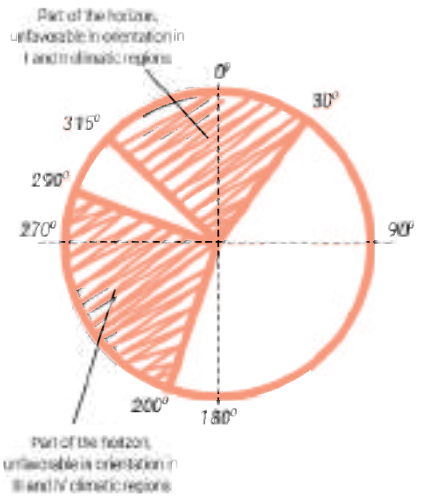

Fig 3. Recommended orientation of rooms under 1958 SNiP on Residential Buildings

the SNiP of 1958 on Residential Buildings provided 4 regions of climatic regions and micro-districts of the USSR and their characteristics. This document specifically stated that the orientation of the windows of the living rooms of apartments and dormitories to the northern part of the horizon within 315-30o in I and II climatic regions to the western part of the horizon within 200-290o in III and IV regions is not allowed (refer to Figure 1 for visualization).[77]

In SNiP of 1962 on Residential Buildings, a limitation regarding the orientation of windows in the areas north of the Arctic Circle within the range from 315 to 45 was added.78 The following SNiP II-L.1-71 on Residential Buildings[79] was the last where the topic of orientation was covered.[80] In addition to the limitation of the orientation of rooms, when placing buildings in the I and II climatic regions, in areas where the prevailing winter winds have a direction ranging from 290 to 70°, it is allowed to orient no more than one living room in two-room and three-room apartments, and no more than two living rooms to this sector of the horizon in four-room and five-room apartments. In dormitories, and in all climatic regions, it is allowed to orient living rooms to the horizon sector within the range from 310 to 50° , as well as to the sector from 200 to 290° in III and IV climatic regions; the total area of such rooms should however, not exceed 40% of the total living area of the dormitory.

Among the documents available for analysis in modern CIS countries, the norm on the orientation of windows is directly enshrined in building codes on residential buildings in Moldova[81], Uzbekistan[82], and Russia.[83] Thus, both under Moldovan and Russian norms, the orientation of the building and its premises should be regarded in relation to the cardinal points, considering the prevailing directions of the cold wind and solar radiation fluxes. According to Uzbek norms, the orientation of the windows of living rooms to the western part of the horizon in zones I and II within 200-290° should be avoided. It is allowed to orient one room to the west in two-room apartments; in three-room apartments, not more than two rooms should be oriented in this way. With regards to dormitories, no more than 25% of living rooms with sun protection devices or special glazing should be oriented in the specified direction.

In conclusion, among the contemporary CIS nations, fewer than half have incorporated the norm concerning orientation in relation to the horizon. This observation indicates that CIS countries, to a significant degree, do not include this element in their building codes.

3.2. BUILDING CONFIGURATION AND LAYOUT

The shape and surroundings of a building significantly impact its energy consumption, as they can lead to heat gain during cooling periods and heat loss during periods when heat is needed. Thus, in cold climates, the main rooms should either be south-facing (in the northern hemisphere) or north-facing (southern hemisphere), to capture as much solar gain (and thereby, warmth) as possible. In hot climates, the opposite can be done to reduce the heat gained from sun during the day.[84] The insolation (solar radiation) concept is responsible for this.

77 SNiP on Residential Buildings. (1958). https://files.stroyinf.ru/Data2/1/4293781/4293781301.pdf

78 SNiP on Residential Buildings. (1961). https://files.stroyinf.ru/Data2/1/4293800/4293800719.pdf

79 SNiP II-L.1-71 on Residential Buildings (1971). https://files.stroyinf.ru/Data2/1/4293823/4293823188.pdf

80 SNiP 2.08.01-85 "Residential Buildings" (https://files.stroyinf.ru/Data2/1/4293793/4293793708.pdf) and SNiP 2.08.01-89 "Residential Buildings" (https://files.stroyinf.ru/Data2/1/4294854/4294854790.pdf) do not contain provision on orientation.

81 Moldovan NCM C.01.08-2015 "Residential Buildings". (2015). https://www.proiectari.md/wp-content/uploads/2017/07/ro_2060_NCM-C.01.08.pdf

82 Uzbek ShNK 2.08.01-05 "Residential Building". (2006). https://shnk.uz/wp-content/uploads/2021/08/shnk_2.08.01-05rus.pdf

83 Russian SNiP 31-01-2003 "Residential Buildings" (actualized version of 2016 by SP 54.13330.2016). https://gusn.mosreg.ru/deyatelnost/knd/gosudarstvennyy-stroitelnyy-nadzor/normativno-pravovye-akty-soderzhashie-obyazatelnye-trebovaniya/14-09-2018-12-51-38-sp-54-13330-2011-zdaniya-zhilye-mnogokvartir-nye-a

84 United Nations Environment Programme (2021). A Practical Guide to Climate-Resilient Buildings & Communities. Nairobi.

In Soviet times, the insolation concept was primarily enshrined in the 1963 Sanitary Norms and Rules for Ensuring Insolation of Residential and Public Buildings and Residential Development of Populated Areas which defined that the duration of continuous insolation, in the premises and territories should be for at least 3 hours at all geographical latitudes. The insolation standard was determined on March 22 and September 22, the calculations did not consider the first hour after sunrise and the last hour before sunset for areas south of 60°N. For areas north of 60 °N, the calculations did not consider the first and last 1.5 hours of the day. With regards to residential buildings, the standard duration of solar radiation should be provided in one room of 1, 2, and 3-room apartments. It should be provided in at least 2 rooms of 4-room apartments, and in at least 30% of the rooms of multi-room apartments, bedrooms of dormitories, and hotels. The document enshrined that year-round shading of buildings and territories is not allowed, and it also contained a list of publications outlining the methodology for calculating insolation with general instructions for performing calculations. The document stipulates the need to submit the corresponding section as part of the planning and the development projects.

The next phase was in 1974 when a new edition of Sanitary Norms and Rules for Providing Insolation to Residential and Public Buildings and Residential Areas of Cities and Other Settlements (hereinafter referred to as "1974 Sanitary Norms and Rules") was issued. Same as the previous one, it defined that the normative duration of insolation was 3 hours. However, in the new edition, this figure is tied to different periods of the year depending on the geographic latitude – the normalized period is 6 months (March-September) south of 60 °N latitude and 4 months (April-August) north of 60°N.

With the increase in the number of storeys of constructions of 9-12 floors, it became necessary to develop norms that could help in reducing the cost of construction, contribute to its mass character, and, as a result, increase the standard of living by reducing insolation standards . Thus, in 1982, SanPiN 2605-82 Sanitary Norms and Rules for Providing Insolation to Residential and Public Buildings and Residential Areas was introduced.[85] The target value of continuous insolation, which ensures its optimal efficiency, has been 3-4 hours. However, 3 hours was accepted as a normative value only for residential buildings in the northern geographic zone. The boundary of the northern zone is set at 58°N (2° south of the 1974 Sanitary Norms and Rules). In the central geographic zone (58°-48 °N), the standard duration of insolation is reduced to 2 hours and 30 minutes. In the southern geographic zone (south of 48° N), the insolation rate is reduced even more – to 2 hours with an increase in the calculation period to 8 months – from February 22 to October 22. This document also introduced a new and significant provision of the new edition – the norm of intermittent insolation (previously only continuous was allowed).[86]

After the collapse of the USSR, such CIS countries as Belarus, Kazakhstan, Moldova, Russia and Uzbekistan introduced the insolation concept under the sanitary rules and regulations document. In 1994, Belarus enacted the Sanitary Rules and Regulations 10-25-94, and in 2008 the country amended them with the Sanitary Rules and Norms "Hygienic Requirements for Providing Insolation to Residential and Public Buildings and Residential Building Territories"[87] (hereinafter referred to as "Belarus Sanitary Rules and Norms on Insulation"), which are still in force. They mention that in the residential and public buildings optimal efficiency of insolation should be achieved by appropriate placement, orientation, and layout of buildings.

In 2000 Kazakhstan introduced the SanPiN 3.01-077-00 "Sanitary Norms and Rules for Providing Insolation to Residential and Public Buildings and Residential Areas" (in force) which prescribed that insolation is an important health factor and should be considered during the construction of all residential and public buildings as well as residential areas. The optimal efficiency of insolation provides for general health improvement, as well as psychophysiological, bactericidal, and thermal effects while ensuring daily continuous 2.5-3-hour exposure to direct sunlight of rooms and territories. Nevertheless, some documents in Kazakh legislation still refer to the 1982 SanPiN

85 *SanPiN 2605-82 Sanitary Norms and Rules for Providing Insolation to Residential and Public Buildings and Residential Areas (1982).* https://meganorm.ru/Data2/1/4294853/4294853869.pdf

86 *Popovskiy, Y. (2015). History of Sanitary-and-Epidemiologic Regulation of Residential Houses Insolation in USSR and Russian Federation.* https://cyberleninka.ru/article/n/istoriya-sanitarno-epidemiologicheskogo-normirovaniya-insolyatsii-zhilyh-pomescheniy-v-sssr-i-rossiyskoy-federatsii/viewer

87 *Belarus Sanitary Rules and Norms "Hygienic Requirements for Providing Insolation to Residential and Public Buildings and Residential Building Territories". 2008.* https://minzdrav.gov.by/upload/lcfiles/text_tnpa/000181_144605_Post7980_SanPin.pdf

2605-82 "Sanitary Norms and Rules for Providing Insolation to Residential and Public Buildings and Residential Areas" generating a conflict of application.

In 2001 Russia enacted the Sanitary Rules and Norms SanPiN 2.2.1/2.1.1.1076-01 "Hygienic Requirements for Insolation and Sun Protection of Premises of Residential and Public Buildings and Territories" (hereinafter referred to as "Russian Sanitary Rules and Norms on Insulation") which was subsequently substituted in 2021 by the SanPiN 1.2.3685-21 "Hygienic Standards for Ensuring the Safety and (or) Harmlessness of Environmental Factors for Humans".[88] It provides the standards for insulation in the premises of residential buildings, public buildings, and residential areas. In the case of Moldova,[89] the country still uses the Russian Sanitary Rules and Norms on Insulation. Uzbekistan, in 2016, implemented Sanitary Rules and Norms for Design, Installation, and Maintenance of Residential Buildings in Climatic Conditions which defines that, considering the geographical zone of Uzbekistan, the optimal efficiency of insolation in residential buildings is achieved with a continuous solar irradiation of 2.5 hours for the period from March 22 to September 22 indoors, and at least 0.5-1 hour in the local area. In residential buildings of the meridian type, and for apartments where all residential premises are simultaneously insolated, as well as in a reconstructed residential building and/or in particularly difficult urban planning conditions (a historically valuable urban environment, a citywide or district center), it is allowed to reduce the duration of insolation, but not for more than for 0.5 hours.

Moreover, the document specified that the thermal comfort conditions of natural illumination, and the insolation of individual functional premises of residential buildings and public buildings largely depend on their correct orientation and placement on the territory of the settlement. It enshrines that the orientation of the windows of living rooms to the western part of the horizon within 200-290o (for all regions of Uzbekistan) is not allowed. As an exception, it is allowed to focus on the specified part of the horizon in two-room apartments.

Furthermore, in Uzbekistan, it is important to meet certain requirements to prevent excessive heat from sunlight in the living rooms of apartments and sleeping areas of dormitories. Specifically, this applies to spaces that are exposed to light through openings with azimuths ranging from 90 to 290o in all regions of the country.

Nevertheless, in addition to sanitary rules and norms, all CIS countries cover the topic of insolation by either building codes on residential and public buildings topics, or by urban planning-related ones90 though to a different extent.

For example, Armenia superficially discloses the insolation topic in residential[91] and does not cover it at all in the building codes for public buildings[92]. In the first case, it is mentioned that when designing residential buildings, it is necessary to ensure the duration of continuous insolation of apartments for at least 2.5 hours during the day from March 22 to September 22, while the vertical angle of incidence of direct sunlight on the horizontal plane of the height of the windowsill of the glazed light opening of the outer wall should be 60° or more. The insolation of an apartment is considered sufficient if the normative insolation of one of the living rooms in a 1-3-rooms apartment and at least two living rooms in 4-room apartments or more. Reconstruction of a residential building or redevelopment of apartments should not lead to a decrease in the standard level of insolation duration. Under the 30-01-2014 "Urban Construction. Planning and Construction of Urban and Rural Residential Houses" norms[93] [94] it is mentioned that the placement and orientation of residential and public buildings should ensure the

88 *SanPiN 1.2.3685-21 "Hygienic Standards for Ensuring the Safety and (or) Harmlessness of Environmental Factors for Humans (2021). http://www.xn--h1aaihfr1b9dc.com/SanPiN_1_2_3685_21.pdf*

89 *Moldova Construction Regulations NCM C.01.15:2018. http://ednc.gov.md/upload/61/NCM_C_01.152018.pdf*

90 *During USSR, the insulation norms were also enshrined in an urban planning-related document – SNiP II-60-75 "Planning and Development of Cities, Towns and Rural Settlements" (paragraph 5.22) (https://files.stroyinf.ru/Data2/1/4293850/4293850839.pdf). It mentioned that the placement and orientation of residential and public buildings (with the exception of preschool institutions, general education schools, and boarding schools) should ensure the continuous duration of insolation of premises and territories. With regards to the central zone (in the range of geographic latitudes 58-48°N), it should be provided for at least 2.5 hours a day for the period from March 22 to September 22; with regard to the northern zone (to the north of 58°N), it should be provided for at least 3 hours for the period from April 22 to August 22; and with regard to the southern zone (south of 48°N), it should be provided for at least 2 hours for the period from February 22 to October 22.*

91 *Armenian 31-01-2014 Residential Buildings Construction Standards. (2014). https://www.arlis.am/documentview.aspx?docid=90112*

92 *Armenian 31-03-Public Buildings and Constructions. (2020). https://www.arlis.am/documentview.aspx?docid=148184*

93 *Armenian 30-01-2014 "Urban Construction. Planning and Construction of Urban and Rural Residential Houses". (2014). https://www.arlis.am/documentView.aspx?docid=157102*

94 *Armenian 30-01-2014 "Urban Construction. Planning and Construction of Urban and Rural Residential Houses". (2014). https://www.arlis.am/documentView.aspx?docid=157102*

duration of insolation of buildings and territories.

Thus, for the cold zone, it should be at least 2.5 hours a day (from April 22 to August 22), for the middle zone it should be at least 2 hours a day (from March 22 to September 22), and for the hot zone, it should be at least 1.5 hours a day (from February 22 to October 22). For residential buildings used mostly during summer period , where all the premises of the apartment are insolated, as well as in difficult urban planning conditions (historically valuable urban environment, the use of expensive engineering preparations), it is allowed to reduce the duration of insolation by 0.5 hours for each zone. It is also enshrined that for hot zones, it is necessary to provide for measures to limit the thermal impact of insolation in the warm season (with playgrounds, sports facilities, public recreation areas, efficient planting of greenery, and installation of special sun protection structures).

Azerbaijan, under its design norms AzDTN 2.7-2 "Residential Buildings" defines that in 1-, 2- and 3-room apartments, at least one living room, and in 4 or more rooms, at least two rooms, must be provided with normalized insolation continuity.[95] The information on insolation is part of the AzDTN 2.6-1 State Urbanization Norms and Rules "Planning, Construction and Improvement of Urban and Rural Settlements"[96] where it is mentioned that the placement and orientation of residential and public buildings (except for preschool and educational institutions) must ensure uninterrupted insolation of residential premises and territory from March 22 to September 22 and for at least 2.5 hours.

The placement and orientation of preschool and general education, medical and recreational institutions should ensure uninterrupted continuity of insolation for 3 hours in rooms determined by both, the relevant sanitary standards, and the rules for the insolation of residential and public buildings, housing stock, and construction sites. Also, when placing all the premises of apartments in insulated longitudinal (from north to south) buildings of the meridional type, as well as in the conditions of reconstruction of residential buildings, or in special difficult urban planning conditions of new constructions (valuable historical urban ecology, high cost of engineering preparation of the terrain, urban and district centers), it is allowed to reduce the time of insolation by 0.5 hours.

The Belarus SN 3.02.01-2019 "Residential Buildings"[97], SN 3.02.02-2019 "Public Buildings"[98] and SN 3.01.03-2020 "Planning and Development of Settlements"[99] defines the necessity to consider insolation and refer for additional information to Belarus Sanitary Rules and Norms on Insolation.

With regards to residential buildings, Kazakh SP RK 3.02-101-2012 "Residential Buildings" building code[100] mentions that the normalized duration of insolation should be provided at least in one living room for the 1-, 2- and 3-rooms apartments, and in at least two living rooms for the 4 (or more)-room apartments. In addition, the document recommends that when orienting windows to the southwest, sun protection devices that prevent excessive insolation and overheating of the premises in the summer should be installed.

The issue of insolation is widely discussed in the SP RK 3.02-107-2014 "Public Buildings and Structures" document[101] (in the annex), which provides the calculation of the duration of insolation with regards to defining the calculated point of the window, window with the balcony, window with a loggia, and the window with the adjoining wall. Furthermore, the document also includes the insolation definition scheme. As for the urban planning-related norms, the SN RK 3.01-01-2013 "Urban Planning. Planning and Development of Urban and Rural Settlements"[102] outlines that the placement and orientation of residential and public buildings should ensure the duration of insolation of premises and territories pursuant to the Soviet 1982 SanPiN 2605-82 "Sanitary Norms and Rules for Providing Insolation to Residential and Public Buildings and Residential Areas" norms.

The Kyrgyz construction norms (MSN 3.02-04-

95 *Azerbaijan AzDTN 2.7-2 "Residential Buildings" Design Norms. (2021).* https://arxkom.gov.az/en/qanunvericilik/normativler/binalarin-muhendis-sistemleri/zhilye-zdaniya

96 *Azerbaijan AzDTN 2.6-1 State Urbanization Norms and Rules "Planning, Construction, and Improvement of Urban and Rural Settlements". (2001).* https://e-qanun.az/framework/10957

97 *Belarus SN 3.02.01-2019 "Residential Buildings". (2020).* http://mapid.by/assets/files/sn-3.02.01-2019.pdf

98 *Belarus SN 3.02.02-2019 "Public Buildings". (2022).* https://normy.by/mand.php?6661

99 *SN 3.01.03-2020 "Planning and Development of Settlements". (2021).* https://primaline.by/assets/files/w22136480p_1617051600.pdf

100 *Kazakh SP RK 3.02-101-2012 "Residential Buildings". (2015).* https://www.egfntd.kz/upload/NTD/СП%20PK/211021/SP_RK_3.02-101-2012.pdf

101 *Kazakh SP RK 3.02-107-2014 "Public Buildings and Structures". (2015).* https://www.egfntd.kz/upload/NTD/СП%20PK/211021/SP_RK_3.02-107-2014.pdf

102 *SN RK 3.01-01-2013 (amended 05.03.18_45-NK) "Urban Planning. Planning and Development of Urban and Rural Settlements".* https://www.egfntd.kz/upload/NTD/SNRK22/3_01_01_2013.pdf

2004 "Residential Buildings") were absent online and did not cover the insolation concept,[103] while its urban planning related document – SN KR 30-01:2020 "Planning and Building of Cities and Popular Points of City Type"[104] widely considers insolation topic. Thus, it defines that the placement and orientation of residential and public buildings (apart from preschool institutions, general education schools, and boarding schools) should ensure the continuous duration of insolation of residential premises and territories, south of 58 N.L. for at least 2.5 hours a day for the period from March 22 to September 22.

In residential buildings of the meridional type, where all rooms of the apartment are insolated, as well as during the reconstruction of residential buildings or when placing new construction in especially difficult urban planning conditions (historically valuable urban environment, expensive preparation of the territory, the zone of the citywide and regional center), it is allowed to reduce the duration insolation of the premises for 0.5 hours, for each zone respectively. Moreover, the document determines that trees planted near buildings should not interfere with the insolation of residential and public buildings.

The Moldovan norms briefly refer to the insolation of buildings. In relation to residential buildings, the normalized duration of insolation should be provided: in 1-, 2- and 3-room apartments – at least in one living room; in 4-room apartments and more – in at least two living rooms.[105] For public buildings, insolation is not mentioned106 while in terms of urban planning-related norms, the SNiP 2.07.01-89 "Urban Planning. Planning and Development of Urban and Rural Settlements"[107] is used.[108]

In the case of Russia, the SNiP 31-01-2003 "Residential Buildings",[109] SNiP SN 31-06-2009 "Public Buildings",[110] and the SNiP 2.07.01-89 "Urban Development. Urban and Rural Planning and Development"111 provide a brief review of the insolation topic while a comprehensive coverage of the subject is carried out in the applicable SanPiN 1.2.3685-21 "Hygienic Standards for Ensuring the Safety and (or) Harmlessness of Environmental Factors for Humans".

Tajik building codes on residential[112] and public[113] buildings generalize the issue of insolation topic. Regarding the information on adjustment of the insolation duration, such information can be found within the norm GNiP RT 30-01-2018 "Urban Planning, Planning and Development of Settlements" (paragraphs 290-293).

Regarding the placement and orientation of residential and public buildings, they must ensure the continuous duration of insolation of the premises for at least 2.5 hours per day for the period from March 22 to September 22. In the case of children's playgrounds, sports grounds and recreation areas within residential buildings, as well as for the playgrounds of preschool institutions, sports zones, recreational areas, and educational and experimental zones of general education schools, boarding schools, and vocational schools, at least 2.5 hours of continuous insolation should be provided.

The document also mentions that the duration of the minimum insolation time must be ensured in the following spaces:

- in residential buildings – at least in one living room of one-, two-, three-room apartments;
- in two living rooms of 4-5-rooms apartments;
- in dormitories – not less than 60% of living rooms;
- in preschool institutions – in playing and group ones;
- in general education schools, boarding schools, and vocational schools in at least 75% of classes, bedrooms, and game rooms and at least 50% of classrooms and laboratories.

103 *Kyrgyz Public Buildings and Facilities building code. (2018). http://cbd.minjust.gov.kg/act/view/ru-ru/200296*

104 *SN KR 30-01:2020 "Planning and Building of Cities and Popular Points of City Type". (2020). http://cbd.minjust.gov.kg/act/view/ru-ru/200523*

105 *Moldovan NCM C.01.08-2015 "Residential Buildings". (2015). https://www.proiectari.md/wp-content/uploads/2017/07/ro_2060_NCM-C.01.08.pdf*

106 *Moldovan NCM C.01.12:2018 "Public Buildings". (2018). http://ednc.gov.md/upload/61/NCM_C.01.122018.pdf*

107 *Russian SNiP 2.07.01-89 "Urban Planning. Planning and Development of Urban and Rural Settlements". (1990). https://docs.cntd.ru/document/5200163*

108 *Moldovan Information Bulletin No. 3 – 2019. List of normative documents. (2019). http://www.incercom.md/Buletin%203.2019.pdf*

109 *Russian SNiP 31-01-2003 "Residential Buildings" (actualized version of 2016 by SP 54.13330.2016). https://gusn.mosreg.ru/deyatelnost/knd/gosudarstvennyy-stroitelnyy-nadzor/normativno-pravovye-akty-soderzhashie-obyazatelnye-trebovaniya/14-09-2018-12-51-38-sp-54-13330-2011-zdaniya-zhilye-mnogokvartir-nye-a*

110 *Russian SNiP SN 31-06-2009 "Public Buildings". https://tiflocentre.ru/documents/sp-118-13330-2022.php*

111 *Russian SNiP 2.07.01-89 "Urban Development. Urban and Rural Planning and Development" actualized by SP 42.13330.2016 (2016). https://docs.cntd.ru/document/456054209*

112 *Tajik GNiP 31-01-2018 "Residential Multi-Apartment Buildings". (2018)*

113 *Tajik МҚС ҶТ 31-02-2007 "Public Buildings and Facilities".*

When reconstructing residential buildings or placing new construction with particularly difficult urban planning conditions, as well as in residential buildings of the meridional type, where all rooms of the apartment are insulated, it is allowed to reduce the duration of insolation by 0.5 hours.

With regards to Turkmenistan, among its residential buildings (SNT 2.08.01-2015 "Residential Buildings"), public buildings (SNT 2.08.02-19 "Public Buildings and Structures")[114] and urban planning-related building codes (SNT 2.07.01-08. "Urban Planning. Planning and Development of Cities and Towns"), only the second one was accessed though it does not contain a provision on solar insolation.

Uzbekistan avails all norms on residential[115] and public[116] buildings as well as urban planning-related ones[117] which contain the solar insolation topic. Moreover, it applies the 2016 Sanitary Rules and Norms discussed above. Despite the broad legal framework, and in addition to the norms for the construction of public buildings in 2012, a Handbook on the Design of New Energy-Saving Solutions for Public Buildings[118] was compiled. It stresses that the duration of insolation, determined by sanitary and hygienic standards, should be 3 hours per day from March 22 till September 22, and should be provided in the premises of group preschool institutions, in dormitory boarding schools, and in 50% of the classrooms of general education schools (primarily in the premises of primary classes). Intermittent insolation in the listed premises is allowed, provided that the total duration of insolation during the day is increased by at least 0.5 hours.

Moreover, not only by providing protection from solar radiation, excessive insolation and reflected glare from the surfaces of neighboring buildings by using the optimal orientation and location of the premises, but also by the landscaping of the adjacent territory, and the use of sun protection devices, which includes tinted protective glazing.

3.3. NATURAL VENTILATION

Both the building's orientation on the site and the building's internal configuration can be designed to take advantage of cooling breezes. The prevailing wind direction should be considered when deciding the building orientation on the site to allow for optimum positioning of windows and to maximize natural ventilation whenever outside temperatures are low. directing the prevailing winds towards the building, is one of the best ways to achieve relative "coolth" in habitable spaces.[119]

All **USSR** norms, though to a different extent, provided for natural ventilation. Thus, those of 1962 "On Heating, Ventilation, and Air Conditioning"[120] provided for the possibility to establish three types of ventilation: natural, mechanical, and mixed. According to this, natural ventilation is subject to ensuring normalized air conditions in the premises if it is acceptable according to technological conditions. Air supply to the premises with natural ventilation should be provided in the warm season at a level of 0.3 to 1.8 m and in the cold season – at least 4 m from the floor to the bottom of the opening.

The Construction norms and rules of 1975[121]enshrined a novelty in the context of natural ventilation on its standards for industrial premises, which states that natural ventilation (including periodic ventilation) should be designed if it is permissible under the conditions of the technological process or the presence of people, as well as the storage of goods or materials. Building norms of 1988[122] supplemented that ventilation systems with natural induction for industrial premises should be calculated: in the cold period of the year for all heated premises, and in the warm period of the year for premises

114 *Turkmen SNT 2.08.02-19 "Public Buildings and Structures". (2019).* https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwi7uKH2rNH9AhXjwAIHHcWSBu0QFnoECCcQAQ&url=https%3A%2F%2Fwww.pdf-archive.com%2F2018%2F06%2F14%2Funtitled-pdf-document-22%2F&usg=AOvVaw2RrueaHLhGnz_vs9jwgGU2

115 *Uzbek ShNK 2.08.01-05 "Residential Building". (2006).* https://shnk.uz/wp-content/uploads/2021/08/shnk_2.08.01-05rus.pdf

116 *Uzbek GNiP 2.08.02-09 "Public Buildings". (2011).* https://lex.uz/docs/4444293

117 *Uzbek ShNK 2.07.01-03 "Urban Planning. Planning for The Development of Urban and Rural Settlements Territories". (2009).* https://shnk.uz/wp-content/uploads/2021/08/shnk_2.07.01-03rus.pdf

118 *Handbook on the Design of New Energy-Saving Solutions for Public Buildings. (2012).* https://mc.uz/wp-content/uploads/2022/01/pos.-shnk-2.08.02-09.pdf

119 *United Nations Environment Programme (2021). A Practical Guide to Climate-Resilient Buildings & Communities. Nairobi.*

120 *Building Norms and Rules. SNiP II-H.7-6 "Heating, Ventilation and Air Conditioning". (1962).* https://files.stroyinf.ru/Data2/1/4293803/4293803950.pdf

121 *Building Norms and Rules. SNiP P-33-75 "Heating, Ventilation and Air Conditioning". (1976).* https://files.stroyinf.ru/Data2/1/4293801/4293801325.pdf

122 *Building Norms and Rules. SNiP 2.04.06-86 "Heating, Ventilation and Air Conditioning". (1988).* https://meganorm.ru/Data2/1/4294815/4294815604.pdf

with excess heat – based on the difference in the specific gravity of air at the calculated parameters of the external and internal air of the considered period of the year; in the warm season for rooms without excess heat – based on the action of the wind, assuming a wind speed of 1 m/s. The most recent regulations pertaining to natural ventilation were implemented in **1991**,[123] which mirrored those of 1988.

At the same time, sufficient ventilation systems with natural induction for residential, public and administrative buildings should be designed for the difference in specific gravity of outdoor air at a temperature of 5°C and indoor air at the design temperature for the cold period of the year. Among the available norms of the CIS countries, the norms of **Armenia**[124], **Azerbaijan**[125], **Belarus**[126], **Kazakhstan**[127], **Kyrgyzstan**[128], **Moldova**[129], **Russia**[130], **Tajikistan** (references the norms of Russia) and **Uzbekistan**[131] have been analyzed. The **Turkmen** building code **SNT 3.05.02-94 "On Heating, Ventilation, and Conditioning"** was not available in the public domain.

The analysis has shown that the norms on natural ventilation of 1988 are repeated in all building codes mentioned, except in the case of Kazakhstan which, though enshrining the possibility to equip buildings with natural ventilation, does not provide any specifications. Also, the Uzbek norms separately mention that to create high-efficiency, economical, easy-to-use, energy-saving ventilation or air conditioning, it is recommended to use natural stimulation for air movement as much as possible when developing projects.

Overall, natural ventilation has been in place since Soviet times. Those regulations were subsequently adopted by the countries; however, the norms have not undergone significant changes. For example, the norms do not consider the prevailing wind direction when deciding the building orientation to maximize natural ventilation whenever outside temperatures are low.

3.4. ROOFS

The roof is a large, exposed surface area and can constitute up to 70 percent of a building's total heat gain.[132] This can be a building's vulnerability point; as the sun hits the surface for much of the day, a significant amount of heat can enter (in hot climates) or escape the building (in cold climates). Among the available options, the protection of the roof takes place through appropriate insulation and reflective surfaces.[133]

The roof reflectivity could be achieved using roofing materials with a high solar reflectance index (SRI), including white broken china mosaic, high SRI paints, and other materials. Increasing the reflective quality (albedo) of the roof and walls contributes to an overall reduction in the urban heat island. The cool roof approach could reflect sunlight and absorb less heat. They can reduce indoor temperatures by 1 °C to 4 °C, which has the potential to lower energy bills by up to 20 percent.[134]

During the Soviet times, in 1976, through the Decree of the State Committee of the Council of Ministers of the USSR for Construction No. 226, the building code SNiP II-26-76 "Roofs" (hereinafter referred to as "Building code SNIP II-26-76 "Roofs")[135] (further amended in 1979 and 1980) was approved. It substituted the 1969 Guidelines for the Design of Rolled and Mastic Roofs of Buildings of Industrial Enterprises SN 394-69 (hereinafter referred to as "Building code SN 394-69")[136] and the 1974

123 SNiP 2.04.05-91 "Heating, Ventilation and Conditioning". (1991). https://meganorm.ru/Data2/1/4294854/4294854695.pdf

124 Armenian Building Code IV-12.02.01-04. "Heating, Ventilation and Air Conditioning". (2004). http://www.irtek.am/views/act.aspx?aid=27284

125 Azerbaijan Design Norms "Heating, Ventilation and Air Conditioning". (2017). https://www.e-qanun.az/framework/36497

126 Belarus SN 4.02.03-2019 "Heating, Ventilation and Conditioning". (2019). https://www.askgroup.by/files/---4.02.03-2019-----.pdf

127 Kazakh SP RK 4.02-101-2012 "Heating, Ventilation and Air Conditioning". http://dobren.kz/normdoc/СП%20РК%204.02-101-2012%20Отопление_вентиляция%20и%20кондиционирование%20воздуха.pdf

128 Kyrgyz SN KR 41-04:2022 "Heating, Ventilation and Conditioning". (2023). https://gosstroy.gov.kg/wp-content/uploads/2022/05/CH-KP-OB-и-K.pdf

129 Moldovan SNiP 2.04.05-91 "Heating, Ventilation and Conditioning". (1991). http://webcache.googleusercontent.com/search?q=cache:7v0nYzeSbBQJ:www.ednc.gov.md/Custom/Sivadoc/Download.aspx%3Fid%3D102194%26t%3DNormative&cd=1&hl=ru&ct=clnk&gl=ke&client=safari

130 Russian SNiP 41-01-2003 "Heating, Ventilation and Conditioning" (2003) reviewed by SP 60.13330.2020. https://docs.cntd.ru/document/1200035579

131 Uzbek "Heating, Ventilation and Air Conditioning" building norms. (1996). https://lex.uz/uz/docs/4441103

132 Al-Obaidi, K., M. Ismail, and A. Rahman, Passive cooling techniques through reflective and radiative roofs in tropical houses in Southeast Asia: A literature review. Frontiers of Architectural Research, 2014.

133 United Nations Environment Programme (2021). A Practical Guide to Climate-resilient Buildings & Communities. Nairobi.

134 Ibid

135 USSR SNiP II-26-76 "Roofs" (1976). https://files.stroyinf.ru/Data2/1/4294854/4294854778.htm

136 Guidelines for the Design of Rolled and Mastic Roofs of Buildings

Instructions on Design of Roll and Mastic Roofing of Buildings of Industrial Enterprises SN 394-74 (hereinafter referred to as "Building code SN 394-74")[137]. Both documents considered, to a certain extent, the reflectivity of the roofs by using light color materials.Thus, the Building code SN 394-69 stated that to reduce the effect of solar radiation on the waterproofing carpet, and to reduce heat gains into buildings through coatings in the southern regions with a summer design outdoor temperature (the average temperature at 1 pm of the hottest month) of 25°C, the cooling of the roofs with water (by irrigation or filling with a layer of 25-60 mm) and/or or the installation of a protective layer of light-colored materials may be employed.

The building code SN 394-74 also enshrined that in areas with an average monthly temperature in July of 25°C and above, a protective layer of light-colored materials should be provided on the roofs. The protective layer should be made either of gravel or concrete, reinforced cement, and other slabs, utilising cement-sand mortar, or sandy asphalt concrete. The gravel must be dry, have grains 5–10 mm in size, and a frost resistance grade not lower than 100 (it is allowed to use stone chips for the protective layer that meet the specified requirements). The thickness of the protective layer of gravel should be 10 mm and 20 mm on the coated roofs using metal profiled flooring and combustible or slow-burning insulation without a leveling screed (with a roof slope of up to 12.5%) . Regarding concrete, reinforced cement, and other slabs, cement-sand mortar, or sandy asphalt concrete, their thickness should be not less than 25 mm and have the same frost resistance grade as gravel.

Regarding the building code SNIP II-26-76 "Roofs", it briefly states that to reduce the heating temperature of the roof, protective layer materials (for example, gravel) of light colors should be used. However, despite the widespread use of roof cooling, these proposals using light gravel are only applicable to flat roof shapes or to roofs with a slight incline. To tackle this, in 1987, the Guidelines for the Technical Operation of Roofs of Residential Buildings with Rolled, Mastic, and Steel Roofs[138] were adopted. These Guidelines, on the one hand, mention that rolled roofs should have a protective layer on top with a light outer surface while, on the other hand, they state that to reduce solar radiation on the roof it is recommended to use light-colored paint materials with a solar energy absorption coefficient not higher than 0.6: Organ silicate compositions of light colors: VN-30, VN-30, VN-30-DTOH; VN-30DT; Enamel KO-174, Lacquer MET-1; Silicone hydrophobic liquids: GKZH-10, GKZH-11, GKZH-94, BT 177 paint.

Regarding modern regulations, below is an overview of the standards for roofs in CIS countries such as **Armenia, Azerbaijan, Belarus, Kazakhstan, Moldova**, **Tajikistan, Russia** and **Uzbekistan**. **Turkmenistan** despite having the **TGK 2.03.10-01 "Roofs" building code**, in 2015, in terms of improving the energy efficiency of buildings campaign, introduced an **Energy Efficient Roof Design Guide.** This Guide is however not available online. In the case of **Kyrgyzstan**, it was not possible to obtain information on roof building standards.

In 2020, **Belarus** adopted a list of new building codes among which there is **SN 5.08.01-2019 "Roofs"**[139]**,** which substituted the 2013 Technical Codes of Good Practice "Roofs: Building Design Standards and Rules for their Construction."[140] The document provides for accounting for the thermal insulation of roofs, though it does not establish a specific indicator. It mentions that the thickness of the thermal insulation layer should be determined based on a heat engineering calculation done under **SP 2.04.01-2020 "Construction Heat Engineering"**.[141] The document also provides information related to inversion roofing and points out that the thermal insulation in that case should be provided as a single layer of materials with low long-term water absorption at full immersion and with a compressive strength of at least 0.1 MPa.

Uzbekistan in 1995 adopted the building standards KMK 2.03.10-95 "Roofs". Furthermore, and to improve the energy efficiency of buildings and structures, in 2010-2011 the country carried out a revision to these standards, and further adopted the **2012 Guidelines for the Design of Roofs and**

of Industrial Enterprises SN 394-69 (1969). https://files.stroyinf.ru/Data2/1/4293767/4293767706.pdf

137 *Instructions on Design of Rolled and Mastic Roofing of Buildings of Industrial Enterprises SN 394-74 (1974). https://files.stroyinf.ru/Data2/1/4293799/4293799278.pdf*

138 *Guidelines for the Technical Operation of Roofs of Residential Buildings with Rolled, Mastic and Steel Roofs (1987). https://files.stroyinf.ru/Data2/1/4293802/4293802014.pdf*

139 *Belarus SN 5.08.01-2019 "Roofs." (2019). https://stroystandart.info/uploads/pdf/sn.5.08.01.2019.pdf*

140 *Technical Codes of Good Practice "Roofs. Building Design Standards and Rules for their Construction" (2013). http://www.vertragia.by/others/NormyPr.Krowli.pdf*

141 *Belarus building code SP 2.04.01-2020 "Construction Heat Engineering". (2020). https://stn.by/files/projects/txt-sp_stroitelnaya_teplotehnika.pdf*

Roofs of Energy Efficient Buildings.[142]

The document states that to reduce the heating temperature of the roof, it is necessary to use materials of protective layers (for example, gravel) of light colors, foil-rolled roofing materials capable of reflecting heat from solar insolation (used for the top layer of waterproofing (carpet). Concerning insulation, the document defines a list of thermal insulation materials. However, it is mentioned that only cellular concrete, including foam concrete, is both safe and durable enough to be used. The document provides specifications on thermal insulation of non-attic as well as pitched roofs. With regards to the latter, the insulation must be protected from moisture by water vapor contained in the air of the room, and with a layer of vapor-barrier material. The vapor barrier layer should be installed on the inner (lower) side of the insulation.

In Tajikistan, the topic of roofs is governed under the SNiP 31-10-2021 "Roofs" 120.030.030. It defines that roofs made of rolled and mastic materials could be done in a traditional (when the waterproofing carpet is located above the thermal insulation) or inversion (when the waterproofing carpet is located under the thermal insulation) manner.[143] Thus, for the first one, thermal-insulating boards composed of the following materials are used: mineral wool, polystyrene foam, polyisocyanurate foam, and fiberglass.

With regards to the inversion roofing, thermal insulation is provided from materials with low water absorption (no more than 0.7% by volume in 28 days) and compressive strength of at least 100 kPa. At the same time, it should be singled-layer, since blocking thin layers of water in multilayer insulation reduces its heat-shielding properties and eliminates moisture evaporation.[144] The operative sections of the inversion roof should have protective layers of light colors to reduce the temperature on the surface of the thermal insulation. This can be made of extruded polystyrene foam, which has low heat resistance (about 75°C).

142 *Guidelines for the Design of Roofs and Roofs of Energy Efficient Buildings (2012). https://mc.uz/wp-content/uploads/2021/12/kmk-2.03.10-95.pdf*

143 *The same two types of roofs are defined under Moldovan NCM C.04.03-2015 "Roofs. Design Standards" building code*

144 *The same norms are also applicable under Azerbaijan's 2015 "Roof Coatings. Design Standards" building code (https://arxkom.gov.az/qanunvericilik/normativler/insaat-konstruksiyalar-sistemi/dam-ortuk-leri-layihelendirme-normalari), Russian SP 17.13330.2017 "SNIP II-26-76 building code (https://meganorm.ru/Data2/1/4293744/4293744728.pdf) and Armenian 31-04-2022 "Roofs" building code (https://www.arlis.am/DocumentView.aspx?DocID=165281)*

The Inversion roofing method is also applicable under the **Kazakh SN RK 3.02-37-2013 "Roofs"** building code.[145] It mentions that only slab extruded polystyrene foam should be used as thermal insulation with regards to inversion roofing. It is characterized by almost zero water absorption, which excludes the possibility of accumulation of moisture therein and generates defrosting during the operation of the roof.

In complex roof structures, and in the presence of particular architectural elements (attics, parapets, skylights, etc.), the possibilities for air circulation are significantly reduced. Therefore, another important component of the roof concept is the **attic space ventilation,** which serves two main functions: to lower attic temperatures and to remove excess moisture.[146] A Ventilation channel (space) is prescribed under the building codes of **Armenia, Azerbaijan, Kazakhstan, Russia, Tajikistan,** and **Uzbekistan**. With regards to the Russian and the Tajik norms, the height of the ventilation channels (gaps) between the surface of the thermal insulation and the base under the roof, depends on the length and the angle of the roof slope, and must be at least 50 mm. In **Azerbaijan**, the height of the ventilation channels varies from 40 to 250 mm depending on the incline of the roof. In **Armenia**, the 50 mm standard is also enshrined, though the building code provides for the possibility to calculate it based on a specific formula.

Thus, it can be summarized that the issue of thermal insulation of roofs is covered in the Belarus, Uzbekistan, Russia, Tajikistan, Armenia, and Azerbaijan documents, which also determine the applicable materials to be used for roofing. The aforementioned countries together with Kazakhstan, enshrine the possibility of building inverted roofs, which, among other things, involve the use of a light coating to reflect the heat from solar insolation. Moreover, all these countries provide attic ventilation necessary to remove heated air accumulated under the roof in the summer and create normal thermoregulation.

145 *Building code SN RK 3.02-37-2013 "Roofs" of the Republic of Kazakhstan. https://www.egfntd.kz/upload/NTD/SNRK22/3_02_37_2013.pdf*

146 *Attic Ventilation 101 | IIBEC. The International Institute of Building Enclosure Consultants (IIBEC). 2023b, January 24). https://iibec.org/attic-ventilation-101/*

3.5. THERMAL ADAPTATION & MATERIALS FOR THERMAL COMFORT

Designing energy-efficient buildings and promoting thermal adaptation is crucial especially cold climates. In general, thermal adaptation relates to the efficiency of a building to resist heat loss through building elements such as walls, floors, roofs, and windows. This is done considering factors such as the vapor barrier, façade glazing and paint, as well as the materials. Thus, further analysis includes norms of all CIS countries documents except the Moldovan building code NCM E.04.01:2017 "Thermal Protection of Buildings" and Turkmen TGK 2.01.03-98 "Construction Heating Engineering" due to their unavailability online.

In the realm of thermal adaptation strategies, the **vapor barrier** plays a crucial role in enhancing building performance and energy efficiency. Serving as a protective layer within the building envelope, a vapor barrier helps control moisture movement, preventing the passage of water vapor from warm interior spaces to cooler exterior environments. By effectively mitigating the risk of condensation and moisture-related issues, such as mold growth and structural deterioration, the vapor barrier ensures a healthier and more durable indoor environment. It helps to maintain a comfortable and consistent temperature, optimize thermal insulation, and minimize energy losses. As an essential component of thermal adaptation strategies, a well-designed and properly installed vapor barrier contributes to sustainable and resilient buildings, promoting long-term occupant comfort. The Vapor barrier component has been defined in Soviet building codes, such as in the **1955 Construction Norms and Rules**[147] (hereinafter referred to as **"1955 Document"**), **SNiP II-A.7-62** of **1963 "Building Heat Engineering"**[148] (hereinafter referred to as **"1963 Document"**), the **SNiP II-A.7-71** of **1971 "Building Heat Engineering"**[149] (hereinafter referred to as **"1971 Document"**) and the **SNiP II-3-79** of **1979 "Building Heat Engineering"**[150] (hereinafter referred to as **"1979 Document"**). Furthermore, the **Russian**[151] building code enshrined in the *framework of protection against waterlogging of enclosing constructions* the need to calculate the required resistance to vapor permeability of a building, attic floor, or part of a structure.

In addition to the insolation topic covered under paragraph 3.2, it is highly required to consider the balanced coefficient of the **façade glazing** to have a well-designed and energy-efficient building envelope. Thus, the **Azerbaijani**,[152] the **Kyrgyz**,[153] and the **Tajik**[154] building codes define that with regards to residential buildings, the coefficient should be no more than 15% in the Kyrgyz and Tajik documents, and 18% in under the Azerbaijan document. Regarding public buildings, both Azerbaijan and Kyrgyzstan define that the coefficient should not exceed 25%, while in the Tajik document, the standard is 22%. **Belarus**,[155] in its turn, though not defining the standard for residential and public buildings façade glazing, provides a formula to do so.

Façade paint is another crucial component since it serves as an effective strategy to minimize heat absorption. By utilizing reflective pigments, white colors can reflect a significant portion of solar radiation rather than absorbing it. This reflective property helps to reduce the amount of heat that is transferred into the building's interior, keeping the indoor spaces cooler and reducing the reliance on cooling systems. White or light-colored facades act as a thermal barrier, mitigating heat gain and creating a more comfortable and energy-efficient environment. Additionally, this approach contributes to an overall urban heat island mitigation, as lighter colors reduce the heat radiated back into the surrounding environment. By harnessing the power of color, buildings can optimize thermal performance, decrease energy consumption, and promote sustainable and climate-conscious design practices.

147 *Construction Norms and Rules. (1955).* https://files.stroyinf.ru/Data2/1/4293808/4293808444.pdf

148 *SNiP II-A.7-62 "Building Heat Engineering". (1963).* https://files.stroyinf.ru/Data2/1/4293808/4293808406.pdf

149 *SNiP II-A.7-71 "Building Heat Engineering". (1971).* https://files.stroyinf.ru/Data2/1/4293808/4293808405.pdf

150 *SNiP II-3-79 "Building Heat Engineering". (1979).* https://files.stroyinf.ru/Data2/1/4294854/4294854803.pdf

151 *Russian SNiP 23-02-2003 "Thermal Protection of Buildings", actualized by SP 50.13330.2012 of 2013.* https://docs.cntd.ru/document/1200095525

152 https://enerjiportali.az/wp-content/uploads/2022/06/1-AzDTN-2.12-4-Binalarin-istilik-muhafiz%C9%99si-Layih%C9%99l%C9%99ndirm%C9%99-normalari.pdf

153 *Kyrgyz SNiP KR 23-01:2013 "Building Heat Engineering (Heat Protection of Buildings)"*

154 *Tajik SNiP RT 23-02-2021 "Thermal Protection of Buildings"*

155 *Belarus building code SP 2.04.02-2020 "Thermal Protection of Residential and Public Buildings. Energy Indicators". (2020).* https://energodoc.by/js/pdfjs/web/viewer.html?file=/file/fulltext-view/7712.pdf

Although the **Kazakh**[156] building code does not oblige the use of exclusively light colors, it includes a table where the absorption coefficients of solar radiation are considered. Thus, for example, the light-yellow facade paint absorbs only 0.2ρ while the black paint coefficient absorbs 0.9ρ which means that the light-yellow paint reflects a significant amount of solar radiation, reducing the heat absorbed by the facade and minimizing heat transfer into the building's interior. Therefore, in terms of thermal insulation, using light-colored paints with lower absorption coefficients can be more beneficial in reducing heat gain and improving energy efficiency.

The **Materials** also play a crucial role when defining the thermal performance of the building. Therefore, when choosing a material, **the product's "thermal transmittance" (also known as the U-value) measured in** W/m^2K **should be considered.** The lower the U-value of a material, the better it is at keeping the indoor temperature comfortable even when there are big temperature changes outside.[157] The U-value is not a constant value, therefore it is calculated as follows:[158]

1) The initial stage involves determining the thermal resistance denoted by the symbol R and measured in m²K/W using the following formula:

$$R=d / \lambda$$

where d is the thickness of the material layer, expressed in meters, and λ (lambda), measured in W/mK, is the thermal conductivity coefficient of the material.

2) The next step is to calculate the overall heat transfer coefficient by using the following formula:

$$R1= R+Rsi+Rse$$

where Rsi is the heat transfer coefficient outside, and Rse is a coefficient of heat transfer from the inside.

3) The last step to calculate the heat transfer coefficient (U-value) is to use the formula:

$$U=d / R1$$

where d is the thickness of the wall or partition, expressed in meters, and R1 is total thermal resistance

Thus, both the λ (lambda) coefficient and the thermal resistance (R) play a vital role in the thermal protection of buildings. The Value of the λ (lambda) coefficient indicates how much heat the material can pass through itself. The lower the value of the λ (lambda) coefficient, the lower the conductivity of the material and, therefore, it is better insulated from heat losses. This means that under the same conditions, more heat will pass through a substance with a higher thermal conductivity.[159] The R-value indicates how well the material resists heat transfer at a specific thickness. Good insulation will have a higher R-value indicating it is better at reducing heat loss.[160]

Nevertheless, in the USSR documents, the focus was made rather on the calculation of norms of heat transfer resistance of building envelopes – R-value. The first norms for the thermal protection of buildings were called T.U and N. of 1929. They stated that "the degree of thermal protection provided by the protection is determined by its resistance to heat transfer and the stability of the thermal regime inside the building during periodic heating of the latter". The rules considered the thermotechnical calculation of enclosing structures, calculation of heat losses, and calculation of the heating system.[161] Further, there were four documents that defined the required heat transfer' resistance of the building envelopes.

The 1955 and 1963 Documents defined the general formula for the calculation of the value of resistance to heat transfer of building envelopes while the 1971 and 1979 Documents defined the required heat transfer resistance for windows,

156 *Code of Rules SP RK 2.04-107-2022 "Design of Thermal Protection of Buildings". (2022).* https://www.egfntd.kz/upload/NTD/СП%20PK/211021/2_04_107_2022.pdf

157 *United Nations Environment Programme (2021). A Practical Guide to Climate-Resilient Buildings & Communities. Nairobi.*

158 *Что такое коэффициент теплопроводности и как его рассчитать. (n.d.).* https://nedvio.com/qa/chto-takoe-koeffitsient-teploperedachi-i-kak-ego-rasschitat/#:~:text=Расчет%20коэффициента%20теплопередачи&text=Для%20его%20расчета%20используется%20формула,)%20—%20это%20коэффициент%20теплопроводности%20материала.

159 *Что такое коэффициент теплопепердачи и как его рассчитать. (n.d.).* https://nedvio.com/qa/chto-takoe-koeffitsient-teplopereda-chi-i-kak-ego-rasschitat/#:~:text=Расчет%20коэффициента%20теплопередачи&text=Для%20его%20расчета%20используется%20формула,)%20—%20это%20коэффициент%20теплопроводности%20материала.

160 *What are U-values, R-values and Lambda Values? (n.d.).* https://www.kingspan.com/gb/en/knowledge-articles/what-are-u-values-r-values-and-lambda-values/

161 *Horshkov, A. S., & Litchak, V. I. (2015). History, Evolution and Development of Regulatory Requirements for Building Envelopes.* https://unistroy.spbstu.ru/userfiles/files/2015/3(30)/1_gorshkov_30.pdf

balcony doors, and skylights of different buildings.

At the same time, all the documents dated from 1955 to 1979 contained tables where the λ (lambda) coefficient of different materials was indicated. It determined the suitable materials to be used in construction. Thus, the 1979 Document contained six groups of materials with their corresponding coefficients of thermal conductivity:

- Concretes and Mortars, where vermiculite concrete has the lowest thermal conductivity coefficient – 0.11 W/mK, while reinforced concrete has the highest one – 2.04 W/mK,
- Brickwork and Natural Stone Cladding, where brickwork from solid trefoil bricks done with cement-sand mortar has the lowest thermal conductivity coefficient – 0.47 W/mK), while granite, gneiss and basalt have the highest one – 3.49 W/mK.
- Wood, Products therefrom, and Other Natural Organic Materials, where heat-insulating peat slabs have the lowest thermal conductivity coefficient – 0.064 W/mK, while oak along the grain has the highest one – 0.41 W/mK.
- Thermal Insulation Materials, where polyurethane foam and perlite concrete have the lowest thermal conductivity coefficient – 0.4-0.5 W/mK, while expanded clay gravel has the highest one – 0.23 W/mK.
- Roofing, Waterproofing, Cladding, and Rolled Floor Coverings, where products done from expanded perlite on a bituminous binder have the lowest thermal conductivity coefficient – 0.099 W/mK, while bituminous concrete has the highest one – 1.05 W/mK.
- Metals and Glass, where window glass has the lowest thermal conductivity coefficient – 0.76, while copper has the highest one – 407 W/mK.[162]

Exponents of λ (lambda) coefficient of different materials are incorporated in current Kazakh,[163] Tajik,[164] and Uzbek165 building codes.

Basic thermal resistance (R) values are defined regarding the building envelope in Armenia,[166] Azerbaijan,[167] Belarus,[168] Kyrgyzstan,[169] Russia,[170] Tajikistan[171] and Uzbekistan[172] for external walls, non-attic coverings, and attic floors, overlappings over passages and cold undergrounds and cellars, windows and balcony doors and lanterns and varies and depend on the degree-days of the construction area.

As for the general U-value, in the building codes of Belarus,[173] Kyrgyzstan,[174] and Tajikistan[175] it is called Km, Kmtr, and Кобш respectively, and is aimed to determine the overall heat transfer coefficient of the building. Nevertheless, these documents do not contain the threshold on U-value indicators, unlike Kyrgyz 2012 Regulations on the Procedure for Energy Certification of Buildings[176] which define minimum requirements for the heat transfer coefficient of building envelopes. Therefore, the U-value applicable to exterior walls or pitched roofs with a slope exceeding 45 degrees shall be 0.32 W/m2K, while for flat roofs or pitched roofs with a slope below 45 degrees and without attics, it shall be 0.2 W/m2K. In the case of roofs with attics, the U-value should be 0.25 W/m2K.

In conclusion, thermal adaptation and the use of appropriate materials are essential in achieving thermal comfort and energy efficiency in

162 *Horshkov, A. S., & Litchak, V. I. (2015). History, Evolution and Development of Regulatory Requirements for Building Envelopes. https://unistroy.spbstu.ru/userfiles/files/2015/3(30)/1_gorshkov_30.pdf*

163 *Code of Rules SP RK 2.04-107-2022 "Design of Thermal Protection of Buildings". (2022). https://www.egfntd.kz/upload/NTD/СП%20PK/211021/2_04_107_2022.pdf*

164 *Tajik SNiP RT 23-02-2021 "Thermal Protection of Buildings"*

165 *KMK 2.01.04-97 "Construction Heat Engineering"*

166 *Armenian Building Code RACN 24-01-2016 "Thermal Protection of Buildings". (2016). http://www.nature-ic.am/Content/announcements/9486/RACN%20for%20publishing_19.08.2016.pdf*

167 *Azerbaijan Design Standards AzDTN 2.12-4 "Thermal Protection of Buildings". (2022). https://enerjiportali.az/wp-content/uploads/2022/06/1-AzDTN-2.12-4-Binalarin-istilik-muhafiz%C9%99si-Layih%C9%99l%C9%99ndirm%C9%99-normalari.pdf*

168 *Belarus building code SN 2.04.02-2020 "Buildings and Constructions. Energy efficiency". (2021). https://normy.by/tnpa/1/6921.pdf*

169 *Kyrgyz SNiP KR 23-01:2013 "Building Heat Engineering (Heat Protection of Buildings)"*

170 *Russian SNiP 23-02-2003 "Thermal Protection of Buildings", actualized by SP 50.13330.2012 of 2013. https://docs.cntd.ru/document/1200095525*

171 *Tajik SNiP RT 23-02-2021 "Thermal Protection of Buildings"*

172 *Uzbek Manual for the Design of New Energy-Saving Solutions for Building Heat Engineering (complements KMK 2.01.04-97). (2011). https://mc.uz/wp-content/uploads/2021/12/posobie-k-kmk-2.01.04-97.pdf*

173 *Belarus building code SP 2.04.02-2020 "Thermal Protection of Residential and Public Buildings. Energy Indicators". (2020). https://energodoc.by/js/pdfjs/web/viewer.html?file=/file/fulltext-view/7712.pdf*

174 *Kyrgyz SNiP KR 23-01:2013 "Building Heat Engineering (Heat Protection of Buildings)"*

175 *Tajik SNiP RT 23-02-2021 "Thermal Protection of Buildings"*

176 *Regulations on the Procedure for Energy Certification of Buildings. (2012). http://cbd.minjust.gov.kg/act/view/ru-ru/93706*

buildings. The vapor barrier is a crucial element in building design, as it helps control moisture movement, prevents condensation and moisture-related issues, and optimizes thermal insulation. Balanced façade glazing contributes to energy-efficient building envelopes by controlling heat transfer.[177]

The use of reflective and light-colored facade paint helps reduce heat absorption and heat gain, creating a more comfortable indoor environment and mitigating the urban heat island effects.

Overall, the thermal protection of buildings, to varying degrees, is covered under all the reviewed building codes of the CIS countries.

177 *If windows amount to 20 per cent or less of a wall then the windows should allow 75 per cent of visible light into the building. If windows account for 35 per cent of a wall, then they should only permit 40 per cent or less of the visible light into a building. Retrieved from: United Nations Environment Programme (2021). A Practical Guide to Climate-Resilient Buildings & Communities. Nairobi.*

4

CONCLUSIONS: WHAT COULD BE APPLIED IN KHOROG AND TAJIKISTAN IN GENERAL

A comparative analysis utilizing the UN-Habitat and UN Environment Programme methodology was conducted to assess the building codes of CIS countries (namely Armenia, Azerbaijan, Belarus, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, and Uzbekistan). The analysis demonstrated the adaptability of the changes made to the codes after the Soviet era, as well as the degree of compliance with global standards. The results of this analysis can be used to determine the level of sophistication of Tajik legislation in relation to regulation and climate, identify any deficiencies that impede the development of the construction industry, and offer recommendations for both Tajikistan as a whole and Khorog in particular, based on international experience and best practices of CIS countries.

An examination of building codes from a regulatory standpoint has revealed that Tajik building codes undergo review every 5 to 15 years, on average. Since the collapse of the Soviet Union, each document has been reviewed an average of 2 times, except for one document that is directly adopted from Russian legislation. Among the analyzed norms of the CIS countries, this indicator is relatively new, though, under the UN-Habitat methodology, it is recommended that building codes are reviewed and updated on a regular basis – a 3–5-year cycle to account for emerging changes.

To address the challenges facing the construction industry, regulatory documents must not only be regularly updated but also tailored to a specific area. The analysis revealed that Tajikistan is one of three CIS countries that prioritizes the development and implementation of local regulations, although this document does not include an analysis of such norms due to their absence.

Nonetheless, the prospect of developing local regulations is still under consideration in Tajik legislation, similar to Russia where territorial norms are extensively applied due to its federal structure, and the autonomous Republic of Karakalpakstan forming part of Uzbekistan.

Another component analyzed pertains to the use and consideration of local materials in construction. Although such a requirement was established during the Soviet era to encourage the use of local raw materials in building material production, none of the modern countries analyzed mandates the use of locally sourced materials. As a recommendation, Tajikistan's building codes that relate to the use of building materials should

include a provision emphasizing the preference for local materials. This will promote affordable housing, reduce construction costs, and mitigate the environmental impact of construction.

Low-cost housing constitutes an essential component of the regulatory analysis. It entails subsidizing specific building materials, expediting approval procedures, or offering specific housing typologies. However, no such provision was discovered in this analysis. In the CIS countries, this provision is typically enshrined in primary legislation, namely, laws and codes, with several exceptions. Only as recent as 2022, did Tajikistan secure guarantees for social housing in a distinct chapter of the Housing Code, which implies the provision of housing through a social rental agreement to those in need. Neither this code nor any other technical (building) document defines the minimum parameters and qualities of social housing. This is entrusted to the local executive body of state power which depending on the level of provision with residential premises achieved in the relevant territory, should define them.[178]

The recommendations from the climate perspective are precisely tailored for Khorog, situated at an altitude of 2029 meters in the Pamir Mountains gorge in the northern hemisphere. Being sheltered by the mountains, it experiences a Mediterranean-influenced subarctic climate (classified as "Dsc" under the Köppen-Geiger climate classification system)[179] with cold, snowy winters and hot, dry summers with the number of heating degree days (HDD) outnumbering cooling degree days (CDD). Moreover, Khorog is exposed to such natural disasters as avalanches, landslides, and rockfalls which are usually triggered by rainfall, snowfall, floods, or earthquakes.[180] Thus, buildings become highly vulnerable and building codes themselves should play a significant role in climate adaptation and mitigation.

One crucial factor to consider is the orientation of buildings, which significantly impacts their energy efficiency by facilitating access to solar radiation. Therefore, in the context of Khorog, it is advisable to position residential buildings on the southern slopes[181],[182] (as shown in Figure 2) while taking natural hazards into account (to adapt buildings to hazards refer to paragraph B.3_ Hazard Adapted Buildings of Khorog Urban Design Guidelines). Public buildings and educational institutions, which operate during the daytime and are equipped with an artificial microclimate system, may be situated on the northern-facing slopes.[183] This is intended to maximize solar exposure, with a minimum threshold of 2.5 hours per day, as defined under Tajik legislation.

Another important component to consider when constructing buildings in Khorog is designing the ventilation system for buildings. It is recommended to use natural ventilation techniques with consideration of prevailing wind patterns to ensure adaptivity to the surrounding natural environment. It is advisable that the inlet is of a small size, while the outlet should be of a larger size to facilitate better airflow.[184]

Regarding the thermal adaptability component, it is recommended to consider the building design and its envelope components, roofing, and materials in Khorog. In order to improve the thermal efficiency of buildings, it is advisable to employ uncomplicated architectural designs, opt for light-colored exterior walls due to their superior reflectivity, and utilize construction materials with suitable U-values, taking into account their local sourcing. The following U-value benchmarks under the AKDN Green Building Standards are suggested:[185]

- Walls: 12-0.15
- Floor: 0.08-0.12
- Roof: 0.10-0.12
- Windows: 0.8-1.0 (triple glazing)
- External doors: 1.0-1.2

Furthermore, in Khorog, considering its unique climatic conditions, it is highly advisable to consider climatic parameters such as air temperature and humidity, wind speed, and solar radiation intensity when performing building heat engineering calculations. When installing roofs, it is crucial to ensure adequate insulation regardless of the method used (traditional or

178 *Как в Таджикистане получить социальное жилье? | Новости Таджикистана ASIA-Plus. (2022).* https://asiaplustj.info/ru/news/tajikistan/society/20221102/kak-v-tadzhikistane-poluchit-sotsialnoe-zhile

179 *World Bank Climate Change Knowledge Portal. (n.d.).* https://climateknowledgeportal.worldbank.org/country/tajikistan

180 *Landslide and Geohazard Risk in Transport. (2016).* https://documents1.worldbank.org/curated/en/515091505829549485/text/119809-WP-P160578-PUBLIC-GPSURR-Landslide-Geohazar-Risk-Report.txt

181 *United Nations Environment Programme (2021). A Practical Guide to Climate-Resilient Buildings & Communities. Nairobi.*

182 *AKDN Green Building Standards. (2021)*

183 *Recommendations for the Development of Hilly Areas of the Republic of Tajikistan. (2008)*

184 *AKDN Green Building Standards. (2021)*

185 *Ibid*

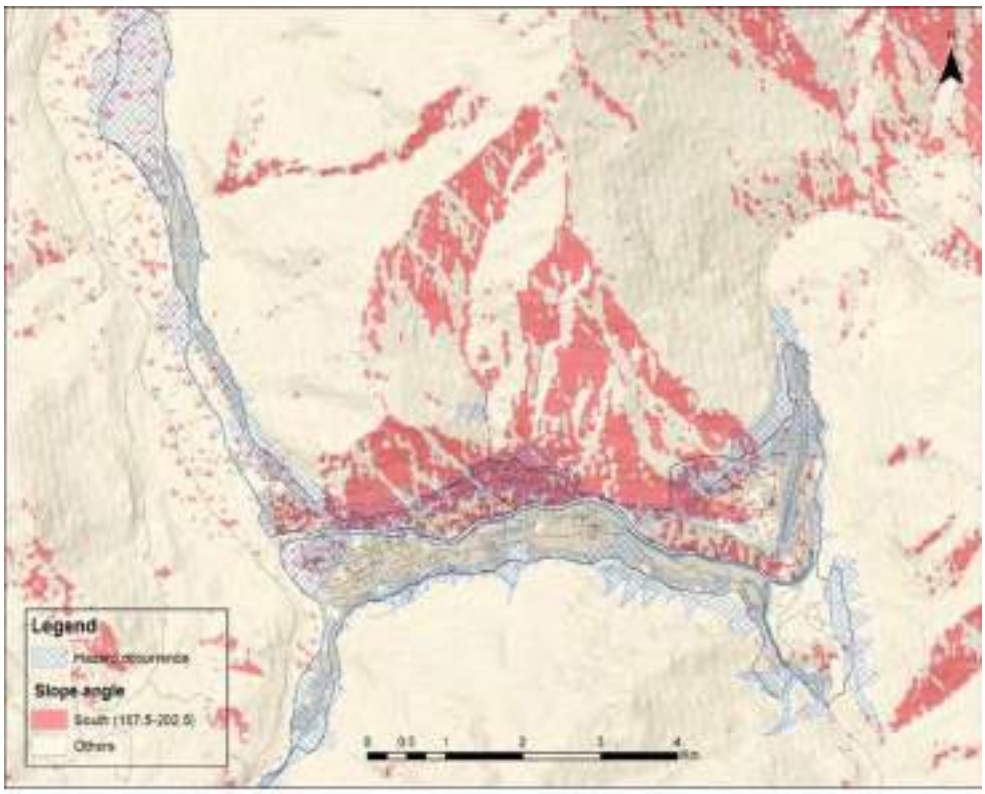

Fig 4. South Facing Slopes

inversion). Additionally, preference should be given to light-colored roof materials that reflect heat from insolation more efficiently. Moreover, to promote proper thermoregulation and remove accumulated heated air under the roof during summer, it is desirable to provide attic ventilation spaces subject to the length and angle of the roof slope within buildings. Also, to tackle waterlogging, a proper vapor barrier both of the roof and the building itself should be ensured.

To sum up, Tajikistan is a "huge construction site"[186] given its existing potential for the swift advancement in this sector. Its revised Nationally Determined Contribution (NDC) of October 2021 under the "Energy" area promotes the establishment of building practices with the aim to reduce energy consumption through, among others, the use of architectural designs of efficient houses and buildings.[187] Furthermore, the country's Construction Industry Development Strategy 2030[188] incorporates fresh and effective measures aimed at leveraging the latest technologies, including those pertaining to energy efficiency. Thus, the application of green building minimum compliance measures defined in this document to construction in Khorog will facilitate the adaptability to climatic conditions[189] while the accompanied comparative analysis of CIS countries will disclose solutions on how to achieve certain sustainable development targets.

186 *Report of the Chairman of the Committee for Architecture and Construction under the Government of the Republic of Tajikistan M.M. Zuvaydzody "On the implementation of the state urban planning policy of the Republic of Tajikistan". (2021).* https://www.faufcc.ru/internation-al-co-operation/mezhpravitelstvennyy-sovet/XLI/6.pdf

187 *The Updated NDC of the Republic of Tajikistan. (2021).* https://unfccc.int/sites/default/files/NDC/2022-06/NDC_TAJIKISTAN_ENG.pdf

188 *Construction Industry Development Strategy 2030 of the Republic of Tajikistan. (2022)*

189 *Annex 3. Rwanda Green Building Minimum Compliance System. (2019).* https://gggi.org/wp-content/uploads/2019/07/Annex-3-Rwanda-Green-Building-Minimum-Compliance-System-REVISED.pdf

5

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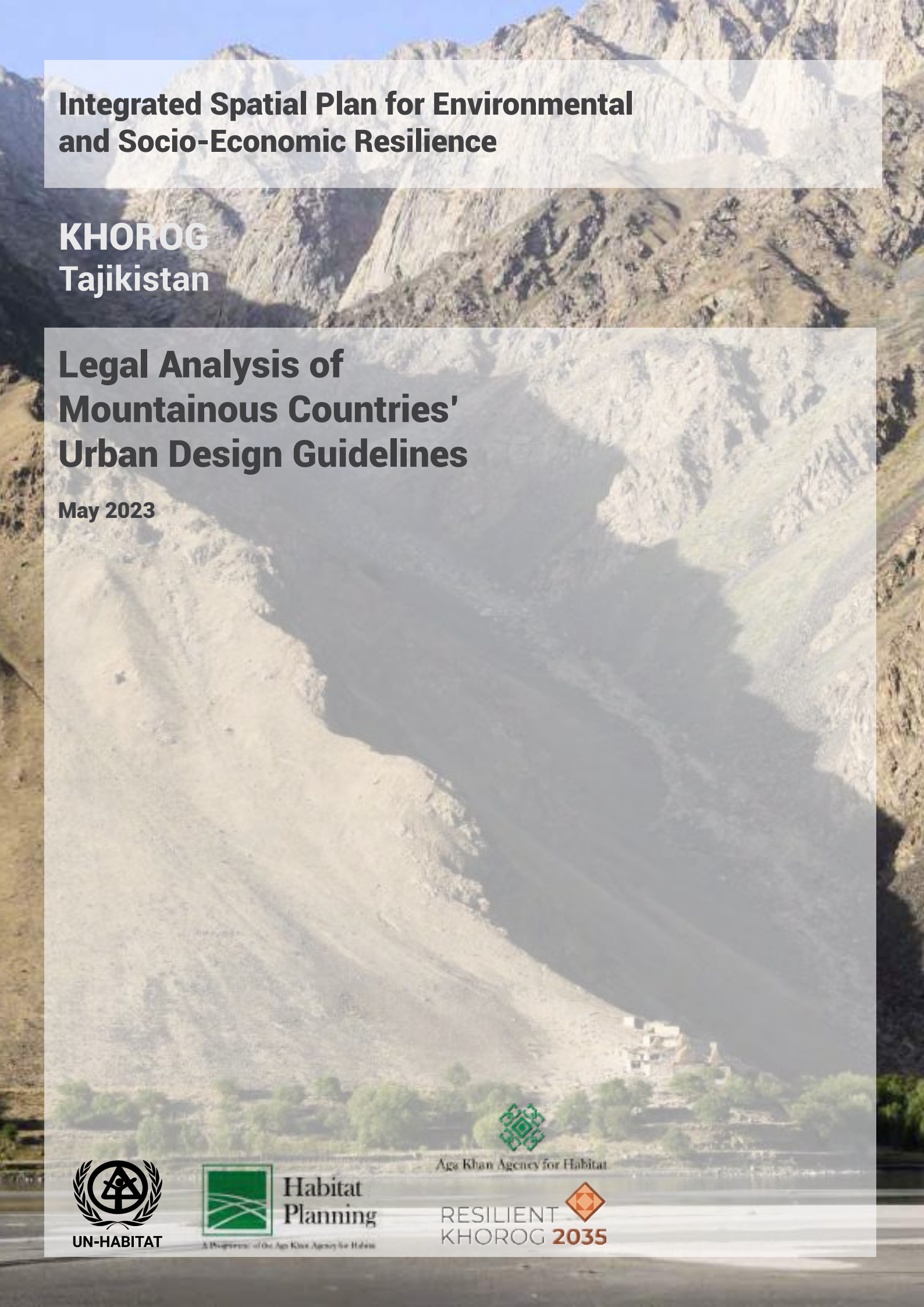

Integrated Spatial Plan for Environmental and Socio-Economic Resilience

KHOROG
Tajikistan

Legal Analysis of Mountainous Countries' Urban Design Guidelines

May 2023

UN-HABITAT

Habitat Planning

A Programme of the Aga Khan Agency for Habitat

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RESILIENT KHOROG 2035

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RESILIENT KHOROG 2035

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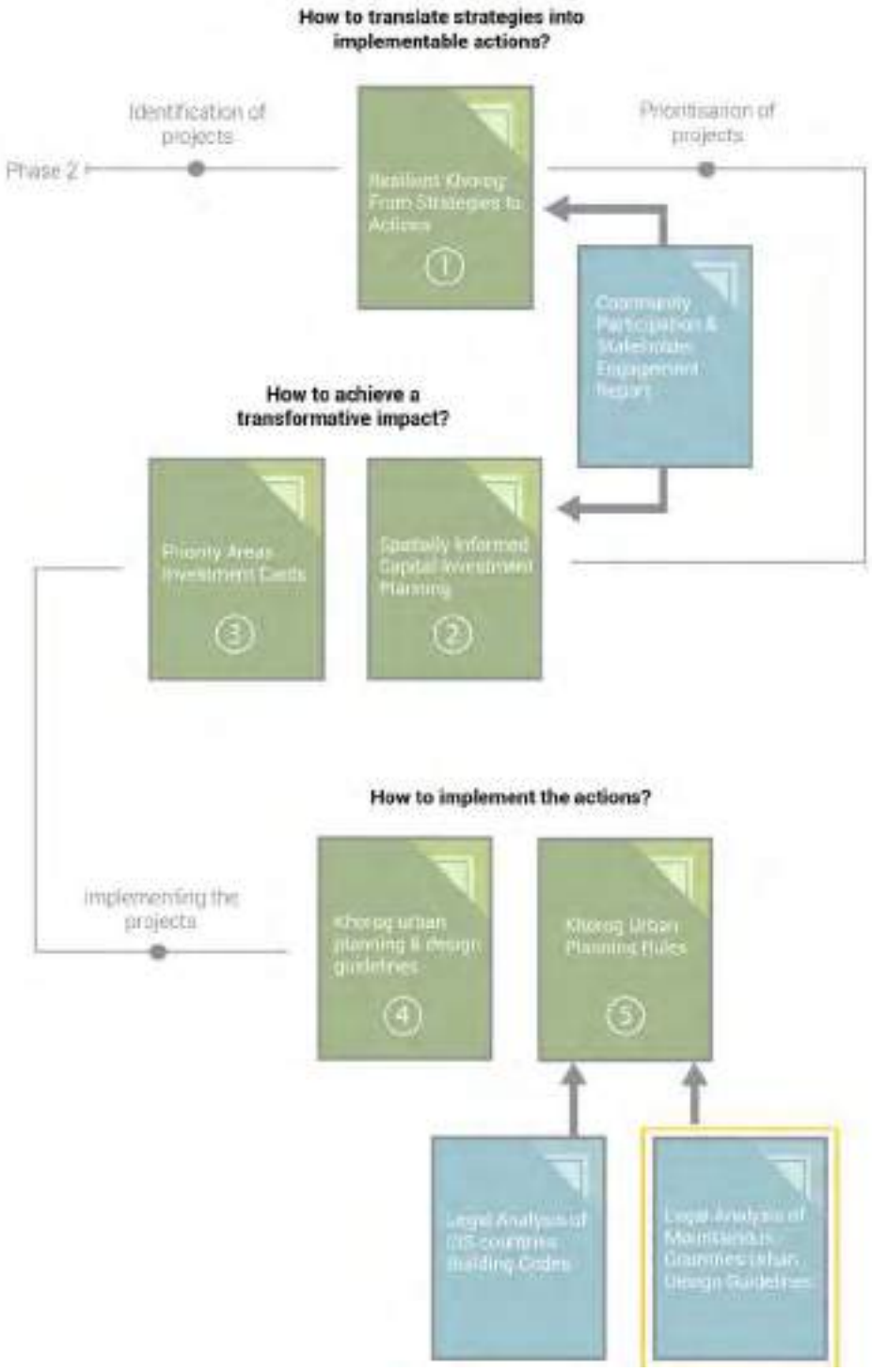
and Socio-Economic Resilience

Analysis of Mountainous Countries' Urban Design Guidelines



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LEGAL ANALYSIS OF MOUNTAINOUS COUNTRIES' URBAN DESIGN GUIDELINES

Andorra, Canada, France, Kyrgyzstan, Montenegro, North Macedonia, Switzerland, Tajikistan & USA

EXECUTIVE SUMMARY

From 2020-2021, UN-Habitat in collaboration with the Aga Khan Agency for Habitat and the government of Tajikistan, through the Aga Khan Development Network, launched and completed the 1st phase of the project "Integrated Spatial Plan for Environmental and Socio-Economic Resilience" in Khorog, Tajikistan. The project was based on a holistic assessment of resiliency that was undertaken for Khorog in 2017 and 2018 by the Swiss State Secretariat for Economic Affairs, with partnership from the members of the Khorog Resilience Investment Programme that includes the European Union for Resilient Infrastructure, the government of Japan, the International Finance Corporation, and the World Bank.

The objective of the project was to strengthen the environmental, legal, economic, spatial, and infrastructure policies and projections, to conduct transformative planning and technical capacity-building projects for stakeholders.

From the legal perspective, and by applying the Urban Law Module of the Law and Climate Change Toolkit – an online resource aimed to help countries put in place the legal frameworks necessary for effective domestic implementation of the Paris Agreement and its Nationally Determined Contributions, UN-Habitat analysed the current Tajik legislation and provided the recommendations that would contribute to the inclusion of climate change issues into the planning laws and regulations of Tajikistan at both the national and the local level.

The 2nd phase of the project aims to develop transformative neighborhood projects based on the analysis and plans developed in the 1st phase within the urban design scope and with a legislative aspect focusing on reviewing the inter alia urban planning guidelines of mountainous cities and countries to extract the best urban planning practices for their further application in Khorog.

Thus, Chapter 1 delves into the significance of mountains, which encompass a quarter of the Earth's land surface and offer numerous benefits including water, minerals, timber, non-timber forest products, food, fiber, fuel products, and nearly half of the world's biodiversity. It examines the definition of "mountains" under the legislation of various countries worldwide, including, among others, France, Romania, Italy, Ukraine, Kyrgyzstan, and Tajikistan, and the relevant criteria.

The chapter concludes that the definition of mountains is intricate, influenced by various factors such as elevation zones, morphology and climate, latitude, biodiversity and food security, land-use opportunities and constraints, conflicts and cooperation, and highland-lowland interactions.

Moreover, the document discloses the effect of urbanization on mountains and concludes that, in accordance with legal requirements, due regard must be fully given to their natural and climatic characteristics, with the aim of enhancing and augmenting such features, while avoiding adverse impacts on the natural environment.

After examining the essential aspects of mountains and mountainous cities, Chapter 2 presents a roster of countries and cities to be analysed in the subsequent chapter. This analysis takes into account their climatic and geographic characteristics, as well as their urban development management mechanisms. As such, this report concentrates on the analysis of three national and twelve regional and local urban planning norms. To ensure a thorough and comprehensive analysis, the selection is based on a comparison of the geography and climate of fifteen countries/cities including Khorog and Tajikistan. Although Khorog possesses unique characteristics regarding population and density, it is proximate to at least six study countries and cities in terms of territorial area and to around the same number in terms of elevation. The weather patterns, while distinctive due to their high altitude and remote placement in the Pamir Mountains, are still comparable to the climates of at least six study countries/cities. Thus, this diversity in the selection of the study countries/cities has resulted in an extensive analysis of urban planning practices for subsequent application in Khorog.

Chapter 3 contains a comparative analysis of legal regulations of the cities and countries through

the lens of the UN-Habitat "My Neighbourhood" Methodology.

Moreover, the components of neighborhood, street, public open space, and block dimensions were analyzed based on the urban planning-related regulations of fifteen cities and countries to extract the best practices to be further adapted to Khorog. In the case that those documents did not bear the required components due to their legal nature, other policy and regulatory documents were analysed. These documents focussed on traffic management, zoning, land use, environmental-related regulations, and building codes to extract the best practices.

Furthermore, this chapter presents a perspective on developing mountainous terrain encompassing all the above-mentioned components to define their unique characteristics.

Lastly, the document establishes connections between the applicable components of the four dimensions to create a comprehensive and holistic approach to urban development, specifically in Khorog.

In conclusion, the document presents a summary of recommendations, solutions, and actionable steps in terms of urban planning in mountainous cities that can be applied in Khorog.

Fig 1. View of Khorog's Mountains, UN-Habitat, September 2022

1

INTRODUCTION

Mountains, mountain towns, and mountainous countries constitute a distinct ecosystem that is vastly different from lowland areas. These regions are often characterized by extreme weather conditions, diverse terrain, and limited resources, which require a high degree of adaptation and resilience from the communities that inhabit them. In mountainous regions, agriculture, forestry, and tourism are among the main economic activities that sustain local livelihoods.

However, these activities are often subject to environmental risks such as landslides, avalanches, and erosion, which can have devastating consequences for communities living in mountainous areas.

Despite these challenges, mountainous cities and countries, though situated in rugged terrain, are characterized by unique architectural styles, vibrant cultural traditions, and a deep connection to the natural environment. Their inhabitants have adapted to the challenges of living in a mountainous region, such as steep slopes, harsh weather conditions, and limited resources. Furthermore, they have developed distinctive identities that set them apart from their lowland counterparts.

The city of Khorog presents a compelling illustration of a community's resilience in the face of adversity and its capacity to prosper within a given milieu. The following chapter (1.1) undertakes a comparative analysis aimed at delineating the prominent attributes of the legislative demarcation of mountain cities, their distinguishing characteristics, the regulatory framework governing their activities, as well as the impact of urbanization on their development. This exercise aims to highlight the singular nature of mountainous cities and countries and, in the case of Khorog, to generate more nuanced recommendations.

1.1. DEFINITION AND INTERNATIONAL REGULATION OF MOUNTAINOUS CITIES AND REGIONS

Mountains cover about a quarter of the world's land surface and provide water and mineral resources, timber and non-timber forest products, food, fiber, and fuel products,[1] as well as shelter nearly half of the world's biodiversity.[2] Policy decisions influencing the use of mountain resources are generally made in centers of power far from mountain communities, who are often politically marginalized and receive inadequate compensation for mountain resources, services, and products.

1 *Lu, X. Mountain surface processes and regulation. Sci Rep 11, 5296 (2021). https://doi.org/10.1038/s41598-021-84784-8*

2 *Ding, Y., & Peng, J. (2018). Impacts of Urbanization of Mountainous Areas on Resources and Environment: Based on Ecological Footprint Model. MDPI. https://pdfs.semanticscholar.org/4716/04fe830591253d-03fedd430dca48e99eade2.pdf*

Mountain ecosystems are exceedingly diverse but fragile because of their steep slopes, altitude and extreme landscapes. Many of these ecosystems are being degraded because farmers might be applying unsustainable agricultural practices and inappropriate development.[3] Moreover, mountains serve as home to one-tenth of the world's population who might be vulnerable to food shortages and chronic malnutrition. People living in the mountains, and particularly disadvantaged groups such as women and children, suffer disproportionately from the unequal distribution of assets and from conflicts.[4]

Nevertheless, the unitary definition of "mountain" has remained somewhat "blurry"[5]. For instance, the Oxford English Dictionary states that a "mountain" is a "large natural elevation of the earth's surface, one high and steep in form (larger and higher than a hill) and with a summit of relatively small area". Thus, two topographic criteria are indispensable in identifying mountains: The elevation and the steepness.

The absence of a universally accepted definition of the word mountain,[6] has left room for lawmakers to enshrine the mountain peculiarities in national legislation.

Various elements may be considered to define mountains and to determine their boundaries, including natural characteristics (altitude, topography, climate, vegetation) as well as human factors (food security, land-use opportunities, and constraints, highland-lowland interactions).[7]

At the international level, the Group on Earth Observations defined two types of mountains: low and high. The first one varies between 91 and 400 meters, while the second one is over 400 meters.[8] In other cases, and focusing on the ecological aspect, four mountain classes are identified: low mountains; scattered low mountains; high mountains; and scattered high mountains.[9]

At the legislative level, the first delineations of mountain areas were included in national laws and policies in the Alpine countries[10] and further supplemented with the criteria under the EU Directive 75/268/ECC dated 1975 and subsequent Regulations (EC 950/97 on improving the efficiency of agricultural structures; EC 1257/1999 on support for rural development from the European Agricultural Guidance and Guarantee Fund).

These regulations focus on altitude combined in many cases with slope. In some other cases, criteria such as climate and topography are included.[11]

The French Law No. 85-30 of January 9, 1985, relating to the Development and Protection of the Mountain,[12] and further codified in Articles 122-1 to 122-25 of the Urban Planning Code, for example, defines the term "mountain" as "a set of territories whose fair and sustainable development constitutes an objective of national interest because of their economic, social, environmental, landscape, health and cultural role". The law specifies that in the French overseas departments, the mountain areas include the municipalities and parts of municipalities located at an altitude greater than 500 meters in the department of Réunion, and 350 meters in the departments of Guadeloupe and Martinique.

Romania in the 2018 Legea Muntelui (197/2018) defines the mountain as a "territory of particular

3 United Nations University. (1987). Key issues for mountain areas (M. F. Price, L. F. Jansky, & A. A. Iatsenia, Eds.). https://collections.unu.edu/eserv/UNU:2448/pdf9789280811025.pdf

4 Ibid.

5 Ives JD, Messerli B, Spiess E (1997) Mountains of the World – A global priority. In: Messerli B, Ives JD, (eds.), Mountains of the World: A global priority. Parthenon, Carnforth and New York. pp 1-15.

6 Koulov, Boian & Nikolova, Mariyana & Zhelezov, Georgi. (2016). Mountain Development Policies in Bulgaria: Practices and Challenges. 10.1007/978-3-319-27905-3_1.

7 Villeneuve, A., Castelein, A., & Mekouar, M. A. (2002). Mountains and the Law: Emerging Trends. http://www2.ecolex.org/server2neu.php/libcat/docs/LI/MON-069219.pdf

8 Price MF, Arnesen T, Gløersen E, et al. (2018) Mapping mountain areas: learning from Global, European and Norwegian perspectives. Journal of Mountain Science 16(1). https://doi.org/10.1007/s11629-018-4916-3

9 Karagulle D, Frye C, Sayre R, et al. (2017) Modeling global Hammond landform regions from 250-m elevation data. Transactions in GIS 21: 1040-1060.

10 Price MF, Arnesen T, Gløersen E, et al. (2018) Mapping mountain areas: learning from Global, European and Norwegian perspectives. Journal of Mountain Science 16(1). https://doi.org/10.1007/s11629-018-4916-3

11 Gløersen, Erik & Price, Martin & Aalbu, Hallgeir & Stucki, Erwin & Roque, Olivier & Schuler, Martin & Perlik, Manfred. (2004). Mountain Areas in Europe: Analysis of mountain areas in EU member states, acceding and other European countries.

12 Loi n° 85-30 du 9 janvier 1985 relative au développement et à la protection de la montagne. (1985). https://www.legifrance.gouv.fr/loda/id/JORFTEXT000000317293

national, strategic, economic, social and environmental interest."[13]

The Constitution of Italy includes a separate clause on mountain areas. The Law on the Development of Highlands 991/1952, being an implementing mechanism of the constitutional provision, identifies mountain areas as those within municipalities that have certain combined characteristics of altitude (greater than 600 meters above sea level for 80% of the territory) or height difference (a difference of 600 meters between the minimum and the maximum altitude of a municipality), and low cadastral income.[14]

In Spain, at the sub-national level, the Catalan High Mountain Law 2/1983 identifies "mountain areas" as those territories formed by one or more municipal districts that are not part of a mountain county but that meet at least one of the defined conditions.

Other European examples of mountain altitude include the case of Ireland, which considers areas to be mountainous above 200 meters. For the Czech Republic this threshold is 700 meters. For Norway, Bulgaria, and Belgium the thresholds are respectively 600, 420, and 300 meters.[15]

Albania, Montenegro, North Macedonia, Serbia, and Turkey adhere to the definition of "mountainous area" defined under the Pre-accession Assistance-Rural Development Program (IPARD) for 2007-2013[16] defining a mountain as an area located on an altitude of minimum 1000 meters or located on an altitude between 500 meters and 1000 meters and having a slope of minimum 17%.[17] Moreover, the documents of the five countries under the IPARD Program provide annexes with those villages considered to be "mountainous."[18]

Another example of mountain regulation comes from the Law of Ukraine 1995 "On the Status of Mountain Settlements." It defines specific criteria which assign settlements to the mountain category. Thus, a settlement or part thereof can be called "mountainous" if more than a third of the inhabitants of this settlement live, at an altitude of 400 meters and above sea level in the territory, the relief of which is very fragmented by barracks, watercourses, etc., and the location of 50 percent or more of agricultural land within of this item on slopes with a steepness of 12% or more.[19]

China defines the criterion of mountainous cities as a large proportion of an area of at least 300 meters altitude and above a 25% slope.[20]

In the case of Kyrgyzstan, the Law of Kyrgyzstan of 2002 "On Mountainous Territories" not only gives a definition of mountain settlements but also enshrines the definition of a mountainous territory – an area located within the established hypsometric relative mark, with a deep basis for the dissection of the relief (the difference between the lower and upper marks per unit area), which has a complex of natural factors, consisting of: height, relief, landscape.

Moreover, the law divides the mountainous territories into three following categories: lower mountainous territories (up to 1500 meters above sea level), medium mountainous areas (from 1500 to 2000 meters above sea level), and upper mountainous areas (2000 meters or more above sea level).[21]

The Law of Tajikistan of 2013 "On Mountainous Regions" describes these regions as territories that have characteristic natural features (natural altitudinal zonation) which influence the

13 *Sala, S. (n.d.). Governance in mountain areas: what has changed in the last years? [Slide show]. EUROMONTANA General Assembly. https://www.euromontana.org/wp-content/uploads/2021/10/StefanoSala_GovernanceStudy.pdf*

14 *Cadastral Income (it. "Cadastral Rendita") means a taxable value calculated by the government for every building in Italy.*

15 *Karamanorcid, Z. T. Strategic Planning and Safety of Mountainous Areas in Türkiye's Public Administration Organization. https://doi.org/10.4236/jss.2022.1012032*

16 *IPADR means the instrument for pre-accession assistance for rural development which focuses on rural areas and the agri-food sectors of countries in the process of joining the EU.*

17 *Instrument for Pre-Accession Assistance Rural Development (IPARD) Programme (2014-2020). https://ipard.tarim.gov.tr/Content/IPARDII-2022-10th.pdf*

18 *Annex 2: List of "Mountainous" areas (North Macedonia). (2019). http://ipard.gov.mk/wp-content/uploads/2019/03/Annex-2_List-of-Mountainous-areas.pdf | Republic of Serbia IPARD Programme for 2014-2020. (2017). https://ipard.co.rs/images/dokumenta/IPARD%202014-2020.pdf*

19 *Law of Ukraine "On the Status of Mountain Settlements." (1995). https://zakon.rada.gov.ua/laws/show/56/95-вр#Text*

20 *Liu, Y.; Fan, P.; Yue, W.; Huang, J.; Li, D.; Tian, Z. Assessing Polycentric Urban Development in Mountainous Cities: The Case of Chongqing Metropolitan Area, China. Sustainability 2019, 11, 2790. https://doi.org/10.3390/su11102790*

21 *Law of the Republic of Kyrgyzstan No.151 "On Mountainous Territories" (2002). http://cbd.minjust.gov.kg/act/view/ru-ru/1108*

formation of ecosystems, the way of life, and the economic activities of the population living within these territories. According to this law, there are three types of mountainous areas/regions and territories:

Type one, territories of medium mountainous regions located at an altitude of 1000 to 1500 meters above sea level and having moderate natural conditions; type two, territories of high mountainous regions located at an altitude of 1500 to 2000 meters above sea level and having relatively moderate natural conditions; and type three, territories of the highest mountainous regions, located at an altitude of 2000 meters above sea level, with special natural and living conditions.[22]

In the case of Georgia, the Law 2015 "On the Development of High-Mountain Regions" sets the parameter of an altitude of 1500 meters above sea level to identify high-mountain settlements. In exceptional cases, the status of a high-mountain settlement can also be granted to a settlement located below 800 meters above sea level.[23]

Thus, it could be summarized, that "mountains" are areas defined by a geographical location while the term "mountainous area" refers to the environment of the mountains and their surrounding areas.[24]

Regarding the definition of "mountain city", it is used to imply cities built on mountains. However, the definition is quite complex and is usually influenced by elevation zones, morphology and climate, latitude, biodiversity and food security, land-use opportunities and constraints, conflicts and cooperation, and highland-lowland interactions.[25]

In general, and according to the aforementioned documents, the elevation of mountainous areas varies from 200 meters to 2000 meters.

22 *Law of the Republic of Tajikistan "On Mountainous Regions." (2013). http://ncz.tj/content/закон-республики-таджикистан-о-горных-регионах-республики-таджикистан*

23 *Strategy for Development of High Mountain Settlements of Georgia. (2019). https://mrdi.gov.ge/files/1/HM%20Strategy%20(ENG).pdf*

24 *Karamanorcid, Z. T. Strategic Planning and Safety of Mountainous Areas in Türkiye's Public Administration Organization. https://doi.org/10.4236/jss.2022.1012032*

25 *United Nations International Strategy for Disaster Reduction. (2002). Disaster Reduction for Sustainable Mountain Development. https://www.unisdr.org/files/4031_MountainBooklet2002eng1.pdf*

1.2. URBANIZATION AND ITS EFFECT ON MOUNTAINOUS CITIES URBAN DEVELOPMENT

Mountainous cities have complex urban environments that are different from the cities on flatlands, because of the interaction between intensive urban development and its restricting natural limits.[26] Mountains themselves are among the regions that are the most sensitive to, and already affected by, climate change, which might exacerbate existing challenges.[27]

Due to climate change and the impact of a growing population, there is an urgent need to sustainably manage mountain areas by, inter alia, effective urban planning approaches. Elevation is often overlooked, even though thousands of cities across the globe are nestled in highlands, plateaus, and mountain ranges.[28] In this regard, one of the main tasks of urban planning is to transform the hostile and extreme high-altitude zones into a safe, reachable, exciting and global place for everybody through new buildings and infrastructural technologies.[29]

Though the urbanization in mountains (66%) is lower than that of lowlands (78%),[30] such areas remain environmentally, culturally, economically fragile[31], and vulnerable to socioecological challenges like depleting natural resources and increasing risk exposure to natural hazards.[32]

26 *Luo C, Li X. Assessment of Ecosystem Service Supply, Demand, and Balance of Urban Green Spaces in a Typical Mountainous City: A Case Study on Chongqing, China. Int J Environ Res Public Health. 2021 Oct 19;18(20):11002. doi: 10.3390/ijerph182011002. PMID: 34682747; PMCID: PMC8536085.*

27 *Wehrli, A. (2014). Why Mountains Matter for Sustainable Development. https://bioone.org/journals/mountain-research-and-development/volume-34/issue-4/MRD-JOURNAL-D-14-00096.1/Why-Mountains-Matter-for-Sustainable-Development/10.1659/MRD-JOURNAL-D-14-00096.1.full?tab=ArticleLinkCited*

28 *What is the highest city in the world? (2020, November 10). World Economic Forum. https://www.weforum.org/agenda/2020/11/50-highest-cities-world-sea-level/*

29 *Machedón, A. M. (n.d.). High Altitude Urbanization. Developing Strategies for New Territories (2018). https://doi.org/10.14198/EURAU18alicante*

30 *Ehrlich, D.; Melchiorri, M.; Capitani, C. Population Trends and Urbanisation in Mountain Ranges of the World. Land 2021, 10, 255. https://doi.org/10.3390/land10030255*

31 *Mountain Ecosystems Impact Upon the Whole World. (n.d.). https://www.activeremedy.org/mountain-ecosystems-impact-upon-the-whole-world/*

32 *Juliane Dame, Susanne Schmidt, Judith Müller, Marcus Nüsser, Urbanisation and socio-ecological challenges in high mountain towns: Insights from Leh (Ladakh), India, Landscape and Urban Planning, Volume 189, 2019, Pages 189-199, ISSN 0169-2046, https://doi.org/10.1016/j.landurbplan.2019.04.017. https://www.sciencedirect.com/science/article/pii/S0169204619305341*

Mountain land should be left as undisturbed as possible, thus, one of the main principles, while working on urban planning in mountainous cities, is a disaster reduction approach.

Landslides, debris flows, avalanches, floods, earthquakes, and glacial lake outburst floods, can sometimes cause massive loss of life and property and can result in whole areas being cut off for days, weeks, or even months.

Some ecological hazards are inherent to the mountain terrain: extreme slopes and unstable formations turn heavy rain or snow into agents of destruction. In some cases, the water loosens boulders, or sodden earth can slip down exposed rock faces and pose a danger to the inhabitants. Moreover, melting snow can break away and collapse, and the roads and trails clinging to hillside slopes and creeping precariously through narrow valleys can become blocked or broken away.

Furthermore, rivers in valley bottoms can become temporarily dammed only to release their waters sometime later in disastrous flood waves. In addition, the rain can induce soil erosion, freezing, thawing, and the water circulation within the rocks could also pose danger by breaking down rock.[33]

Conventional approaches to urban development have frequently exacerbated, rather than resolved, urban resilience challenges.[34]

Changes in land-use that substitute natural environments with less permeable built environments reduce the water infiltration, the storage capacities, and the levels of evapotranspiration.[35] This translates into higher surface runoff volumes, reduced water retention rates and increased discharge rates, higher flood peaks, and increased flood frequencies.

Urbanization also increases vulnerability to flooding impacts due to the increase in population densities.[36] Even in the absence of climate change, poor urbanization practices lead to climate-related vulnerabilities. When climate change and poorly managed urbanization are combined, the impacts of both are often compounded, with flooding creating social, economic, and environmental costs and disruptions, including the provision of vital public services, such as transport, water and wastewater management, communications, and electricity.[37]

For example, in France, the 1954 Town Planning Code specifies, that urbanization in mountain areas "should be carried out in continuity with the towns, villages, hamlets, groups of traditional buildings or existing dwellings, subject to the adaptation, change of destination, repair or limited extension of existing buildings, as well as the construction of annexes, of limited size, to these buildings, and the construction of installations or of public facilities incompatible with the neighbourhood of inhabited areas".[38]

Generally, rapid urbanization has exerted tremendous pressure on natural systems in mountains.[39]

As urbanization processes directly influence runoff and flood volume, the role of drainage systems in reducing vulnerability, as part of a climate change adaptation strategy, becomes critical.

Other potential approaches may be the inclusion of improved natural drainage systems, avoid

33 *Adler, C., P. Wester, I. Bhatt, C. Huggel, G.E. Insarov, M.D. Morecroft, V. Muccione, and A. Prakash, 2022: Cross-Chapter Paper 5: Mountains. In: Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 2273–2318, doi:10.1017/9781009325844.022. https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_CCP5.pdf*

34 *Balderas Torres, A., Angón Rodríguez, S., Sudmant, A. and Gouldson A., 2021. Adapting to climate change in mountain cities: Lessons from Xalapa, Mexico. Coalition for Urban Transitions. London and Washington, DC. https://urbantransitions.global/wp-content/uploads/2021/02/Adapting-to-Climate-Change-in-Mountain-Cities_Lessons-from-Xalapa-Mexico.pdf*

35 *Butler, D. and Davies, J. W., 2011. Urban Drainage. Spon Press, London and New York.*

36 *Huong and Pathirana, 2013. Urbanization and climate change impacts on future urban flooding in Can Tho city, Vietnam.*

37 *Balderas Torres, A., Angón Rodríguez, S., Sudmant, A. and Gouldson A., 2021. Adapting to climate change in mountain cities: Lessons from Xalapa, Mexico. Coalition for Urban Transitions. London and Washington, DC. https://urbantransitions.global/wp-content/uploads/2021/02/Adapting-to-Climate-Change-in-Mountain-Cities_Lessons-from-Xalapa-Mexico.pdf*

38 *Jabre, L. (2022, July 29). Urbanisation en montagne : les requérants excipent de l'illégalité du classement du terrain pour sauver leur vue. https://www.lagazettedescommunes.com/820383/urbanisation-en-montagne-les-requerants-excipent-de-lillegalite-du-classement-du-terrain-pour-sauver-leur-vue/*

39 *Ding, Y., & Peng, J. (2018b). Impacts of Urbanization of Mountainous Areas on Resources and Environment: Based on Ecological Footprint Model. MDPI. https://pdfs.semanticscholar.org/4716/04fe830591253d-03fedd430dca48e99eade2.pdf*

building in risk areas from risk areas, as well as public participation campaigns and urban waste management.

Developing alternative approaches to urban development is therefore critical, and interventions promoting ecosystem or nature-based solutions as "green" and "blue" (ocean-centric) alternatives to more conventional "grey" concrete-based infrastructure have attracted great interest. Innovations relating to blue and green infrastructure can offer new insights into the ways urban areas can adapt to a changing climate, while simultaneously addressing a range of wider urban issues.[40]

Some studies on mountain cities use the Site Stability Index[41] to evaluate whether the area is suitable for future development. This index is composed by:

- Hill Stability (lithology, structure, slope morphometry, relative relief, land use and land cover, hydrological conditions)
- Ecological Sensitivity (water source, natural drainage pattern, vegetation, topography, erosion)
- Microclimate (solar access, exposure to cold winds, rainfall & humidity, snowfall, skylight/daylight factor)
- Visual Aesthetics (visual sensitivity, visual fragility, scenic value)
- Locational Aspects (proximity to existing developments, accessibility, availability of infrastructure, quality of place)

The results of the assessment have helped in the rational and easy evaluation of the suitability of different sites for development, as well as determining the sensitivity of specific areas.

Thus, it can be summarized that urban planning in mountainous areas should consider natural and climatic features to the greatest extent possible, supplement and improve, and not destroy the natural environment.

For the planning and design of a human settlement in an environmentally sensitive region and interpreting the spatial plane into a 3-dimensional urban form and skyline, the issues related to eco-sensitivity and environmental aesthetics, which often may be non-measurable and non-physical, need to be dealt with by planners and designers and their interpretation in physical dimension calls for a very logical and rational basis. The interrelationship between the human being, the environment, the place, as well as eco and social systems creates a rational scientific base for the development of human habitat, ensuring the sustainability of the future urban development in hills and thus, it should be considered a priority.[42]

40 *Balderas Torres, A., Angón Rodríguez, S., Sudmant, A. and Gouldson A., 2021. Adapting to climate change in mountain cities: Lessons from Xalapa, Mexico. Coalition for Urban Transitions. London and Washington, DC. https://urbantransitions.global/wp-content/uploads/2021/02/Adapting-to-Climate-Change-in-Mountain-Cities_Lessons-from-Xalapa-Mexico.pdf*

41 *Balderas Torres, A., Angón Rodríguez, S., Sudmant, A. and Gouldson A., 2021. Adapting to climate change in mountain cities: Lessons from Xalapa, Mexico. Coalition for Urban Transitions. London and Washington, DC. https://urbantransitions.global/wp-content/uploads/2021/02/Adapting-to-Climate-Change-in-Mountain-Cities_Lessons-from-Xalapa-Mexico.pdf*

42 *Pushplata. (2000). Urban Design Matrix for Hill Towns. http://shodhbh-agirathi.iitr.ac.in:8081/jspui/image/pdf/web/viewer.html?file=/jspui/bitstream/123456789/78/3/URBAN%20DESIGN%20MATRIX%20FOR%20HILL%20TOWNS.pdf*

2

COUNTRIES' OVERVIEW: GEOGRAPHY, CLIMATE, URBAN GOVERNANCE SYSTEM, AND URBAN PLANNING TOOLS

Mountainous cities are often subject to unique legal considerations due to their geographic location and topography which together with weak governance frameworks can create a complex system.

Urban planning in mountainous cities presents unique challenges due to the difficult terrain, limited space, and other environmental factors. These cities often have steep slopes, narrow streets, and constrained building sites, making it challenging to create livable, sustainable, and attractive urban environments.

Additionally, mountainous cities often face natural hazards such as landslides, rockfall, and avalanches, which require careful consideration in the planning process.

To address these challenges, it is required to take a holistic approach that considers all the above.

A comparative analysis was undertaken across the following nine mountainous countries and respective cities to define best solutions to tackle the challenges faced by the city of Khorog:

- USA: Aspen (Colorado) and Jackson (Wyoming)
- Canada: Banff (Alberta) and Fernie (British Columbia)
- France: Briançon and Chamonix Mont-Blanc
- Switzerland: Charrat, Conthey, Monthey, and Saxon (Canton of Valais)
- Andorra: La Massana
- Montenegro: Žabljak
- North Macedonia
- Kyrgyzstan
- Tajikistan

The objective of this analysis, done using the UN-Habitat "My Neighborhood" Methodology and broadly defined in Chapter 3, was to identify the most effective urban planning practices that could be adopted in Khorog to address the aforementioned challenges.

The analysis also includes the case of Tajikistan to help trace what is already incorporated in its urban-planning legislation and therefore make evident which norms could still be adapted in the case study of Khorog.

Thus, this chapter provides an overview of the topography, the climatic conditions, and the meteorological patterns of countries and urban centers as well as key legal urban planning documents and governmental institutions applying them. This is done to trace the similarities of location and climate, which can influence urban planning decisions in mountainous cities.

For instance, cities in mountainous regions that share similar weather patterns could implement comparable infrastructure and design strategies to manage the impact of extreme weather events. This could include constructing buildings and roads that are more resistant to landslides, flooding, or heavy snow loads, or developing emergency response plans that are tailored to the specific weather risks faced by the city.

Furthermore, the natural landscape and climate of a mountainous city can provide opportunities for sustainable urban planning, such as integrating green spaces and renewable energy sources into the city's infrastructure.

Similarly, shared economic activities such as tourism or forestry may require specialized zoning and land use regulations to balance the needs of the local community, the industry, and the tourists. Overall, the similarities in location and climate between mountainous cities can inform urban planning decisions, creating sustainable and resilient cities.

Moreover, the level in which the analysis of the urban-planning-related decisions are taken (national, regional, or local level) will provide valuable insights into the institutional structures and power dynamics that shape urban planning decisions and will help to identify opportunities for greater collaboration and coordination between different levels of government.

Ultimately, a deeper understanding of the legal and institutional frameworks that govern urban planning in mountainous cities can help ensure that these cities are able to develop in a sustainable way and that they can adapt to the unique challenges posed by their geography and climate.

In the Khorog context, such an approach will help the city to identify the scope of rights and responsibilities of those in charge of urban planning and will help in informing its effectiveness.

2.1. GENERAL OVERVIEW OF COUNTRIES' AND CITIES' GEOGRAPHY, CLIMATE, WEATHER

Countries and cities chosen for this comparative analysis share similar characteristics with Tajikistan and specifically Khorog. They include challenging topography, high altitude, extreme weather conditions, diverse plant life, fluctuating temperatures, and vulnerability to natural disasters.[43]

The selected countries are located on the continents of North America, Europe, and Asia, and are known for having a substantial percentage of mountainous terrain. The altitude of the cities is an essential factor in urban planning and in the construction of buildings and infrastructure, especially in mountainous areas, as it affects accessibility, weather conditions, and their vulnerability to natural disasters.

Notably, Colorado and Wyoming are the most mountainous states in the United States[44], with cities such as Jackson (WY) and Aspen (CO) having elevations close to that of Khorog, namely 1901 and 2438 meters, respectively. Moreover, the province of British Columbia in Canada is reputed to have the highest percentage of mountainous terrain, which is approximately 75%, while the province of Alberta, despite having only 24% of mountainous terrain, is the second- hilliest province of the country.

Regarding the proportion of mountainous terrain in selected European countries, the figures vary from 35% (France) to 90% (Andorra), with Switzerland, Montenegro, and North Macedonia falling in between with mountainous terrain percentages of 60%, 75%, and 80%, respectively.

The elevation of the selected European cities differs from that of Khorog due to the lack of high mountains like the Pamir Mountains. Thus, Žabljak, Montenegro, is located at an altitude of 1,456 meters above sea level, making it the highest-situated town in the Balkans. La Massana,

43 *Kumar, A. (n.d.). Massive multi-storey development in hill regions. https://www.researchgate.net/figure/Massive-multi-storey-development-in-hill-regions_fig4_260011070*

44 *Mountainous terrain of Colorado is 71%, while of Wyoming – 65%.*

Andorra, sits at an elevation of 1,230 meters, nestled in the Pyrenees mountains. The city of Briançon, France, located in the Hautes-Alpes department, sits at an altitude of 1,326 meters, while Chamonix Mont-Blanc, also in France, is situated at an altitude of 1,035 meters. Charrat, Conthey, Monthey, and Saxon, situated in the canton of Valais, are the cities with the highest altitude in Switzerland, with elevations of 502, 468, 412, and 449 meters respectively.

Overall, Žabljak and La Massana are the highest cities among the mentioned ones, followed by Briançon. Chamonix Mont-Blanc, on the other hand, has a lower elevation, while the Swiss cities have significantly lower elevations than rest of the mentioned cities.

As for the Asian continent, the mountainous terrain in such Central Asian countries as Tajikistan and Kyrgyzstan encompasses 93% and 90.7% respectively.

Regarding population density, Khorog has a significantly lower population density (7.1 persons/km2) and accommodates the highest number of people (30,500)[45] than most of the cities examined in this document.[46] This means that Khorog has a unique opportunity to plan and develop its urban areas with a low-density approach that allows for larger green public spaces.

Additionally, the low population density can create opportunities for economic growth, as there may be less competition for resources and more room for new businesses to emerge. However, the main challenge for Khorog's urban development is to balance the future growth of the city with the desire to maintain the unique natural landscape and cultural heritage of the region.

With regards to the climate of the above-mentioned countries and cities, these have different climates, with some areas experiencing colder temperatures and more snowfall due to their high altitude and proximity to mountain ranges. Thus, the climates of these cities greatly depend on their geographical locations. Jackson and Aspen have a semi-arid climate with cold, snowy winters and warm summers, while Banff and Fernie have a subarctic climate with long, cold winters and mild summers. Briançon and Chamonix Mont-Blanc have an alpine climate with cold winters and mild summers. Charrat, Conthey, Monthey, and Saxon experience a continental climate with cold winters and warm summers. Žabljak and La Massana experience long, snowy winters and mild cool summers.[47] The climate in Khorog, on the other hand, is influenced by its location in the Pamir Mountains and is characterized by cold winters and mild summers. The city experiences relatively low precipitation throughout the year, with most of it taking the form of snow during the winter months. In comparison to the other cities, Khorog's climate can be considered harsher and more extreme due to its high altitude and remote location.

Hence, the selected countries and their respective cities have significant similarities with Khorog, though they also possess their own geographical and climatic features. This diversity in the selection helps to ensure a comprehensive and inclusive analysis of factors that could be applied to Khorog.

2.2. GENERAL OVERVIEW OF URBAN GOVERNANCE SYSTEM AND URBAN PLANNING TOOLS

Urban governance directly affects both decision-making – whether done on the national or local level, the bodies involved, as well as the scope of their powers. Thus, it is extremely important to understand how the institutional model functions

45 *The populations of Jackson and Aspen are 10,760 and 7,004 people, respectively. In Banff and Fernie, the numbers are 7,847 and 5,249 people. In France, Briançon and Chamonix Mont-Blanc have populations of 11,339 and 8,611, in the sequence mentioned. In the canton of Valais, Monthey has the highest population at 17,777 people, while Charrat is the least populated at 1,849 people. Conthey and Saxon have populations of 8,792 and 6,278 people, correspondingly. La Massana has a population of 10,359 people, while Žabljak's population is 1,723 people. Kyrgyzstan and North Macedonia are not included in this comparison, as they are analyzed on a national level rather than a regional or local level.*

46 *Jackson has a population density of around 1390 persons/km2, while in Aspen it reaches 701 persons/km2. Banff has a population density of around 2,035 persons/km2, and Fernie has a population density of around 13.5 persons/km2. Briançon and Chamonix Mont-Blanc have population densities of around 413 and 61 persons/km2, respectively. Charrat, Conthey, Monthey, and Saxon have population densities ranging from around 100 to 620 persons/km2. La Massana has a population density of around 160 persons/km2, while Žabljak has a population density of around 9 persons/km2. Kyrgyzstan and North Macedonia are not included in the comparison as they are analyzed at a national level rather than a regional or local level.*

47 *Kyrgyzstan and North Macedonia are not included in this comparison, as they are analyzed on a national level rather than a regional or local level.*

in the context of urban planning, how much authority is given to the responsible institutional actors, and what documents regulate their activities, as well as what decisions they can have an influence on, to have a better understanding of the applicable international norms.

In the following paragraph, the primary methods utilized by urban planning authorities to arrange activities, as well as the key regulatory documents, will be outlined.

Andorra

Andorra has a unitary system of government consisting of a national government and seven local governments, known as parishes.[48] Its governmental system is characterized by a clear division of responsibilities between the national government and local governments[49] including the urban planning ones.

At the end of the 20th century, the legal system of Andorra lacked a provision that would establish the general legal framework for territorial and urban planning in the country. The need for it has been especially accentuated since the 1993 Constitution which delimited the competences among the Government and the local administration. The absence of an adequate urban planning-related regulatory framework has been more evident by the lack of approval of a general plan or planning instrument of national scope, as well as the nonexistence of local general plans. All this changed in 2000, when the Law for the Ordination of Territories and Urbanism (Llei de l'Ordenació del Territori i l'Urbanisme) was approved.[50] This law regulates the territorial planning and land regime, urban planning, and building throughout the national territory.[51]

The national and local governments are both responsible for urban planning. The Government, through the Department of Urban Planning of the Ministry of Urban and Territorial Planning, is mandated with the approval of planning guidelines, projects of national interest, sectoral plans with supra-municipal impact, urbanization, town planning, and construction regulations. The Government is entrusted with the powers to approve and update the list of national heritage and to establish the areas exposed to natural risks and the protection works to be carried out to develop actions there. The local administrations are competent for the approval of planning and district planning plans, partial and spatial plans, and regulatory ordinances of subsidiary regulations.[52] This delegation of power to the local governments ensures that development and planning are carried out in a way that meets the specific needs and requirements of each parish, while still aligning with the broader national goals for urban planning and development.

The primary legal instrument governing urban planning at the local level is the Master Plan of Urban Planning and Development (Pla D'Ordenació i Urbanisme Parroquial or POUP)[53] which is based on the provisions of the Urbanization Regulations as established by Article 59 of the Law for the Ordination of Territories and Urbanism. The POUP is subject to development and implementation by the parishes.

This analysis will specifically examine La Massana, which is one of the seven parishes in Andorra. La Massana first introduced its POUP in

48 *Andorra: Structures and Competences. (n.d.).* https://barometre-reformes.eu/en/andorra/andorra-structures/

49 *Llei general d'ordenació del territori i urbanisme. (2001).* https://faolex.fao.org/docs/pdf/and183235original.pdf

50 *Lefebvre, F. (Ed.). (n.d.). Principado de Andorra.* http://content.efl.es/getFile.aspx?data=ZmlsZU5hbWU9TVUyMDEzXzExNzAwXzExODg4X1BSLnBkZiZhcmVhPWV4dHJhbWVtZW50b3Mmc3ViRm9sZGVyP-WRvY3Vt&download=0

51 *Articles 58 and 59 of the Law for the Ordination of Territories and Urbanism (Andorra). (2000).* https://www.consellgeneral.ad/fitxers/documents/lleis-1989-2002/llei-general-dordenacio-del-territori-i-urbanisme.pdf/view

52 *Sistema D'ordenació Territorial i Urbanístic (Principat d'Andorra). (n.d.).* https://ddd.uab.cat/pub/trerecpro/2012/hdl_2072_202620/PFC_DinaChiguenDian_annex02.pdf

53 *Comparisons | Global Practice Guides | Chambers and Partners. (n.d.).* https://practiceguides.chambers.com/practice-guides/compari-

October 2006[54] and underwent a revision in 2015.[55] The POUP is subject to the legal requirement to undergo revision every six years to ensure that the document remains relevant and up to date considering the changing circumstances and needs of the parish. Thus, this report will analyze the 2015 Master Plan of Urban Planning and Development for La Massana, hereinafter referred to as "Andorran Document".[56] At the same time as the development of this analysis the plan underwent a minor update,[57] but due to the unavailability of the latest version online, the focus will remain on the 2015 version.

Canada

The Canadian community planning practice and institutions derive from both American and British influences, but the outcowme of that combination of influences is distinctive.[58] The Canadian approach resembles to both these systems in terms of shifting main powers in planning to regional levels. No national-level plan exists in Canada, but all provinces and territories have one or more Regional Plans which contain high-level objectives and policies for regional-scale land use, growth management, environmental protection, regional-scale infrastructure, and economic development. While some Regional Plans cover the entire province, others are prepared only for specific areas and may contain land-use plans in the form of maps, or only strategic guidelines.[59]

Provinces have full autonomy over land-use planning, but the federal government can influence planning on federal lands and provide financial support for the programs. Provinces have the autonomy to create their own law relating to planning. As a result, the planning systems widely vary across provinces depending on population size and available resources. While provinces and territories with few inhabitants tend to centralize land-use planning, those with larger populations delegate more power to local governments. Municipalities in all provinces generally have similar powers to regulate development on their territory. However, there are differences in how these powers are exercised between the provinces, meaning that the environmental laws, the building codes, and the planning legislations are managed at the provincial level while zoning laws are managed at the municipal level.

In Alberta, the legal basis for regional land-use planning was established in 2009 with the enactment of the Alberta Land Stewardship Act.[60] The purpose of the regional plans is to define regional outcomes (economic, environmental and social) and a broad plan for land and natural resource use for public and private lands, aligning provincial strategies and policies at the regional level, etc.

Moreover, to govern any issue specifically, the local authorities introduce the bylaws. Thus, to fulfill the provisions of the Alberta Land Stewardship Act, and pursuant to the 2000 Municipal Government Act, the town of Banff introduced the 1990 Land Use Bylaw[61] ,which aimed to provide orderly, economic, beneficial, and environmentally sensitive development of the Town. The Banff Design Guidelines form an integral component of the Banff Land Use Bylaw. Furthermore, in 2006, Banff introduced the Street and Public Place Use Bylaw[62], and in 2004 the Site and Building Guidelines[63]. These will also be further analyzed in this document. Moreover, in 2020 the Streetscape Design Guidelines were produced. Thus, these five instruments of information (Land Use Bylaw, Design Guidelines, Street and Public Place Use Bylaw, Streetscape Design Guidelines and Green Site and Building Guidelines) will be collectively

son/664/8670/14000-14005-14017-14028-14036-14042-14065-14073

54 Ibid

55 Ibid

56 Comú de La Massana. Pla D'Ordenació i Urbanisme Parroquial. Primera Revisió. Normes Urbanístique. (2015). https://docplayer.es/80275549-Comu-de-la-massana-pla-d-ordenacio-i-urbanisme-parroquial-primera-revisio-normes-urbanistiques.html

57 Candel, P. (2022, November 24). El comú de la Massana modifica el pla d'urbanisme per "adaptar-lo a la normativa general." Altaveu. https://www.altaveu.com/actualitat/parroquies/massana-modifica-pla-urbanisme-adaptar-lo-normativa-general_43852_102.html

58 Hodge, G. (2007). The Roots of Canadian Planning. https://doi.org/10.1080/01944368508976796

59 The Governance of Land Use. Canada (Land-Use Planning Systems in the OECD: Country Fact Sheets). (2017). https://www.oecd.org/regional/regional-policy/land-use-Canada.pdf

60 Nature and Effect of Regional Plans. (n.d.). https://landuse.alberta.ca/Governance/NatureEffectofRegionalPlans/Pages/default.aspx

61 Town of Banff Land Use Bylaw. (1990). https://www.codepublishing.com/AB/Banff/

62 Town of Banff Street and Public Place Use Bylaw (2006) https://www.banff.ca/DocumentCenter/View/260/Street-Use---Consolidated---Bylaw-124

63 Town of Banff Green Site and Building Guidelines. (2004). https://banff.ca/DocumentCenter/View/530/Green-Site--Building-Design-Guidelines?bidId=

further referred herein as the "Banff Documents".

Similarly, British Columbia, under the Part 14 "Planning and Land Use Management" of 2015 Local Government Act[64], defines that local government may regulate the use of land and its density, buildings, and other structures as well as their siting, size, and dimensions, and the land permitted uses. It is also entitled to regulate the shape, dimensions and area, and the establishment of minimum and maximum sizes of all parcels of land that may be created by subdivision.

Also, the City of Fernie's Zoning Bylaw regulates how the land, buildings, and other structures may be used within the community. This bylaw guides the growth of Fernie in a systematic way, by ensuring that both the uses of land and structures are compatible with each other, while supporting their sustainability, resilience, and growth goals.[65] Thus, this document will analyze the City of Fernie 2009 Consolidated Zoning Bylaw No.1750 (hereinafter jointly referred to as the "Fernie Document").

France

Throughout its history, the French spatial planning has been characterized by the following cultural and historical characteristics: an old stabilization of the national frontiers; a consciousness of the potential of its many territories regarding economic development, culture, heritage, landscape, etc.; a strong political and economic centralization of power; and a State intervention both in the post-war reconstruction period and in the effort to rebalance the relationship between Paris and the province.Nevertheless, under the influence of some of the developments of the past decades, i.e., the formation of the EU, and the implementation of the European regional policy, decentralization, globalization of the economy, and the sustainable development problematic, public interventions in spatial planning have undergone some changes.[66]

In the French law, the spatial planning law is a combination of different tools. Regulatory town-planning consists of the drawing up of town-planning documents by the municipalities as well as the public establishments for inter-municipal cooperation. National authority represented by the Ministry of Reconstruction and Urban Planning mostly provides a framework for the plans to be produced by local authorities and are entrusted with the supervision functions.

The fundamental rules of town planning are stipulated in the 1996 Town Planning Code (Code de l'Urbanisme). It constitutes a decentralized law. As a result, most of the rules that apply to town planning are set at the local level. Nevertheless, the following documents though developed on the local level, still must comply with the provisions of the Town Planning Code:

- Territorial Coherence Schemes (Schéma de Cohèrence Territoriale): these are strategic or prospective planning mechanisms on the size of an urban area, an employment area or a large living area.
- Local Urban Plans (Plan Local d'Urbanisme): these documents set the rules for land use and development plans for municipalities over the long term.
- Communal Maps (Cartes Communales): these are simplified documents that delimit building zones and non-building zones. They are suitable for towns as well as low-density villages.[67]

In the Briançon area, there are two sets of urban planning documents that govern land use and development. The Territorial Coherence Scheme (SCoT du Briançonnais) and the Briançon Local Urban Plan (Plan Local d'Urbanisme or PLU) serve as regulatory frameworks. The SCoT[68] is a higher-level document that covers a wider geographical area and includes 13 municipalities within the Community of Municipalities of Briançonnais.[69] It provides long-term strategies and objectives for sustainable and coherent urban development in the area, focusing on space organization, urban planning, housing, mobility, commercial

64 *Part 14 "Planning and Land Use Management" of 2015 Local Government Act (British Columbia)* https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/r15001_00_multi#section34

65 *City of Fernie's Zoning Bylaw. (n.d.)* https://webcache.googleusercontent.com/search?q=cache:JGK6GRmicT8J:https://www.fernie.ca/EN/main/city/departments-services/planning-development-services/zoning.html&cd=1&hl=en&ct=clnk&gl=ke&client=safari

66 *Swiss Federal Office for Spatial Development. (2008). Spatial Planning and Development in Switzerland. Observations and Suggestions from the International Group of Experts.*

67 *JuriPresse. (2021, September 3). Qu'est-ce que le droit de l'urbanisme?* https://www.juripresse.fr/blog/quest-ce-que-le-droit-de-lurbanisme/

68 *Rapport de présentation. Tome 1 "Diagnostic." (2017).* http://www.ccbrianconnais.fr/sites/default/files/deliberations/annexe_2017_66e_scot_brianconnais_arret_schema_coherence_territorialef4f9.pdf; *Schéma de Cohérence Territoriale (SCoT). (n.d.)* https://www.ccbrianconnais.fr/scot;

69 Ibid

development, and the environment.[70]

The Briançon PLU is more specific to the municipality of Briançon and was created in 2007, covering the entire municipal territory, except for its historical site – Cité Vauban.[71,72]

It contains zoning maps and regulations, building height and density restrictions, and other guidelines for urban development.[73] The plan has undergone modifications over the years to comply with regulatory changes enacted in 2014[74], which established new public territorial authorities called "metropolitan areas" with greater autonomy and powers[75]. The SCoT and Briançon PLU work together to ensure sustainable and coherent development in the Briançon area.[76]

The Local Urban Plan of Chamonix-Mont-Blanc contains the zoning plan, land use regulations, building height and density regulations, and environmental and heritage protections. It includes a comprehensive set of regulations for urban development and provides detailed specifications for each type of development, such as residential, commercial, or industrial.

Thus, this document will conduct the analysis of the local urban plans of both cities, namely the 2007 Briançon[77] and 1977 Chamonix Mont-Blanc[78] Local Urban Plans (hereinafter referred to respectively as "Briançon Document" and "Chamonix Mont-Blanc Document").

70 *Deliberation N°2018-55 du 03 juillet 2018. Objei - SCoTdu Brianconnais: approbation du Schema de Cohérence Territoriale du Briançonnais. http://www.ccbrianconnais.fr/sites/default/files/atoms/files/delib_2018-55_scot_brianconnais_approbation_schema_coherence_territoriale_avec_annexes-compresse.pdf; Rapport de présentation. Tome 1 "Diagnostic." (2017). http://www.ccbrianconnais.fr/sites/default/files/deliberations/annexe_2017_66e_scot_brianconnais_arret_schema_coherence_territorialef4f9.pdf*

71 *Secteur sauvegardé. https://www.ville-briancon.fr/secteur-sauvegarde*

72 *Plan Local d'Urbanisme. (2021, February 1). Ville De Briançon. https://www.ville-briancon.fr/plan-local-durbanisme*

73 *Briançon Règlement du Plan Local d'Urbanisme. (2007). https://www.ville-briancon.fr/sites/default/files/atoms/files/plu_reglement_ville_briancon_avril2020.pdf*

74 *Le PLU de demain. https://www.ville-briancon.fr/plan-local-durbanisme; Loi n° 2014-58 du 27 janvier 2014 de modernisation de l›action publique territoriale et d›affirmation des métropoles. (2014). https://www.legifrance.gouv.fr/loda/id/JORFTEXT000028526298*

75 *Loi du 27 janvier 2014 de modernisation de l'action publique territoriale et d'affirmation des métropoles. https://www.vie-publique.fr/loi/20674-loi-maptam-action-publique-territoriale-et-daffirmation-des-metropoles*

76 *SCot du Briançonnaise. https://www.ccbrianconnais.fr/sites/default/files/20200414_foire_aux_questions_scot.pdf*

77 *Briançon Règlement du Plan Local d'Urbanisme. (2007). https://www.ville-briancon.fr/sites/default/files/atoms/files/plu_reglement_ville_briancon_avril2020.pdf*

78 *Chamonix Mont-Blanc Règlement du Plan Local d'Urbanisme. (1977). https://www.cc-valleedechamonixmontblanc.fr/documents/actualite/pdf/modification_8_plu_reglement.pdf*

Kyrgyzstan

Urban governance frameworks of Kyrgyzstan are highly influenced by the standards of Soviet rule meaning they tended to be centralized under the national authorities and remain in the same state. The executive power in the republic is exercised by the National Government, ministerial departments, state committees, administrative departments, and local state administrations. Under the national government, the specialized body dealing with urban planning is called the State Agency for Architecture, Construction, Housing and Utilities. Its structure includes both the central body, State Design Institute for Urban Planning and Architecture, which is directly involved in the development of general plans, urban planning documentation and its approval, etc.[79], and territorial departments for urban planning and architecture dealing with the approval of urban planning documents and its further implementation.

From the legislative perspective, the primary legislative law – the 1994 Law "On Urban Development and Architecture" governs all types of urban planning activities and stages of the urban planning and architectural process.[80] Except for primary legislation, there is a technical document – building norms SN KR 30-01:2020 "Planning and Building of Cities and Popular Points of City Type" aimed at the design of new and reconstruction of existing urban settlements. They include the basic requirements imposed on the territory of Kyrgyzstan, principles and procedures for planning, development of cities and urban-type settlements.[81] This document will be further referred to as "Kyrgyz Document".

Montenegro

Over the last decade, spatial planning policy in Montenegro has become increasingly centralized[82] being concentrated mostly at the Government under the responsible ministry for spatial planning – the Ministry of Ecology,

79 *Charter of the State Design Institute for Urban Planning and Architecture*

80 *Law On Urban Development and Architecture of the Kyrgyz Republic dated 1994*

81 *SN KR 30-01:2020 "Planning and building of cities and popular points of city type"*

82 *Dragović, S. (2021). The Volatile Policy Framework of Spatial Planning in Montenegro: Will the Centre Hold?. In: Berisha, E., Cotella, G., Solly, A. (eds) Governing Territorial Development in the Western Balkans. Advances in Spatial Science. Springer, Cham. https://doi.org/10.1007/978-3-030-72124-4_7*

Spatial Planning and Urbanism.[83] Its Directorate for Spatial Planning and Development carries out such daily tasks related to urban planning as the development of policies, strategies, projects, and programs in the field of spatial planning and spatial development, as well as monitoring and undertaking measures for their implementation; participation in harmonizing national legislation with EU legislation in the field of spatial planning; monitoring and implementation of international conventions in this area; supervising the legality of acts and the legality of the work of local self-government bodies and other entities entrusted with the exercise of public powers; monitoring of the situation in the space, etc.[84]

The urban planning-related work is governed by 2017 Law on Spatial Planning and Construction of Facilities[85] which introduced extensive changes to Montenegrin spatial planning practices, among which spatial planning and construction powers from local authorities have been shifted to the Ministry. Thus, the planning system became centralized.[86]

The law also introduced two important actors, besides the local and state governments, parliaments, and the general public: Authority for Technical Requirements, which is an institution (local or national) or a company (public or private) in charge of a certain infrastructural element (such as road construction and maintenance, water supply or internet provision), and the Revision Council, which is appointed by the state Government, in charge of revising the drafts of planning documents and composed of experts in spatial planning with at least 15 years of experience.

The Council is also required to have a representative of a local government whose territory is being planned in a document under revision. Also, local governments should be represented by a team of experts in charge of working on a planning document, which will be formed by the Ministry.[87]

Furthermore, the law also introduced only two types of documents: Spatial Plan of Montenegro, and General Regulatory Plan. Development of both documents is led by the national government. The Spatial Plan of Montenegro contains rules for development and rules for building by zones; subdivision rules; urban regeneration guidelines; recommendations for the creation of urban projects; advice on landscape architecture; guidelines for the protection of cultural heritage; guidelines for the improvement and protection of nature and the environment; guidelines for the prevention and protection against natural disasters, technical, technological and other accidents; climate change adaptation guidelines; recommendations for reducing seismic risk; guidelines for energy efficiency and renewable energy; guidelines for concession sites; economic and market forecast and other recommendations for the implementation of the plan.

The existing Spatial Plan of Montenegro was valid until 2020 and the new one will be developed in 2023.[88] Thus, subject to applicability, it will be referenced in this document as "Montenegrin Document". Based on the general plan of the country, a detailed plan of the city is formulated. It includes main rules and regulation on how the development of the specific territory should be made, its specifics and at what conditions this should be done.[89] Thus, given that the detailed plan contains all the characteristics of how the city should be planned, this document will analyze 2018 Detailed Urban Plan of Žabljak, Montenegro, which will hereinafter refer to as the "Žabljak Document".

North Macedonia

83 *Ministry of Ecology, Spatial Planning and Urbanism. (n.d.). https://www.gov.me/en/mepg*

84 *Report on the Work and Situation in the Administrative Areas of the Ministry of Ecology, Spatial Planning and Urbanism with the bodies over which the Ministry supervises for the period January – December 2021. (2022).*

85 *Zakon o planiranju prostora i izgradnji objekata. (2017). https://www.gov.me/dokumenta/1603a1b7-1090-4e00-b7fd-e5e97607f030*

86 *Tošić, B., & Živanović, Z. (2019). Comparative Analysis of Spatial Planning Systems and Policies: Case Study of Montenegro, Republic of North Macedonia and Republic of Serbia. 10.5937/zrgfub1902005T*

87 *Dragovic, S. (2018). When Government Takes All the Space: Centralization of Urban Planning in Montenegro. TICYUrb · Proceedings of the Third International Conference of Young Urban Researchers. Vol. VII. https://www.academia.edu/41064683/When_Government_Takes_All_the_Space_Centralization_of_Urban_Planning_in_Montenegro*

88 *Novi prostorni plan Crne Gore tek naredne godine. (2022, November 7). Bankar.me. https://www.bankar.me/2022/11/07/novi-prostorni-plan-crne-gore-tek-naredne-godine/*

89 *Article 17 of the Law on Spatial Planning and Construction of Facilities (Montenegro). (2017). https://www.paragraf.me/propisi-crnegore/zakon-o-planiranju-prostora-i-izgradnji-objekata.html*

The Republic of North Macedonia, despite having its foundations in urban planning regulation from Soviet rule, has transitioned to a European model with a focus on EU priorities. The most important stakeholders are the Government, the Assembly, the Ministry of Environment and Physical Planning, and the Agency for Spatial Planning.[90]

Under the national government, the Ministry of Environment and Spatial Planning, through the Department of Spatial Planning, is responsible for the management and implementation of policies and monitoring processes in shaping the space of the country. The following departments: Unit for plan and spatial policy, Unit for spatial plans implementation, and Division for strategic environmental assessment focus on the coordination of spatial plans activities takes place.[91]

The Agency for Spatial Planning oversees the implementation of general planning policies and the overall spatial policy of the country. It implements and elaborates in detail the spatial plan by preparing spatial plans for specific regions, areas of special interest and the municipalities, for the municipalities of the City of Skopje and the General Plan of the City of Skopje.[92] The activities of the institutions mentioned are governed by Urban Planning Law adopted in 2020. It governs the systemic and hierarchical structure of urban planning in the system of spatial and urban planning, the goals and principles of urban planning and organization of space, the types and content of urban planning plans, and the conditions for performing work in the field of urban planning. Furthermore, the procedure for creating, adopting and implementing urban planning plans, supervising the implementation of the provisions of this Law, as well as other issues in the field of urban planning are also within the scope of this law.

According to the 2020 Urban Planning Law, urban planning should be based on the following principles: balanced spatial development; rational arrangement and use of space; creation and improvement of conditions for humane living and work of citizens; preservation of quality and improvement of the environment and nature; work with climate change.Depending on the scope of urban planning, as well as whether the object of planning is of national or local importance, the following are adopted: general urban plan; detailed urban plan; urban plan for the village; urban plan for outside the settlement; and urban plan for areas and buildings of state importance. In addition, and depending on the scope of the urban plans, they are divided into plans of local and state significance.[93]

On the basis of paragraph 4 of Article 24 of the Urban Planning Law, the Urban Planning Guidelines were adopted in 2020. These guidelines establish standards and norms for urban planning and determine the principles and methods of rational planning of sustainable settlements and buildings for the arrangement and use of space, methods and techniques of urban planning activities, the legal force of planning norms, a system class of goals, as well as all protective or generating standards that ensure the fulfillment of the goals and principles of urban planning. These guidelines will be referred to as the "North Macedonian Document".

The development, adoption, and in particular the implementation of the planning documents are the specific responsibilities of the local administration municipalities, which largely depend on the quality of local development programs, the available budget of the municipalities, and the possibility for attracting local and foreign investments. This right was granted to them in 2002 with the Law on Local Self Government. Although the Law on Local Self Government was enacted in 2002, the actual decentralization and transfer of urban planning-related competencies started in 2004 with the Law on the Territorial Organisation of the Local Self Government of the Republic of Macedonia. This law reduced the number of municipalities and, consequently, their responsibilities in, urban and spatial planning, were enhanced.[94]

90 *Government of the Republic of North Macedonia & United Nations. North Macedonia. (2022).* ***Thematic Baseline: Spatial Planning.***

91 *Department of Spatial Planning (Ministry of Environment and Physical Planning). (n.d.). https://www.moepp.gov.mk/en/министерство/сектор-за-просторно-планирање/*

92 *History: The Planning Process through Institution. (n.d.). https://app.gov.mk/?page_id=2141&lang=en*

93 *Јасна Оро вчанец Аранѓеловиќ. (2022). Public Policy Document. Public Participation in Urban Planning. https://myla.org.mk/wp-content/uploads/2022/08/Ucestvo-na-javnosta-vo-urbanistickoto-planiranje.pdf*

94 *Stefanovska, J., & Koželj, J.A. (2012). Urban planning and transitional development issues: The case of Skopje, Macedonia. Urbani izziv, 23, 91-100. http://www.urbaniizziv.si/Portals/urbaniizziv/Clanki/2012/urbani-izziv-en-2012-23-01-002.pdf*

Switzerland

Switzerland is a federal state characterized by a three-tier structure. It is made up of a federal state (the Confederation), federated states (the cantons), as well as a third level – the municipalities (lower public authorities). The distribution of competencies between the Confederation and the cantons is dominated by the principle of subsidiarity. The cantons exercise all powers which are not directly assigned to the Confederation by the Federal Constitution. As for the relationship between the canton and the municipalities, the canton, in principle, determines which areas come under municipal jurisdiction; however, special rules may also exist at the federal level.[95]

Thus, the Confederation is competent only to define the principles applicable in this matter. It cannot, therefore, adopt detailed prescriptions, thus, federal planning legislation must therefore remain relatively general and abstract. The Confederation is also competent to guarantee coordination between cantons and collaboration with them, and it can also act as a supervisory authority for the cantons in the performance of their tasks; control that must be exercised with moderation – the master plans of the cantons must be approved by the Federal Council.

The development of the Swiss planning system was launched in 1969 with the adoption of constitutional provisions which define the general framework of spatial planning. The first provision enshrined the establishment of private property while the second one gave the Confederation the power to legislate on land use planning.

In 1979, the Federal Law on Spatial Planning was developed which provides a framework law that generally lays down the principles intended to delimit the territorial planning policy of Switzerland, principles which the Cantons will be responsible for executing, namely: preservation of the landscape, the development according to the needs of the population of territories intended for housing and economic activities, as well as the limitation the extent of these territories and, finally, the rational siting of public or public interest constructions and installations.

In addition to the federal law on spatial planning, it should be noted that the Federal Council (the federal government) in 1989 adopted the Ordinance on Spatial Planning, the purpose of which is to specify the principles and instruments as defined by the federal law on spatial planning.[96]

With regards to the cantons, each of the 26 cantons is obliged to adopt regulations for the application of the federal law on regional planning, which must in particular contain prescriptions on the various planning instruments (master plans and land use plans), as well as in terms of building permits.[97] Thus, this document will analyze the 2019 Master Plan (Plan Directeur Cantonal) of the Canton of Valais (hereinafter referred to as "Valais Document").[98] Based on this document, respective municipalities are required to adapt their legislative provisions under the Zone Allocation Plan and the Communal Building and Zone Regulations.[99] The later document of Charrat, Conthey, Monthey, and Saxon municipalities (hereinafter referred to respectively as "Charrat Document"100, "Conthey Document"[101], "Monthey Document"[102], and "Saxon Document"[103]) will be further analyzed in this report.

Tajikistan

Tajikistan, similar to Kyrgyzstan, and as discussed in paragraph 2.2.4, has its urban planning practice influenced from the Soviet rule, where core urban planning functions are still concentrated in

95 *Stefanovska, J., & Koželj, J.A. (2012). Urban planning and transitional development issues: The case of Skopje, Macedonia. Urbani izziv, 23, 91-100. http://www.urbaniizziv.si/Portals/urbaniizziv/Clanki/2012/urbani-izziv-en-2012-23-01-002.pdf*

96 *Donzel, V., & Flückiger. (n.d.). Le droit de l'urbanisme en Suisse. https://www.gridauh.fr/sites/default/files/u440/3eccbbc3161ab%20%281%29.pdf*

97 *Ibid.*

98 *Master Plan (Plan Directeur Cantonal) of the Canton of Valais. (2019). https://www.vs.ch/fr/web/sdt/plan-directeur-cantonal-2019*

99 *Planification Communale et Plan D'Affectation de Zones. (n.d.). https://www.vs.ch/web/sdt/planification-communale*

100 *Reglement des Constructions (Commune de Charrat). https://www.martigny.ch/data/documents/Rglementdesconstructionscharrat.pdf*

101 *Reglement des Constructions (Commune de Conthey). https://www.conthey.ch/data/documents/Reglements/RCCZprovisoire.pdf*

102 *2000 Reglement des Constructions (Commune de Monthey). https://www.monthey.ch/data/dataimages/Upload/_Officielle/UBC/Règlement/Reglement_communal_des_constructions_et_des_zonesy_LCC_2018_08_06_2018.pdf*

103 *2019 Reglement des Constructions (Commune de Saxon). https://www.saxon.ch/wp-content/uploads/2019/04/Règlement-des-constructions.pdf*

central authorities. Thus, the specialized entity of the Government, the Committee for Architecture and Construction, deals with developing technical standards such as the normative rules on construction and urban planning. The implementation function is divided among several entities, namely the Open Joint Stock Company (OJSC) "Shahrofar", local authorities, building organizations, etc. that are responsible for the adherence to and implementation of all urban planning documents.

Specifically, the responsibilities of the OJSC "Shahrofar" include:

- development of urban planning documentation: general plans, detailed planning projects, district planning schemes as well as the development of districts, micro districts, quarters, and individual sites
- development of schemes of engineering networks of settlements and territories
- the architectural design of general plans of construction objects, residential buildings, public buildings and structures, objects of production, hydrotechnical, energy and agricultural purposes, engineering structures, reconstruction of buildings and structures
- construction and design of residential and public buildings and structures, reconstruction of buildings and structures
- design of engineering networks and systems (water supply, sewerage, power supply, communications, heating, gas supply)
- performance of the general designer function
- development of interior and design projects

Together with the OJSC "Shahrofar", the local authorities of the Committee for Architecture and Construction that represent all regions are responsible for monitoring settlements patterns and planning for the future development of the respective territories. Local authorities collect information on the ground and, on request, provide the information to central authorities for the development of general plans.

Regarding the legal regulation of urban planning, the 2012 Town Planning Code was adopted to regulate urban planning activities, their observance by state authorities, local self-government bodies of towns and villages, individuals, and legal entities. The technical document governing urban planning belongs to the category "Town planning norms and rules" – the GNiP 30-01-2018 "Urban planning, Planning and Development of Settlements". These documents will be further referred to as "Tajik Document".

USA

In the USA, "Land-use Planning" is an umbrella term for defining social, economic, environmental, infrastructure capacity, aesthetic, and other relevant aspects, as well as the best present and future uses of geographically specified land areas.

Unlike many other countries, the United States of America does not have a national land-use planning law denominated as such, nor any other differently named national law that would be construed as its functional equivalent. This means that there is a national absence in land-use planning in the United States where a strong preference is given for local planning.

The United States' urban planning system is characterized by a complex network of laws, regulations, policies, and institutions at the federal, state and local level, where the federal government plays a relatively limited role.[104]

The national government is responsible for overseeing five key areas, which include regulating the environment, managing nationally owned land, implementing transportation policies and financing, providing subsidies for housing and economic development, and enforcing regulations against land-use planning.[105] Thus, most powers are entrusted to the states themselves, and urban planning is regulated on the regional and/or local levels.

Nevertheless, to establish a certain level of

104 *The Governance of Land Use. Country Fact Sheet: United States. (2017).* https://www.oecd.org/regional/regional-policy/land-use-United-States.pdf

105 *Kayden, J. S. (2000). National Land-Use Planning in America: Something Whose Time Has Never Come.* https://core.ac.uk/download/pdf/233188478.pdf

standards to regulate land use, in 1926, the U.S. Department of Commerce developed a Standard State Zoning Enabling Act – a "model" act intended to serve as a guide that states could follow.106 It served as a basic instrument for both the states of Colorado and Wyoming. The specifics of this model are defined below.

The legal framework of Colorado is considered "locally controlled" meaning most land use decisions, such as the adoption of zoning and building codes, are driven by local governments, not by the State.[107] Under the Colorado Revised Statutes, land use authority composed of land using, master planning, zoning, etc. is designated to local governments.[108] Therefore, the city of Aspen in Title 26 "Aspen Land Use Code" of its Municipal Code, sets standards, regulations, and procedures for the planning, evaluation, approval, and implementation of land uses and development.[109] Consequently, this document will be referred to as the "Aspen Document".

Land-use planning in Wyoming, as defined by its Planning Statutes, is a basic function and power of local governments,[110] enabled by state legislation governing the operation of towns, cities, and counties.[111] There, local land-use planning occurs primarily at the county and municipal levels, and consists of three major components: land use and its associated infrastructures (transportation and utilities), services (public health, public safety, education, social services, and recreation) , and land development (mainly subdivisions).

Local governments must develop a local land use plan[112]. In the case of Wyoming, the plan developed in 2021 in Jackson, is called the Land Development Regulations[113], and was developed based on 2021 Teton County Land Development Regulations[114].

Urban planning in the USA comprises local regulations which are suited to the needs of individual cities[115], with most of the American cities having the prescribed design guidelines.[116]

The Jackson Design Guidelines were adopted in 2004 to direct the physical development of the Town through building design and land planning. Both documents will be further referred to as "Jackson Documents".

106 *Gribb, W. J., & Jeffrey D. Hamerlinck. (2018). The Legal Basis of Planning in Wyoming. https://www.uwyo.edu/haub/_files/_docs/ruckelshaus/open-spaces/2018-legal-basis-of-planning-in-wy.pdf*

107 *Land Use Planning and Regulation in Colorado | Planning For Hazards. (n.d.). https://planningforhazards.com/land-use-planning-and-regulation-colorado*

108 *Ibid*

109 *Code of Ordinances (City of Aspen, Colorado). Title 26 – Land Use Provisions. (2006). https://library.municode.com/co/aspen/codes/municipal_code?nodeId=TIT26LAUSRE*

110 *Wyoming Statutes § 9-8-301. (n.d.). https://casetext.com/statute/wyoming-statutes/title-9-administration-of-the-government/chapter-8-land-use-planning/article-3-local-level/section-9-8-301-development-of-plans*

111 *Hamerlinck, J. D., & Gribb, W. J. (2016). Local Government Land-Use Planning in Wyoming: Purpose, Process, and Benefits. https://www.uwyo.edu/haub/_files/_docs/ruckelshaus/open-spaces/2016-local-govt-land-use-planning.pdf*

112 *Gribb, W. J., & Hamerlinck, J. D. (2018). The Legal Basis of Planning in Wyoming. https://www.uwyo.edu/haub/_files/_docs/ruckelshaus/open-spaces/2018-legal-basis-of-planning-in-wy.pdf*

113 *Land Development Regulations (Town of Jackson, Wyoming). (n.d.). https://www.jacksonwy.gov/231/Land-Development-Regulations*

114 *Teton County Land Development Regulations. (n.d.). https://jacksontetonplan.com/DocumentCenter/View/932/Teton-County-Land-Development-Regulations-PDF*

115 *Dinic, Milena and P. Mihailo Mitkovic. "Planning regulations in the USA and their implications on urban design in the central city zone." **Facta Universitatis - Series: Architecture and Civil Engineering** 9 (2011): 289-299. https://www.semanticscholar.org/paper/Planning-regulations-in-the-USA-and-their-on-urban-Dinic-Mitkovic/aba7020bef-0c0d2744dfb23bfc64b122aa0c1a09*

116 *Ibid*

3

COMPARATIVE ANALYSIS OF LEGAL REGULATIONS USING UN-HABITAT "MY NEIGHBOURHOOD" METHODOLOGY

To localize the Sustainable Development Goals (SDGs), UN-Habitat has devised a comprehensive methodology, known as "My Neighborhood", which is done in the form of a matrix.[117] It is premised on five city objectives, namely, compactness, connectivity, inclusivity, vibrancy, and resilience, which form the basis for sustainable planning and design initiatives.

This chapter further covers key spatial indicators of four dimensions (neighborhood, street, public open space and block) with examples from legislation of nine mountainous countries. The analysis of this countries, together with the 2023 Khorog Urban Planning Guidelines developed by UN-Habitat, will assist in the development of the Khorog Urban Development Rules.

3.1. NEIGHBOURHOOD

As of October 2022, the global urban population has reached a staggering 4.4 billion [118] meaning that urban areas need to be responsive to the needs and demands of their inhabitants. Therefore, to achieve sustainability in cities and communities, it is imperative to initiate the process at the neighborhood level.[119]

In general, a neighborhood is a community, geographically localized within a larger city, town, or rural area, represented by a spatially defined unit, with its own system of functional and social networks. It directly serves people to meet their daily needs, socialize, and feel safe. Thus, the document will analyze key indicators of neighborhoods based on the legal documents (primary and secondary laws) of the nine mountainous countries to define key peculiar aspects applicable to mountainous cities.The findings of the analysis will be further incorporated into the recommendations for Khorog.

3.1.1. Permeability of Urban Fabric

A permeable street network is a type of urban design that prioritizes the movement of people and goods over vehicular traffic, and which aims to create a more pedestrian-friendly environment

117 *UN-Habitat "My Neighborhood" Methodology: https://drive.google.com/file/d/1HzblcuXx8knZoVhGtrBMjzduSQQMdeAd/view*

118 *Overview. (n.d.). World Bank. https://www.worldbank.org/en/topic/urbandevelopment/overview#:~:text=Today%2C%20some%2056%25%20of%20the,people%20will%20live%20in%20cities.*

119 *UNEP Neighbourhood Guidelines. (n.d.). UNEP Neighbourhood Guidelines. https://www.neighbourhoodguidelines.org/*

by reducing the dominance of cars and increasing the number of alternative modes of transportation, such as walking, biking, and public transit. By promoting active transportation and reducing the reliance on cars, a permeable street network can help to reduce traffic congestion, improve air quality, and enhance the overall livability of urban communities.

Among the key elements defined at the neighborhood scale, both proximity and walkability are crucial as residents in any given neighborhood should have a 5-minute walking distance (around 400-450 m) to key services with exceptions up to 10-15 minutes depending on the city scale and grid.

In urban planning, the "walkability" concept advocates for denser cities120, while in general terms, the concept bolsters the economic, social, environmental, and political aspects of the cities[121]. Thus, walkability supports economic development[122] (e.g., activates street facades). Also, walkable neighborhoods facilitate the reduction of air and noise pollution by encouraging people to leave their cars at home,[123] and, by giving preferences to non-motorized modes of transport.[124]

As for mountainous cities, walkability is promoted by the mountains which are natural attractions by themselves (e.g. hiking trails),[125] though, at the same time, it may be discouraged by, for example, steep slopes.[126]

120 Darlin, D. (2010, January 9). Street Corners vs. Cul de Sacs. https://www.nytimes.com/2010/01/10/business/10every.html

121 ARUP. Cities Alive. Towards a walking world (June 2016) https://www.google.com/url?sa=i&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=0CAQQw7AJahcKEwig9Ky239X7AhUAAAAAHQAAAAQAw&url=https%3A%2F%2Fwww.arup.com%2F-%2Fmedia%2Farup%2Ffiles%2Fpublications%2Fc%2Fcities-alive_towards-a-walking-world_lowres.pdf&psig=AOvVaw0K_M2cyqfGy3LTrNNMIGcO&ust=1669892218706171

122 The Importance of Neighborhood Walkability. (2021, June 29). https://oakwoodhomesco.com/building-your-home/the-importance-of-neighborhood-walkability/

123 Ibid

124 Marshall JD, Brauer M, Frank LD. Healthy neighborhoods: walkability and air pollution. Environ Health Perspect. 2009 Nov;117(11):1752-9. doi: 10.1289/ehp.0900595. Epub 2009 Jul 20. PMID: 20049128; PMCID: PMC2801167. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2801167/

125 Most walkable cities in the US that also have proximity to nature. (n.d.). https://www.reddit.com/r/urbanplanning/comments/url311/most_walkable_cities_in_the_us_that_also_have/

126 Fan, P., G. Wan, L. Xu, H. Park, Y. Xie, Y. Liu, W. Yue, and J. Chen. 2017. Evolving Walkability of Major Cities in the People's Republic of China. ADBI Working Paper 645. Tokyo: Asian Development Bank Institute. Available: https://www.adb.org/publications/evolving-walkability-major-cities-prc

From the countries' case studies, the Jackson Documents provide the best practice by stipulating that the site shall be within 1/4 mile (402 meters) of walking distance from numerous commercial services routinely needed by residents.

Also, to ensure better walkability, organizations such as the UN-Habitat promote infrastructure for safe and convenient walking, and cycling consisting of charactheristics -among others- such as pedestrian sidewalks and cycling paths of appropriate size, street lighting, and universally accessible pedestrian infrastructure.

Pathways and cycling networks, which represent the soft mobility approach and promote connectivity, should form an unobstructed network ensuring the possibility to walk and cycle longer distances. Nevertheless, in mountainous cities, the relief of the terrain (steep gradients), and the severe weather conditions can limit, but do not completely prevent, walking or cycling around the city.

Some studies[127] make the following recommendations to mitigate excessive grades on shared-use pathways:

- The Use of higher design speeds for horizontal and vertical curvature, stopping sight distance, and other geometric features.
- When using a longer grade, it is suggested to consider an additional 1.2 to 1.8 m width to allow slower bicyclists to dismount and walk uphill, and to provide more maneuvering space for fast downhill bicyclists.
- To Install hill warning signs for bicyclists and advisory speed plaque, if appropriate
- To Provide signing that alert path users to the maximum percent of the terrain's grade.
- Exceed minimum horizontal clearances, recovery area, and/or protective railings.
- If other designs are not practicable, a series of short switchbacks to traverse the grade should be used. If this is done, an extra 1.2 to 1.8 m of path width is recommended to provide for maneuvering space.
- To Provide resting intervals with flatter grades, thus allowing users to stop periodically and rest.[128]

127 Sitasi. Matias, Isabel, et al. "Making Cycling Spaces in Hilly Cities." KnE Engineering, 3 May. 2020, doi:10.18502/keg.v5i5.6933

128 American Association of State Highway and Transportation Officiais (AASHTO), Guide for the development of bicycle facilities, 4th ed. (Washington, 2012).

In general, the ideal grade for conventional bicycle use will be the lowest possible, preferably less than 3%, as shown in Figure 1[129].

Bycycle network planning must consider both the existing urban environment conditions and the cyclist's needs, as well as how good bikeability can be achieved through consideration of coherent, fast, pleasant, safe, and comfortable pathways, i.e., through the planning of friendly environments for cycling. A comparative analysis on safe bicycle lanes and parking spaces for cyclists is covered under paragraph 3.2.1.5 while the ways to make sidewalks pedestrian-friendly are defined in paragraph 3.2.1.2.

Regarding street lighting, the Fernie Document enshrines specifics of lighting for service commercial, light industrial, multi-family residential and neighborhood residential buildings. Thus, lighting should provide security and pedestrian orientation.

Light fixtures should reflect the nature of the building style while architectural lighting of the building façade is encouraged as a method of enhancing the appearance of the structure during hours of low light conditions.

Also, the document specifies which types of lighting are permitted (e.g., indirect, turned, enameled, metal shades, metal-cast fixtures, surface mounted fixtures, indirect, downward facing, architectural floodlighting of the building façade) and forbidden (e.g., bare lamps, neon tube lighting, upward casting). This is done both to preserve the city's architectural style, the nature, and wildlife (e.g., it can disorient animals that try to move at night).[130]

129 *IMTT – Instituto da Mobilidade e dos Transportes Terrestres, I.P. Rede Ciclável, Princípios de Planeamento e Desenho (2011).*

130 *By the Site Ecology Team (SET) and Wildlife and Industry Together (WAIT). (2015, April 20). https://kids.niehs.nih.gov/topics/natural-world/wildlife/ecology/lighting*

Though the Tajik Document does not elaborate on standards for street lighting, SNiP 30-04-2021 "Landscaping" defines that when designing lighting for pedestrian streets, squares, and sidewalks and placing lighting elements, visibility at night and daytime and the safety of pedestrians, cyclists, and users of personal mobility equipment should be ensured. It is required to use energy-efficient lamps that do not pollute the atmosphere (including those powered by solar panels) and, to illuminate the territory of pedestrian streets, squares, and sidewalks, it is recommended to use predominantly warm colours.

The document also defines the following types of lighting for pedestrian streets, squares, sidewalks:

Lighting focused on the main pedestrian and bicycle paths, squares

Illumination of the area of pedestrian esplanades

Additional lighting near transport intersections, at intersections of traffic and pedestrians, at public transport stops, and in shaded places

Decorative lighting – architectural illumination of building facades, illumination of small architectural forms, and other landscaping elements (paving, green spaces, advertising structures).

Regarding ramps as a component of universal accessibility of pedestrian infrastructure (paragraph 3.3.4), the North Macedonian Document estipulate that ramps should be at each pedestrian crossing to overcome the unevenness between the sidewalk and the roadway with a width from 1.65 meters to 1.8 meters.

Fig 2. Criteria for cycling potential

The same is applicable under Zabljak Document which says that ground floor establishments should be equipped with external or internal ramps, a minimum width of 90 cm, and a slope ranging from 5% to 8%.

The Kyrgyz Document not only defines sidewalks (required to be raised 15 cm above the level of the driveways) and cycle paths standards (width ranges from 1.2 to 1.5 meters), but they also establish standards for IB climatic sub-areas where a snow load is more than 200 m3/m. The document also stipulates that the width of sidewalks on main streets must be taken at least 3 m. This is made to, inter alia, have a room for snow storage, and to establish effective drainage systems, etc.[131]

The topic of pedestrian crossings, highlighted in paragraph 3.2.1.3, is also defined under the accessibility component. Moreover, the accessibility of the jobs component is explicitly defined under Kyrgyz and Tajik Documents which state that residential premises and workplaces ought to be situated in proximity to institutional and service enterprises, including educational institutions, recycling facilities, fire stations, and food storage warehouses. Additionally, mixed land use, as defined in paragraph 3.1.4, can significantly enhance job accessibility.

Hence, all the mentioned components play a vital role in enhancing the permeability of urban fabric, which entails facilitating ease of movement and preventing the fragmentation of neighborhoods. Such measures are particularly necessary in mountainous cities, where it is essential to fit into and preserve the landscape's sustainability. By promoting the concept of permeability in mountainous cities, it is possible to avoid the isolation of hills and valleys and instead achieve smooth and comfortable slope-adapted solutions.

3.1.2. Safety of Walking and Cycling

Safety is another essential component of permeability, as the goal of a permeable street network is to create a more pedestrian-friendly environment. This requires ensuring that the streets are safe for all users, including pedestrians, cyclists, and drivers. By prioritizing safety in the design of the street network, communities can create a more welcoming and inclusive environment that encourages people to walk, bike, and use public transit, thereby reducing the number of vehicles on the road and improving overall safety for all users.

The safety of walking and cycling is crucial in any city, while in a mountainous one, being hindered by the relief or severe weather conditions, it requires careful consideration of the topography and the needs of pedestrians and cyclists. Thus, it is important to create a safe and accessible environment through street lighting and greenery (paragraphs 3.1.1 and 3.2.2.5), screening techniques (paragraph 3.1.2.5), uninterrupted sidewalk network (paragraph 3.2.1.2), pedestrian crossings and signage (paragraph 3.2.1.3) together with active use of abandoned places (paragraph 3.3.6). By means of the joint application of these standards, both types of soft mobility approaches will facilitate permeability and establishment of a barrier-free environment.

3.1.3. Street Network

Despite streets being broadly discussed under the "Street" dimension (paragraph 3.2.1), on the neighborhood level, it is highly required to consider their hierarchy, network, density[132] and efficiency.

When dealing with cities situated on hilly terrain, it is imperative that the components maintain their topographical features, which entails a certain degree of consideration for the curves and slopes of the landscape, commonly referred to as "respecting the hills".[133,134]

Regarding street efficiency, an adequate level of street capacity both for pedestrians and cyclists, proper amount of land allocated for roads, parking, and public spaces should be ensured. In this regard, the Jackson Documents specify that city streets should accommodate all uses and facilities, namely vehicular traffic, bicycles,

131 *Ayres. (2022, February 15). Well-designed Sidewalks Keep Pedestrians, Communities on the Move. https://www.ayresassociates.com/well-designed-sidewalks-keep-shoppers-and-others-on-the-move/*

132 *To be achieved by applying S.2_ Adapted Streets Network to Hazard Areas principle of Khorog Urban Design Guidelines*

133 *Levy, A. (2018, December 31). Difficult Urban Geography Part 2: Hilly Topography. Pedestrian Observations. https://pedestrianobservations.com/2018/12/31/difficult-urban-geography-part-2-hilly-topography/*

134 *Jackson Documents provide that both horizontal and vertical street alignment should relate to the natural contours of the site insofar as is practical while being consistent with safe geometric design.*

pedestrians, all public and other required utilities, snow storage, on-street parking where provided, and in some cases, pathways, special storm-drainage facilities, or other special treatments such as medians or traffic channelization.

The document defines the following standards (Table 1).

Type of Street	Permitted speed (km/h)	Width
Major Arterial	88.5	7
Minor Arterial	73	7
Collector	56	7
Collector – Hillside	48	6.7
Local	40	6
Local – Hillside	32	6
Cul-de-sac	40	15 radius
Alley	24	6
Private Road	24	6
Pathway	N/A	2.4-3
Pedestrian way		

Table 1. Street Network under the Jackson Documents

Moreover, it specifies that a parking lane is required on each side of the travel way on collector and local streets.

The North Macedonian, Tajik, and Kyrgyz Documents, as well as the national legislation of Switzerland and Andorra, exhibit a clear manifestation of the street hierarchy. As such, both Switzerland[135] and Andorra[136] differentiate between three distinct categories of roads based on their ownership.

In the first case, the roads are the following:

- national roads, governed by federal legislation,
- cantonal roads, composed of routes of basic and complementary networks as well as local interest, and,
- communal roads which are subdivided into three classes composed of roads of regional interest, local roads, and paths serving as a means of communication between several municipalities, theforest, and the rural roads.

In the second case, there are:

- general roads, which are owned by the government and where the maximum speed limit is 90 km/h,
- secondary roads, where the maximum limit is 60 km/h, and
- streets, where the speed limit varies between 20 and 50 km/h.[137]

More details on street networks are provided in the North Macedonian Document, which divides the streets into primary, serving for the movement and transportation of road users, and secondary, serving for access of road users to urban content in the parcel building (Table 2).

Also, both the Tajik and the Kyrgyz Documents almost identically define the hierarchy of streets, their parameters, and speed limits (Table 3):

Another example comes from the Banff Documents which distinguish eight streetscape types (arterial streets, connection streets, downtown streets, local neighborhood streets, local low activity neighborhood streets, local industrial streets, commercial and residential

135 *Loi sur les routes 725.01. (1991).* https://www.rdppf.vd.ch/Documents/ROUTES/LCR_LRou.pdf

136 *Llei 18/2016, del 30 de novembre, de designació de carreteres i gestió de la xarxa viària.* https://www.consellgeneral.ad/fitxers/documents/lleis-2016/llei-18-2016-del-30-de-novembre-de-designacio-de-carreteres-i-gestio-de-la-xarxa-viaria

137 *Llei 12/2021, del 13 de maig, del Codi de la circulació.* https://www.mobilitat.ad/Uploads/llei_12_2021_13_maig_codi_11_20210929115147_ca-ES.pdf

Type of Street			Permitted speed (km/h)	Width
Primary	Main Street	Expressway	60-100	3.5-3.75
		City highway	40-90	3-3.5
		Main street through the settlement	40-60	3.25-3.5
	Collector Street		40-60	3-3.5
Secondary	Service streets		30-50	3-3.25
	Residential streets		30-40	2.75-3
	Industrial streets		30-50	3.5-3.75
	Uncategorized	Access streets	20	5.5
		Car-pedestrian		4
		Combined carriageways	N/A	3.5
		Pedestrian streets	N/A	2

Table 2. Street Hierarchy under the North Macedonian Document

Type of Street		Permitted speed (km/h)	Width
Main roads	High speed street	120	3.75
	Regulated traffic street	80	3.50
Main streets	*Citywide:*		
	For continuous movement	100	3.75
	Of controlled traffic	80	3.5
	Of regional significance:	70[138]	3.5[138]
	Car-pedestrian	50	4
Streets and roads of local importance	Streets in residential buildings	40	3
	Streets and roads in scientifically industrial, industrial, and communal storage areas	30/50/40	3/3.5/3.5
	Park roads	40	3
Passages	Main	40	2.75
	Secondary	30	3.5
Pedestrian streets	Main	N/A	1
	Secondary	N/A	0.75

Table 3. Street Hierarchy under the Tajik and Kyrgyz Documents

alleys) as well as transportation modes applicable to each of them, namely cycling, transit, heavy vehicles, moving cars, and parked cars. In this way, each street type has a priority rating for each transportation mode while the design for each street type allocates space to each transportation mode.

Hence, both the hierarchy and network of streets play a crucial role in facilitating the movement of people and goods in urban areas. A well-designed street hierarchy can ensure that different types of streets are used for their intended purposes, with larger and more heavily trafficked streets serving as arterial routes for high-volume traffic, while smaller streets provide access to local destinations such as homes, shops, and schools. This not only helps to reduce congestion and improve traffic flow but also enhances the overall safety and accessibility of the street network.

In addition, a well-connected street network can provide multiple route options for travelers, reducing travel times and increasing the efficiency of the transportation system.

By carefully designing and maintaining the hierarchy and network of streets, urban communities can create a more efficient, safe, and accessible transportation system that meets the needs of all users.

3.1.4. Compatibility of Uses

As it was mentioned before, the development of mountainous terrain requires minimal damage to the environment andbe sustainable.[138]

Also, inferior geographical conditions and economic locations in mountainous areas are often accompanied by insufficient land supply, and inhabitants prefer to put more effort into the shortfall of residential land.[139] It is for these reasons that homogeneous types, to a large extent, of residential buildings were preferred.

Nevertheless, the transition to mixed land use and, as a result, mixed-use development is dictated by the economic development of the cities.

The diversity of parcels and plots promotes a great diversity of urban fabric and architectural forms necessary to create a vibrant streetscape. They facilitate better walkability and a higher level of pedestrian interaction which facilitates economic activities and creates a more vibrant environment.

A good example of this is how mixed-use development became a widespread principal for the Canton of Valais, Switzerland. In this case, The Conthey Document allows a mix of residential and commercial zones (intended for collective dwellings (four or more dwellings) and offices) as well as commercial and small business areas intended for shops, small businesses, and offices, and limited to 500 m2.

The Monthey Document, in addition to allowing a mix of residential, commercial, and administrative zones also establishes the possibility of a hotel-tourism-commercial zones mixture as well as a combined transport terminal, private or public industrial, and craft businesses together with parking area.

The Saxon Document provides for the possibility to accommodate commercial activities (casinos, shops, exhibition premises, public establishments, etc.), reception buildings for housing and hotels, cultural centers, training centers, institutes, leisure and health activities, and public or semi-public utility facilities (parking, etc.).

Another example comes from the Žabljak Document which promotes areas for mixed uses consisting of commercial, business, and residential facilities, facilities that do not interfere with housing and serve the area, shops, facilities for administration, culture, education, health, and social care, sports and recreation, religious facilities, etc.

The North Macedonian Document expounds on the feasibility of having compatible (mixed) uses of buildings, which must be established based on the principles of tolerance, functional compatibility, and spatial compatibility while existing in the same or adjoining space. Accordingly, if two types of uses are incorporated into a spatial unit, they must be arranged in a manner that limits the representation of the second type to a maximum

138 *Patel, D. (2022, June 8). An overview of Hill Architecture. RTF | Rethinking the Future. https://www.re-thinkingthefuture.com/designing-for-typologies/a7098-an-overview-of-hill-architecture/*

139 *Ma, W., Jiang, G., Zhou, T., & Zhang, R. (2022, April 20). Mixed Land Uses and Community Decline: Opportunities and Challenges for Mitigating Residential Vacancy in Peri-Urban Villages of China. https://www.frontiersin.org/articles/10.3389/fenvs.2022.887988/full*

of 40% to preserve the character and usage pattern of the spatial unit.

The document also stresses that the most important rules are the combination of compatible uses and protective rules of incompatibility, i.e., rules that protect vulnerable uses from incompatible uses that impede or impair use and quality.

Thus, such a balanced mix of different types of facilities, activities, and tenures promotes the compatibility of uses meaning it provides dynamic spatial, functional, and structural coexistence of many activities, occupations, and interests in one space, and in such a way promotes accessibility to services.

This concept can also be traced through the provisions outlined in paragraphs 3.3.1 and 3.3.3.

3.1.5. Public Transport

In mountainous cities and due to the hilly conditions, modes of public transport are restricted to buses, light rails, trains, streetcars, trolleys, and urban cable cars. While buses are a more mobile means of transportation with a comparatively easily established and wide network of stops, the establishment of electric public transport is though more challenging but considered to be highly energy efficient.

Nevertheless, the principle of multimodality of transportation is enshrined in the Valais Document which states that though the implementation of public transport is difficult due to the topography of the territory and the dispersion of urbanization, the communes should be equipped with public railway lines, regional flat-mountain cable cars, and bus lines. Effectiveness and affordability of public transport especially in mountainous cities of the Canton of Valais, where the welfare of the population is highly dependent on mobility, could be reached through the promotion of new forms of public transport by encouraging the implementation of innovative solutions in this area (e.g. introduction of more flexible offers, the establishment of evening/night offers, on-demand buses, vehicles using other energy sources than petroleum fuels).[140]

140 Valais Document

Such expansion of users' options encourages public transport links between urban centers, hillsides, and side valleys fosters. As a supplementary characteristic of the transport category, though being a part of the street dimension, accessible stops for public transport should be established.

To guarantee accessibility, it is imperative to implement universal design principles and construct ramps that adhere to proper design and inclination specifications, with a recommended maximum gradient of 10%. This is especially crucial in regions with significant elevation variations, where practicality and safety are prioritized.

An example of such measures can be found in the Valais 2020 Directive on Bus Stops[141] which allows for variable curb heights ranging from +3 to +22 cm to address the varying terrain requirements of different users. Regarding the national regulation, Switzerland provides that the width of the ramp should be of minimum 1.9 m., while the boarding area should be 90 x 90 cm and be visually and tactilely recognizable. The stops themselves should be equipped with benches, cash dispensers, control screens, etc., and have a maximum height of 1.6 meters142. Regarding France, the standards for public transport stops are regulated on the national level143. The width of public transport stops is recommended to be between 0.9 and 1.4 meters with a 1.5 meters diameter which allows the maneuvering of a wheelchair. They should be marked with the title, letter, or number of at least 12 centimeters in height and in contrasting color with respect to the background.

Efficiency is also important, especially in mountainous cities, where the terrain is restricted for public transport routes, meaning residents should have easy and universal access within 5 to 15 minutes of walking distance to public

141 Directive (Canton du Valais) 2020 Arrêts de bus. (2020, June 26). https://www.vs.ch/documents/315040/1853218/Arrêts+de+bus.pdf/376759a9-ceeb-f948-2cc9-57745a38da03?t=1606981830784

142 Schmidt, E., & Manser, J. A. (2003). Rues – Chemins – Places (Directives "Voies piétonnes adaptées aux handicapés"). https://architecturesansobstacles.ch/wp-content/uploads/2017/01/Rues-Chemins-Places.pdf

143 Arrêté du 15 janvier 2007 portant application du décret n° 2006-1658 du 21 décembre 2006 relatif aux prescriptions techniques pour l'accessibilité de la voirie et des espaces publics. (2006). https://www.legifrance.gouv.fr/loda/id/JORFTEXT000000646680/#:~:text=La%20largeur%20minimale%20du%20cheminement,et%20d'autre%20du%20cheminement.

transportation points. Thus, the Kyrgyz Document defines that in the city center, the distance of pedestrian approaches to the nearest stop of public passenger transport should vary from 250 to 800 meters (equivalent to 10 minutes) depending on the starting point, namely places of mass visiting, industrial and municipal storage areas, and areas of mass recreation and sports. Also, among the core transport principles, there should include convenience, meaning catchment areas should be provided for different transportation forms to facilitate equitable access to social and economic opportunities, clustering of jobs, housing, services, and amenities. Thus, the same document provides for the possibility of setting up a local system of specialized types of transport (pedestrian, bicycle, and other types) in the historical center.

3.1.6. Consideration of Local Identity, History and Human-Scale Environment

The overall idea of the neighborhood is to create a sense of place and community for its dwellers which can be achieved, among others, through the consideration of the local identity (paragraphs 3.2.1.10, 3.2.2.6 and 3.3.2), history, and human-scale environment.

To retain a traditional character and history, cities must reflect the traditional urban morphology in their public space networks, urban grain, streetscape, etc. The Žabljak Document promotes the preservation of traditional architectural solutions or heritage.

The Kyrgyz and the Tajik Documents enshrine the necessity to consider architectural and urban planning traditions principles while conducting urban planning. Though they do not specifically describe those ones, it could be defined that in the mountainous terrain of Tajikistan, the preference was given to dense residential structural formations with patios, manor, manor-blocked, terraced, blocked and linear-blocked structures, which were formed under the influence of certain natural, climatic, and relief conditions of the area.[144]

Similarly applicable in Kyrgyzstan and owing to the restricted availability of land due to mountainous topography, there has been a proclivity towards densification of the built environment, particularly in the central urban areas.

Under the Chamonix Mont-Blanc and Briançon Documents, construction, installation, and land use practices should conform to the neighboring areas' characteristics and interests, the site's topography, and the natural or urban surroundings, by appropriately adjusting their size, design, location, and external appearance. The façade must exhibit a harmonious aesthetic with the surrounding buildings and perspectives.

The Aspen Document promotes the retention of scale and proportions in building design to maintain Aspen's historic architectural tradition, while also encouraging design flexibility. The document facilitates creative and contemporary architecture, but on a scale that respects historic design traditions. It also ensures that residential structures should respond to the "human scale" in their design to achieve a better quality of life. The "human scale" methodology promotes communication between residents and their surroundings. In the context of Aspen, this entails ensuring that residential constructions do not dominate the visual landscape or obscure the streetscape. The size of the windows is akin to that of traditional Aspen architecture, and the height of a porch is aligned with the building's first floor.

The Banff Documents mention that even the largest buildings in the city should incorporate elements at street level that relate to the "human scale" – for example, well-defined and sheltered entrances, canopies, porches, seating areas, arcades, and low-scale decorative lighting, bicycle and ski racks. It also defines a tradition of wide, open, pedestrian arcades leading from Banff Avenue to parking and residential areas behind creation as well as placement of freestanding institutional buildings in a park-like setting.

The Jackson Documents specifically state that, to give buildings a human scale, canopies should be utilized along sidewalks or property lines.

3.1.7. Preservation and Integration of Blue and Green Infrastructure

Existing natural areas, vegetation, and water

144 *Shermatov, M. U. (2000). Formation of settlements and dwellings in the conditions of mountainous Tajikistan: Traditions and modern problems. https://www.dissercat.com/content/formirovanie-poselenii-i-zhilish-cha-v-usloviyakh-gornogo-tadzhikistana-traditsii-i-sovremenn/read*

should be preserved and integrated with the neighborhood through the system of public spaces, water sources, urban forests, etc.

Among the analyzed document, a special emphasis is made on protective (buffer) areas near the blue zones to preserve them properly.

According to the Kyrgyz Document, a water protection zone is set on both banks of the river ranging from 50 to 150 meters. As per the provisions of the Monthey Document, the prescribed water protection zone standard is set at 8 meters. However, for the Vièze and Rhone rivers, the designated standard for the water protection zone is 15 and 20 meters, respectively.

The Tajik Document, on the other hand, mentions that if there are significant areas of floodplain and other natural areas in the settlement, it is possible to form blue-green systems with a width of 0.5 to 0.7 km in the central zone, from 1.5 to 2 km in the peripheral zones of large settlements, and from 0.2 to 0.5 km – in large and medium-sized settlements. As part of the blue-green systems of the settlement, for the maximum preservation of floodplain territories in their natural state, meadow parks, and hydroparks can be formed, which will promote ecological connectivity to avoid fragmentation and facilitate the movement of natural flows.

Ecological connectivity can also be performed through the creation of wildlife crossing structures (WCS), such as ecological (wildlife) bridges/ overpasses, reindeer viaducts ("renoducts"), etc., which are an essential component of sustainable urban development in mountainous cities. They are critical for conserving and protecting biodiversity by facilitating the movement and migration of wildlife, enabling gene flow, and preventing habitat fragmentation. In addition, ecological bridges offer significant benefits to human populations by improving air quality, reducing the risk of landslides by stabilizing the soil and preventing erosion, and enhancing the aesthetic value of the natural environment. Such WCS are enforced in Canada, namely Alberta, which under 2023 Guideline for Implementing Wildlife Crossing Structures[145] establish animal-vehicle collision (AVC) mitigation measure in the form of underpasses and/or overpasses. Successful implementation of WCS took place in Banff, namely from its National Park to the British Columbia border. This, in terms of urban planning, also facilitated the permeability of the highway to wildlife.

145 *Alberta Guideline for Implementing Wildlife Crossing Structures. 2023. https://open.alberta.ca/dataset/f2011dd9-e5fe-451c-b41c-9854fd5d7de6/resource/ea3c3cac-7d8d-4627-af58-e87f6f01215a/download/tec-guideline-planning-wildlife-crossing-structures.pdf*

3.1.8. Promoting Local Flora

Urban greening increases vegetation and can restore ecological functions to urban systems. Trees, shrubs, hedge plants as well as flowerbeds are used in urban planning to establish critical urban habitats for people. Local flora will fit better into the local landscape and ecosystems, while in mountain terrain exactly the ecological range will support their sustainable development and connection with the natural environment. Thus, urban greening for the countries defined under this document should be considered regarding geography and climate-responsive design techniques defined in paragraphs 2.1, 3.2.1.8 and 3.3.7.

3.1.9. Hazard Mitigation

Hazard mitigation is a crucial aspect of urban planning in mountainous cities. Due to the natural topography and climate of these areas, they are prone to various hazards such as landslides, floods, and wildfires. It is required to consider the location of gathering places, evacuation routes, traffic capacity, and types of transportation that will be used for the transport of the population in case of a disaster. Neighborhood design should also consider hazard mitigation to ensure safety for all.

Thus, the Montenegrin Document highlights the importance of proper spatial and urban planning in ensuring the safety and well-being of people in a given area, especially in the event of an emergency such as an evacuation. It emphasizes the need for identifying suitable gathering places that can accommodate the population in case of evacuation, while also considering the traffic capacity and type of transportation that will be used to transport people to safety.

By considering hazard mitigation in urban planning, mountainous cities can reduce the risk of damage and loss of life during natural disasters,

ultimately leading to a safer and more resilient community. The analysis contained in paragraph 3.2.2.8 should also be applied.

3.1.10. Housing

Housing is a basic human need and is essential for people to lead a healthy and fulfilling life. In mountainous cities, the unique topography and geography of the area present various challenges in providing adequate housing. The steep slopes and limited land availability make it difficult to develop housing that meets the needs of the community. Affordable housing is especially critical in these cities, as the high cost of living can make it challenging for low-income residents to find suitable housing. To address these challenges, specific standards and regulations have been established for housing in mountainous cities, aimed at ensuring that residents have access to safe, comfortable, and affordable living conditions. These regulations cover various aspects of housing, including room layout, circulation pathways, kitchen and bathroom standards, floor coverings, and utilities.

Thus, the Montenegrin Document, under the housing development concept establishes the necessity to provide "affordable" housing, regarding the price.

Tajikistan and Kyrgyzstan apply the "social housing" term regarding affordable housing, however, as defined in paragraph 2.5 of the Analysis of CIS Countries Building Codes, there are either no detailed standards of such housing or such a regulation is yet to be developed.

Nevertheless, the Aspen and Jackson Documents offer notable instances of housing policy, including the provision of affordable housing units for employees. According to the Aspen Document, affordable housing units must be designed to provide a minimum of 37 square meters of net livable area per employee. This requirement aims to ensure that working residents have access to safe and comfortable living conditions, promoting community health and well-being. The units may be in the form of single-family, duplex, multi-family, dormitory or part of a mixed-use structure, and should have adequate storage, which may include additional storage outside of the unit, and increased window area (compared to the building code standards) to provide natural light. The design should be compatible with the neighborhood's character. Furthermore, the document permits the placement of affordable housing units below natural or finished grade, if necessary, due to topography constraints. This approach accommodates the area's unique conditions while providing affordable housing options to the community. Under the Jackson Documents, affordable workforce housing unit is assumed to provide housing for 1.8 local employees in housing options such as detached single-family unit, attached single-family unit, apartment, or accessory residential unit. The document also references the necessity to adhere to the livability criteria broadly defined under the Jackson/Teton County Housing Department Rules and Regulations.[146]

To provide comfortable and safe living conditions in affordable workforce housing units, certain standards have been established. For instance, the layout of each unit should be designed to accommodate a reasonable number of occupants, with a minimum of two (2) persons per one-bedroom unit, three (3) persons per two-bedroom unit, and four (4) persons per three-bedroom unit. Furthermore, adequate circulation pathways must be provided throughout the unit to allow for reasonable furniture configuration.

For restricted housing units, specific standards for kitchens, including sink and oven widths, refrigerator cubic feet, and dishwasher, as well as bathrooms, which must contain a bathtub with shower, sink, toilet, and a minimum of 37 square cm of storage, are required.

Regarding utilities, the rent and utilities for each unit must not exceed thirty percent (30%) per month of the annual gross income of the minimum number of people that could be housed in the unit based upon the occupancy standards.147

In conclusion, affordable housing is a critical component of any community. It ensures that

146 *Jackson/Teton County Housing Department Rules and Regulations. (2022). https://www.tetoncountywy.gov/DocumentCenter/View/24039/Housing-Rules-and-Regulations-Clean*

147 *Teton County. Calculation of Affordable Housing Standards for Resilient Development. https://resilientwest.org/wp-content/uploads/dmdocuments/Teton%20County%20Development%20Standards-Affordable%20Housing.pdf*

working-class families and individuals have access to safe, healthy, and affordable homes, which ultimately leads to a better quality of life. In mountainous cities, where the cost of living can be particularly high, affordable housing becomes even more important. Through thoughtful planning and creative design, it is possible to provide affordable housing options for all members of the community.

3.1.11. Density

Density is an important concept in urban planning that refers to the number of people or activities within a given area. A higher density usually means that there is more economic activity and more efficient use of resources, such as energy and infrastructure. However, high density can also result in congestion, reduced livability, and lower quality of life if not properly planned and managed. Therefore, a balance between density and livability, taking into account factors such as public transportation, open space, and environmental sustainability should be achieved. The Žabljak Document mentions that particular attention should be paid to the more rational use of already occupied space and the occupation of new space should be as little as possible. Such an approach facilitates density efficiency which can promote walkability (paragraph 3.1.1) and the use of public transport (paragraph 3.1.5), leading to less reliance on private vehicles and to a reduction in GHG.

In accordance with the Saxon Document, the appropriate density is done by dividing the area into three zones based on their level of density, namely high, medium, and low-density areas. The high-density zone is reserved for public and individual dwellings and allows for the establishment of small businesses that do not emit nuisances. Similarly, the Conthey Document stipulates the possibility to accommodate high-density zones though they could be arranged only on the plain, while the hillside areas are designated for low-density zones. The Kyrgyz Document also establishes three types of zones based on population density, with different standards depending on the number of people in the city. Thus, a high density in a city with a population of up to 20 thousand people is considered to be 130 people/ha, while in a city where the population exceeds a million, 220 people/ha will be the standard. The Tajik Document does not categorize zones but establishes different population density standards for small (200-250 people/ha) and large cities (375-600 people/ha). Fernie Document calls Multiply Family Residential Zone a high-density zone and allows 74 dwelling units per gross hectare.

Thus, the high-density standard is an important consideration in the urban planning of mountainous cities. The appropriate level of high density is often defined based on the specific conditions of the area, such as population size and topography. However, achieving high density in mountainous cities can be challenging due to limited flat land and the need to preserve the natural environment.

Therefore, high-density planning must be carefully balanced with environmental considerations to ensure sustainable and livable urban spaces in mountainous cities. Methods to achieve the high density are also described in paragraph C.2_ Efficient and Controlled Density of Khorog Urban Design Guidelines.

3.2. OPEN PUBLIC SPACES

The Charter of Public Spaces148 defines public spaces as "all places publicly owned or of public use, accessible and enjoyable by all for free and without a profit motive". UN-Habitat recommends an average of 45-50% of urban land be allocated to streets and public open spaces, where 30-35% is devoted to streets and 15-20% of urban land is allocated to public open spaces. This document will analyze separately the principles applicable to the street and public open spaces with regulatory best practices outlined.

3.2.1. Streets

Streets constitute over 80% of the public areas in urban areas,[149] serving to offer ingress and egress to and from origins and destinations, ease of mobility, and by providing a communal space.150

148 *Charter of Public Spaces. (2001).* https://inu.it/wp-content/uploads/Inglese_CHARTER_OF_PUBLIC_SPACE.pdf

149 *Urban Street Design Guide | National Association of City Transportation Officials. (2017, November 13). National Association of City Transportation Officials.* https://nacto.org/publication/urban-street-design-guide/

150 *Pinder, V. a. P. B. M. (2020, October 21). The 3 Key Functions of Streets. Beyond the Automobile.* https://beyondtheautomobile.com/2020/08/27/the-3-key-functions-of-streets/#:~:text=Streets%20exist%20for%20three%20key,movement%2C%20and%20provide%20public%20space.

Regarding the street design of mountainous cities, there are unique challenges that must be addressed to ensure safe and efficient transportation for all users. Some of the peculiarities to consider when designing streets in mountainous cities should include:

- Topography: Mountainous cities often have steep gradients that require careful consideration during the design phase. factors as slope, grade, and alignment should be considered when designing streets to ensure safe and comfortable movement for all users and alignment with overall nature.
- Drainage: The topography of mountainous cities can also impact drainage, leading to issues such as erosion, landslides, and flooding. Effective drainage solutions should be considered when designing streets to mitigate these risks.
- Pedestrian and cyclist access: In mountainous cities, pedestrians and cyclists may face additional challenges when accessing certain areas due to steep slopes. The needs of these users should be considered when designing streets, incorporating features such as stairs, ramps, and elevators to facilitate safe and easy movement.
- Viewsheds: Mountainous cities often offer stunning views of the surrounding landscape. It should be carefully considered how the street design will impact these views, incorporating features such as scenic overlooks and green spaces to enhance the overall aesthetic of the area.

Overall, designing streets in mountainous cities requires careful consideration of the unique challenges presented by the topography of the area, as well as the users' needs. Further on, the analysis will present some of the best practices from mountainous cities urban planning guidelines to showcase how they can be applicable in Khorog.

3.2.1.1 Active and Complete Streets

Making the street active means having a ratio for pedestrians and cyclists, establishing safe infrastructure, and ensuring diverse mobility means as well as vibrancy. The active street concept is manifested through diverse components, among others, such as mixed land use (paragraph 3.1.4), proximity, walkability, cyclability, accessibility for people with disabilities and of jobs (paragraph 3.1.1), and of public spaces (paragraph 3.2.2.2), while the completeness of streets is defined by providing space for pedestrians, cyclists, drivers, and street vendors.

Among the active street component examples, the North Macedonian Document in general enshrines urban socializing on the street level by making pedestrian streets suitable for movement and walking, communicating, performing artistic, cultural, and social manifestations, relaxation, buying and trading, and food.

3.2.1.2 Convenient Sidewalks and Pathways

Sidewalks and pathways should be of appropriate width, convenient for all the street users, and compatible with the character of the street. The should provide a safe space for walking, cycling, stopping, socializing, resting, etc.

In terms of residential areas, UN-Habitat recommends dedicating around 3 meters[151] as a width standard in the following proportion:

0.5 meter (frontage zone) + 2 meters (pedestrian zone) + 0.5 meter (furniture zone)

With regards to commercial area, the standard is increased to 4 meters and subdivided as follows:

1 meter (frontage zone) + 2.5 meters (pedestrian zone) + 0.5 meter (furniture zone)

The pedestrian zone standard also includes accommodation for wheelchair users – 1.5 meters.[152]

Among the above-mentioned examples, the standards from the Jackson Documents specify that 1.5 meters is applicable to off-street pedestrian ways while alleys have a width of 6 m. The standard of 3 meters is applied to pathways when bicycle and pedestrian paths are combined.

In countries such as Andorra, France, and Switzerland, the regulation of the sidewalk topic takes place on the national/cantonal level – under laws and bylaws. Local governments apply those standards without their incorporation into local urban design guidelines. Thus, the standard of 2 meters for the sidewalk promoted by UN-Habitat

151 *Subject to change depending on the zone.*

152 *UN-Habitat. (2020). Streets for walking & cycling. Designing for safety, accessibility, and comfort in African cities. https://unhabitat.org/sites/default/files/2020/06/streets-for-walking-and-cycling.pdf*

is established at the cantonal level of Valais[153] and Andorra.[154]

In accordance with French regulations, the recommended width for sidewalks is 1.8 meters, but shall not be less than 1.4 meters, subject to certain conditions. Where there are no obstacles, the width may be reduced to 1.2 meters. Additionally, sidewalks should have a 15 cm elevation and be lowered to 4 cm at vehicle entrances, and to 2 cm at pedestrian crossings.[155]

The Žabljak Document defines the possible width of the pathways from 1.5 to 2 meters depending on the width of the road (ranging from 3.5 to 6 meters). In case the road is 3 meters, the sidewalks are not provided. The North Macedonian Document defines that the smallest width of the sidewalks from the streets of the city's primary street networks, except for the transit highway, is 4.5 meters, while for the main street through the village, the smallest width of the sidewalk in conditions of unbuilt street frontage is 2 meters. The smallest width of the sidewalks for the streets from the secondary network is 2.4 meters, which is the minimum necessary to ensure the smooth movement and passage of disabled persons and persons with reduced mobility on public sidewalks from the street network.

According to the Tajik Document,[156] the width of sidewalks varies from 0.75 to 4.5 meters depending on the street category. So, for example, the smallest width is set for secondary passages, and 4.5 meters (the widest) – for the main streets of citywide significance, where continuous traffic passes. As for the streets in residential areas, where the speed of movement should not exceed 40 km/h, the width of the pathways is 1.5 meters. In general terms, all pathways are required to be raised by 15 cm.

153 *Valais Roads Act (1965). https://lex.vs.ch/app/fr/texts_of_law/725.1*

154 *Decret 277/2021, de l'1-9-2021, pel qual s'aprova el Reglament dels tipus i significat dels senyals verti- cals de circulació. (2021). https://www.mobilitat.ad/Uploads/reglament_dels_tipus_significat_dels_senyals_11_20210929115852_ca-ES.pdf*

155 *Arrêté du 15 janvier 2007 portant application du décret n° 2006-1658 du 21 décembre 2006 relatif aux prescriptions techniques pour l'accessibilité de la voirie et des espaces publics. (2006). https://www.legifrance.gouv.fr/loda/id/JORFTEXT000000646680/#:~:text=La%20largeur%20minimale%20du%20cheminement,et%20d'autre%20du%20cheminement.*

156 *The same applies under Kyrgyz Document.*

3.2.1.3 Prioritizing Pedestrian Movement through Safe and Convenient Pedestrian Crossings

Pedestrian crossings are especially important in mountainous cities due to the topography of the terrain. In such areas, pedestrians face unique challenges such as steep inclines and declines, limited visibility around corners, and narrow sidewalks that make it difficult to navigate through the city on foot. Pedestrian crossings provide a safe and accessible way for people to cross busy streets and intersections, reducing the risk of accidents and increasing the overall safety of pedestrians. They also help to facilitate the movement of people between different areas of the city, promoting active transportation and reducing the reliance on cars.

By providing well-placed and well-designed pedestrian crossings, using adequate signage and markings, proper lighting, speed limits, etc., mountainous cities can encourage more people to walk, improving the livability of the city and promoting healthier lifestyles.

In Switzerland, the local documents do not cover the topic of pedestrian crossings which is being entrusted to the regulation under the regional (canton) level. Thus, the 2020 Directive of Valais "Signalisation et marquage" (Directive)[157] establishes that each of the crossings should be located at visibility distances and be equipped with signage visible from both sides. The transversal slope should be a maximum of 6%.[158]

The national standard159 developed by the Swiss Association of Road and Transportation Experts (VSS) specifies that two elements should be considered when defining visibility: the detection distance of the pedestrian crossing by the road user, who must see at least the sign "Location of a pedestrian crossing" ("Emplacement d'un passage piéton"), and if possible the island and/or the marking. The document recommends the following standards for the sight distance (Table 4):

157 *Canton du Valais Directive "Signalisation et marquage". (2020). https://www.vs.ch/documents/315040/1853218/Directive+SDM_Plan+signalisation+et+marquage+type+14.09.2020.pdf/35f6a764-f5da-db06-68c8-12fb219287b9?t=1610434866920&v=1.0*

158 *Žabljak Document defines that the slope of pedestrian crossings should be up to 5% with exception of 8.3% in some cases.*

159 *SN 640 241 "Traversées à l'usage des piétons et deux-roues légers". (2016). https://www.mobilitescolaire.ch/wp-content/uploads/2018/03/ate_colloque_a4-2017-19_web.pdf*

Maximum authorized speed	Required sight distance
30 km/h	25 meters
40 km/h	40 meters
50 km/h	55 meters
60 km/h (locally)	75 meters
60 km/h (out of town)	100 meters

Table 4. Standards of Sight Distance under the Swiss National Legislation

The lighting on pedestrian crossings should, if possible, be arranged in such a way as to obtain a positive contrast: the pedestrian should appear light on a dark background with a minimum illuminance of 5 lux.

Same as in Switzerland, the standards for pedestrian crossings in France are established at the national level and are subsequently adopted at the local one. Thus, it is enshrined that the crossing should be of horizontal nature with a width of 0.8 meters and a tactile contrast should be applied on it.160 The French legislation also provides the recommendations for the color to be used on the crossings. Thus, it shouldn't lead to any possible confusion with the regulatory marking, day or night, and in all weathers. It also should not weaken the reading or impair its proper understanding and should not devalue regulatory signage (e.g., the red coloring generally reduces the contrast at night between the white stripes and the roadway, therefore it is not recommended to be applied).161 Andorra, in its turn, enshrines the application of the following types of paint: acrylic, acid, cold application (plastic), hot application (thermoplastic), and adhesive (prefabricated). The document also stipulates that the width of pedestrian crossings should measure 4 meters, although this may be reduced to 2.5 meters if sufficient reasoning is provided. Vehicles are prohibited from parking within 2 meters of pedestrian crossings to enhance visibility. Pedestrian crossings should be located where the flow of pedestrians is high, particularly in proximity to buildings such as schools, hospitals, administrative centers, workplaces, large commercial establishments, transportation hubs, and areas with high pedestrian accident rates, and at points where sidewalks or pedestrian routes are interrupted by roadways.162 Moreover, the North Macedonian (paragraph 3.1.1), the Kyrgyz, and the Tajik Documents indicate that pedestrian crossings should be equipped with ramps to overcome unevenness between the sidewalk and the carriageway. Also, the Tajik GNiP 32-02-2012 "Highways" specifies that lightened coatings can be used to highlight pedestrian crossings.

Thus, in mountainous cities, designing safe and accessible pedestrian crossings is essential for promoting mobility and reducing the risk of accidents. Due to changes in grade, pedestrian crossings may need to be equipped with ramps or steps to accommodate the terrain. Clear and visible markings and signage should also be installed to ensure safe and efficient pedestrian movement, while also enhancing the visibility of crossings to motorists. By taking these factors into account, mountainous cities can create pedestrian-friendly environments that encourage active transportation and promote community well-being.

3.2.1.4 Appropriate and Environmentally Sustainable Forms of Parking

Appropriate and environmentally sustainable forms of parking are another important component of the street dimension under UN-Habitat's "My Neighborhood" Methodology. While UN-Habitat recommends that at least 30 percent of the land be allocated for roads and parking, it is also important to avoid its expansion. Urban parking facilities should be considered more profoundly based on

160 *Arrêté du 15 janvier 2007 portant application du décret n° 2006-1658 du 21 décembre 2006 relatif aux prescriptions techniques pour l'accessibilité de la voirie et des espaces publics. (2006).* https://www.legifrance.gouv.fr/loda/id/JORFTEXT000000646680/#:~:text=La%20largeur%20minimale%20du%20cheminement,et%20d'autre%20du%20cheminement.

161 *Circulaire relative à l'utilisation de la couleur sur chaussée. (1996).* https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000000376640

162 *Reglament de les marques viàries. (2021).* https://www.mobilitat.ad/Uploads/reglament_marques_viaries_11_20210929115752_ca-ES.pdf

meeting the basic functional requirements and the impact on the urban landscape environment and pedestrian travel experience163 as well as in a way to improve water quality, increase groundwater supply and reduce the urban heat island effect. With regards to the parking spaces in mountainous cities, there are several specifics applicable. First, mountainous cities have tight land resources, poorly available space, and make full use of marginal areas of urban development and construction. Second, they have a distinct regional character, with large parking needs and traffic. Third, the layout of the facilities has led to an impact on the landscape appearance of the mountain town and has interfered with pedestrian travel within the city.164 The environmental design of parking facilities incorporates both internal and external environments. Among them, the interior environment relies on technical landscaping combined with interior pedestrian access, disabled access, and security signs for the car park, and enhances the landscape effect by adding green vegetation, creative landscaping vignettes, and floor-to-ceiling pavement designs. Concerning external environmental enhancement, primarily for parking entrances and exits, and areas connected to the external environment, landscaped environments are shaped to achieve perfect integration with the surrounding environment. At the same time, the impact on passing pedestrians and dynamic traffic is reduced by setting up obvious entrance and exit signs and stop signs that quickly guide motorists to a smooth stop.[165]

The topic of parking is widely covered in urban planning guidelines of different countries though there is a different level of detail. The Jackson Documents define six types of parking so that each of them can meet the needs of a different group of people and not have a negative effect on walkability. Thus, there are on-street, surface, enclosed, tuck-under, structured and underground parking which could be used for open spaces, residentials, lodging, commercial, amusement/ recreation, institutional, industrial, infrastructure, accessory, and temporary needs. Their dimensions are 2.7 x 6 meters, and their number varies from 0.5 to 7 parking spaces per dwelling unit or employee (depending on the applicability). It is also required to have one disabled space per 25 lots which should be as close as possible to a building entrance. As a supplementary measure and where applicable, parking lots should be paved, shall include landscaped islands to avoid large expanses of asphalt, and shall be screened from off-site, or their view substantially filtered by vegetation. They should be equipped with an off-site snow repository (2.5% of the total lot) and adequate drainage of the snow storage area to accommodate snowmelt. Each of them should be sensitive to the natural terrain and landscape. The Banff Documents mention that parking spaces should be closed, located below grade, screened (fencing or walls) and, where possible, located in the least visible area of the site.

The Fernie Document, in relation to parking requirements for people with disabilities, defines that the minimum size of the lot should be 3.9 x 6 m, it should be also marked and signed – "Reserved for Handicapped Only" and include a Handicapped Logo. Also, such parking spaces are to be located as close as possible to accessible elevators, ramps, walkways, and building entrances.

The Chamonix Mont-Blanc Document defines 12 m2 (2.5 x 4.5 meters) per parking space. The groups of individual parking areas must be arranged in the plots in such a way as to create a movement yard inside the said plots and have only one access by public road. Parking space standards are provided for residential use houses (collective and individual forms), offices and shops, educational institutions, health establishments, performance and meeting rooms, hotels, and tourist residences. Thus, for example, 1 space is provided for 40 m2 of floor area in residential areas while in office areas this standard is 25 m2 of floor area. The Briançon Document enshrines 1 parking space for 40 m2 and 50 m2 for shops and offices respectively, while it defines that for residential houses the number of parking spaces varies from 0.75 meters to 1.5 m.

In Switzerland, the Charrat, Conthey, Monthey, and Saxon Documents define that parking on public roads outside the areas provided for this

163 *Liu, S.; Tan, S. Building a New Framework for Urban Parking Facilities Research with Quality Improvement: The Case of Chongqing, China. Int. J. Environ. Res. Public Health 2023, 20, 607. https://doi.org/10.3390/ijerph20010607*

164 *Ibid*

165 *Ibid*

purpose is prohibited, so each owner is required to provide enough parking spaces on private land to ensure the parking of his/her own vehicles and those of his/her customers or visitors. Access to parking spaces must be easy in all seasons. The standards vary from 1 parking place per 80-100 m2 in residential areas or 2 parking places per housing to 50-100m2 per office ones. Also, from the tourist point of view, the Valais Document defines the establishment of three parking areas for travelers in three cantons to foster traveling.

The North Macedonian Document defines the minimum width and length of the parking space for passenger cars in the amount of 2.5 meters and 5 meters respectively. Also, the guidelines provide for the establishment of access ramps to parking lots. With regards to people with disabilities, the sizes of the parking space should be 3.5 x 5 meters. In case the parking space is not arranged at the same level as the sidewalk or an accessible footpath next to it, then the exit from the parking space should be provided along the sidewalk or ramp with a slope of not more than 5%, and in exceptional cases with a maximum slope of up to 8% and a minimum width of 1.4 meters. They should be located close to the entrances of nearby buildings and may have a horizontal slope of no more than 2%.

The lack of adequate, equipped parking areas for vehicles is typical for the entire urban area of Žabljak, Montenegro. To tackle this, the Žabljak Document defines a standard of 8 parking spaces per 1000 m2 in residential areas, 15 parking spaces in the business area, and 30 – in shopping ones. Moreover, the urban plan enshrines a possibility of vertical parking where parking spaces should be provided with dimensions of at least 2.3 x 4.8 meters (no more than 2.5 x 5 meters) and a width of communications for access from 5.5 meters up to 6 meters. When parking at an angle (30/45/60°), the depth of the parking space (perpendicular to the road) is 4.3/5/5.3 meters, and the width of the carriageway is 2.8/3/4.7 meters. The width of the parking space should be at least 2.3 meters.

The Andorran Document defines the following types of parking spaces: public places in the open air, basements in the public space, private places in the open air, or in public or private buildings either in the basement or on other floors of the building. More specifications are provided in the Decree on Construction Regulations Approval[166] which states that the parking spaces must be between 2.8 and 4.5 meters. They should be made accessible both for pedestrians or car parking users and equipped with ramps of the slope between 10 and 12%.

The Kyrgyz Document defines the possible distance to parking spaces from 10 to 50 meters depending on the number of parking spaces which varies from 10 to 300 pieces.

The Tajik Document provides wide specifications on the parking topic. Thus, the following standards are applied (Table 5):

Thus, the establishment and measurements of parking spaces are widely covered under the identified documents since they provide convenient and safe locations for vehicles to park,

166 *Decret del 13-5-2020 d'aprovació del Reglament de construcció. (2020).* https://www.bopa.ad/bopa/032069/Pagines/GR20200515_13_26_20.aspx

Buildings and parcel boundaries to which the distance is determined	Distance from parking walls and borders considering the number of cars				
	up to 10	11-50	51-100	101-300	more than 301
Residential buildings	5	10	15	25	35
End faces of houses without windows	5	5	10	15	25
Public buildings	5	5	10	15	25
School and institution site boundaries	10	10	15	25	*
Borders of medical institutions with a hospital	15	25	* Determined in agreement with the state sanitary supervision authorities		

Table 5. Parking Standards under the Tajik Document

reducing the likelihood of illegal or obstructive parking that could pose safety risks or impede traffic flow. Adequate parking facilities can also encourage the use of personal vehicles, reducing traffic congestion and promoting efficient use of urban space. In mountainous cities, parking spaces can be especially important due to the challenging topography. Steep slopes and narrow streets can make it difficult to park on the side of the road or in open spaces, creating safety risks and congestion. Adequate parking facilities, including structured parking and designated parking areas, can help alleviate these issues by providing safe and accessible locations for vehicles. In addition, parking spaces for people with disabilities must be provided in accordance with legal requirements, as they are essential for promoting accessibility and independence for individuals with disabilities. Overall, well-designed and strategically located parking facilities can help promote efficient transportation and enhance quality of life in both urban and mountainous areas.

3.2.1.5 Bicycle Lanes & Bike Parking to Promote Cyclability

Bicycle lanes form a valuable component as a part of an active street environment. They provide a safe and complete network of movement. They should be positioned between the footpath and carriageway to minimize conflicts with pedestrians167 and be separated by vegetated buffers. Also, various design techniques such as using color, lane markings, signage, and intersection treatments[168] may be applied to distinguish the bike lines. In terms of standards, a minimum width of 2 meters is required for one-way movement, and 3 meters for two-way movement.

While paving the bike path, such environmental factors as snow, rain, and ice-crusted ground should also be considered. Thus, while snow itself can hinder movement along the bike lanes, it could also be considered a building material to create protective walls separating bicycle lanes from vehicular traffic.[169] Among other reasons which obstruct the usage of bike lanes precipitations in the form of rain or sleet could be named.[170] Nevertheless, possible mechanisms are available to urban planners for solving these problems such as the establishment of a safe slope level, proper track height, and coverage, supplemented by such facilities as parking. Also, an important component is the width of bicycle roads, so that snow clearing could be better accommodated.[171]

Several cities and countries from the analysis provide quite detailed specifications on bicycle lanes regarding their hill topography or environmental specifics. The Jackson Documents generally define that bicycle lanes shall have a pavement width varying from 2.5 to 3 meters. As a part of bike parking to promote the cyclability component the regulations also state that one bicycle parking space shall be provided for every 10 vehicle spaces required and be in a clearly designated, safe, and convenient location.

A safe parking location is defined as a location whereby activity around bicycle parking is easily observable, conveniently located to the bicyclist's destination, and adequately separated from motor vehicles and pedestrians. Surfaces around bicycle parking facilities shall be maintained, mud, and dust free. The Žabljak Document specifies that bicycle routes can run together with motor traffic in low-traffic streets, together with pedestrians, and separated from other types of traffic. If the volume of motor and pedestrian traffic is such that it may threaten the safety of traffic, bicycle traffic should be separated. In general, bicycle lanes should be established on quiet (residential) streets, while those streets with unfavorable slopes should be avoided. The routes should be laid through green areas and should be made as such to connect zones of residence, recreation, and central activities. Spaces for parking bicycles should be established in attractive zones. The minimum width of a one-way bicycle path is

167 *Decret del 13-5-2020 d'aprovació del Reglament de construcció. (2020).* https://www.bopa.ad/bopa/032069/Pagines/GR20200515_13_26_20.aspx

168 *Bike Lanes. (2015, July 24). National Association of City Transportation Officials.* https://nacto.org/publication/urban-bikeway-design-guide/bike-lanes/

169 *City of Beaumont by DIALOG. (2007). Beaumont Winter City Strategy: Background Research Report.* https://www.beaumont.ab.ca/DocumentCenter/View/6696/BWCS-Background-Research-Report-Mar2-2022-reduced?bidId=

170 *David Chapman, Agneta Larsson, Practical urban planning for winter cycling; lessons from a Swedish pilot study, Journal of Transport & Health, Volume 21, 2021, 101060, ISSN 2214-1405,* https://doi.org/10.1016/j.jth.2021.101060.

171 *City of Beaumont by DIALOG. (2007). Beaumont Winter City Strategy: Background Research Report.* https://www.beaumont.ab.ca/DocumentCenter/View/6696/BWCS-Background-Research-Report-Mar2-2022-reduced?bidId=

1-1.25 meters, and a two-way path is 2-2.5 meters. The North Macedonian Document defines that bicycle traffic is planned within the profiles of the street network, except for expressways, where possible in separate lanes, and within pedestrian streets, paths and spaces outside the network of the street network, such as in independent cycle streets and paths. Bicycle lanes may be one-sided or two-sided, located on one or both sides of the street with a width ranging from 1.5 to 3 meters. The maximum longitudinal slope from the cycling path is 8%-12%. Though not being specified at the local level, Canton of Valais allocates 1.5 meters for bicycle lanes.[172] The Kyrgyz Documents defines that the width of bicycle lanes should vary from 1 to 1.5 meters, and they should be arranged raised by 15 cm above the level of passages. The document also allows to arrange bicycle lanes along the edge of the carriageway of streets and roads, marking them with a double line. The lane width must be at least 1.2 meters when driving in the direction of the traffic flow and at least 1.5 meters when driving oncoming traffic. The width of the cycle lane arranged along the sidewalk must be at least 1 meter. The Tajik Document defines two types of cycle paths: separate and isolated. The width of both types of lanes must be 1.5 meters and they must be raised 15 cm above the level of the driveways. The number of lanes varies from 1 to 2 in the case of separated bike lanes, and from 2 to 4 in isolated ones.

Overall, promoting bikeability in mountainous cities requires a multifaceted approach that considers the unique challenges and opportunities presented by the terrain, while also promoting the many benefits of active transportation for both individuals and communities. Some guidelines on bike lanes development in mountainous cities are also available in paragraph 3.1.1.

3.2.1.6 Public Transport Lanes

Among the analyzed documents of nine countries, there are neither parameters nor obligations due to their legal nature to establish public transport lanes. Nevertheless, in mountainous cities, bus lanes are especially valuable because they provide a reliable mode of transportation for commuters who might otherwise avoid the hills and steep inclines. Bus lanes can also encourage more people to use public transportation, which can help to reduce traffic congestion and air pollution in densely populated areas. Thereby, this comparative analysis considers national and/or regional legislation of countries to define the best practices of public transport lanes.

In Canada, the topic of transport lanes is regulated at the provincial level. Thus, the 1996 Motor Vehicle Act of British Columbia[173] enshrines the possibility to define bus lanes with prescribed signs or markings to indicate its reservation for the exclusive use of buses or other prescribed motor vehicles and devices. In Switzerland, the introduction of bus lanes on the federal level was done in 2015.[174] Such lanes are delimited by continuous or broken yellow lines and bear the yellow inscription "BUS" and can only be used by public buses in line traffic and, if necessary, by trams or road railways. In France, Highway Code ("Code de la Route) provides for the possibility to establish bus lanes as a part of the reserved traffic lanes. Though being restricted only for buses, vehicles of public interest, cyclists, taxis, and heavy-duty vehicles are tolerated on these lanes.[175] Andorra indicates that a bus lane or an area of the road is reserved, temporarily or permanently, for the circulation, parking, or stopping of buses and taxis.[176]

Thus, the establishment of public transport lines is essential in mountainous cities since the terrain can be challenging for personal vehicles and bicycles. Public transportation can provide a reliable and convenient alternative for residents and visitors alike, reducing the need for personal vehicles and alleviating traffic congestion on narrow or winding roads.

3.2.1.7 Structural Elements that Provide Universal Accessibility, Comfort of Use, Safety, and Security of Streets

To promote the general accessibility of streets, it is crucial to consider the structural elements under

172 *Valais Roads Act (1965). https://lex.vs.ch/app/fr/texts_of_law/725.1*

173 *British Columbia Motor Vehicle Act. (1996). https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/96318_05#section153*

174 *Ordonnance sur la signalisation routière (OSR) du 5 septembre 1979 (État le 1er janvier 2023). https://www.fedlex.admin.ch/eli/cc/1979/1961_1961_1961/fr*

175 *Codedelaroute.lo. (2021). Voie de Bus | Réglementation et Infractions. Infos Code De La Route. https://codedelaroute.io/blog/voie-de-bus/#Voie-de-bus-reglementation-du-Code-de-la-route*

176 *Reglament de les marques viàries. (2021). https://www.mobilitat.ad/Uploads/reglament_marques_viaries_11_20210929115752_ca-ES.pdf*

the public open spaces and block dimensions as well as general accessibility measures under paragraph 3.1.1. Thus, the accessibility component is promoted through convenient pedestrian crossings (paragraph 3.2.1.3), and the establishment of ramps (paragraph 3.3.4) to expand access for different population groups. Moreover, the tactical surfaces should be considered to promote the universal accessibility concept of streets. Though the Tajik Document does not elaborate on them, Tajik SNiP 30-04-2021 "Landscaping" mentions that driveways, sidewalks, and footpaths should be marked with road markings, tactile-contrasting signs and information about the object should be used. Regarding the safety and security of streets, it is required to provide street lighting (paragraph 3.1.1) and establish clear signage (paragraph 3.2.1.3). The comfort of use is highly promoted through the revitalization of abandoned places (paragraph 3.3.6).

3.2.1.8 Climate-Responsive Street Design

Street design can contribute to urban resilience by improving urban microclimate and reducing urban heat island effects, GHG emissions and energy consumption. Mountainous cities are especially exposed to climate change due to their topography and location which facilitates the effects of extreme weather events, such as landslides, flash floods, and erosion. Thus, street vegetation (paragraphs 3.2.2.7) and green safety buffers (paragraph 3.2.2.5), as well as drainage improves both the quality of the environment and the well-absorbing of CO2. Regarding drainage, green roofs (paragraph 3.2.8) as well as WCS (paragraph 3.1.7) can help by reducing stormwater runoff. The plants absorb and store rainwater, which can reduce the volume and velocity of stormwater runoff. This helps to prevent flooding and erosion in urban areas, particularly during heavy rainfall events. The topic of drainage establishment is also considered in the Kyrgyz Document which provides that the distance of the drainage system to the basement of buildings should be 3 m and 1-1.5 m to the road. In Tajikistan, the topic of drainage devices (open or closed) is governed under SNiP 40-02-2021 "Water Disposal. Outdoor Networks and Facilities".

3.2.1.9 Safe Streets

Both in the general context and in the context of mountainous cities specifically, street safety is important. In addition to human factors, the safety of streets in mountainous cities is also influenced by natural ones. Thus, among the safety measures to apply to the roads, there are forestation which will facilitate the reduction of landslides, traffic calming measures to increase safety for all users, adoption of permeable surfaces in parking areas, removal of parking spaces to enhance visibility, etc. These measures are applicable under the Monthey Document that obliges the traffic restrictions, removal or displacement of parking spaces in the public domain as well placement of plantations to the most possible limit. In addition, measures defined under paragraph 3.2.1.7 are applicable here.

3.2.1.10 Places of Attraction that Reinforce Local Identity

Places of attraction being adjacent to the street by providing seating and resting areas, green spaces, as well as street vending, make movement along the city more comfortable, vibrant and give a positive sense of place. While the Tajik and Kyrgyz Documents indirectly covers the possibility of placing kiosks, benches, and small architectural forms on the pedestrian part of the sidewalks and paths, Tajik SNiP 30-04-2021 "Landscaping" consolidates that for landscaping the territories of pedestrian streets, squares and sidewalks, it is allowed to use decorative paving, small architectural forms, decorative steles and sculptures (and their compositions), flowers, equipment with street furniture, trash cans, toilets, self-service stands for the sale of newspapers and magazines, various fencing of pathways from green spaces. The North Macedonian Document allocates 0.6 m of the street both for the placement of a street planter and a protective fence for row seedlings and 0.7 m for the placement of a bench.

3.2.2. Public Open Spaces

Having sufficient public open space allows cities and towns to function efficiently and equitably as well as fulfill two different but supplementary roles. Firstly, they allow the presence and (to some extent) the function of nature in the built

environment. In this way, they have a regulatory role in the microclimate and the quality of the city environment and at the same time enable the people who live and move in it to encounter nature. Secondly, they function as social areas, since in them a big part of the social life of the town takes place. Thus, they ultimately contribute to the overall improvement of living standards in urban centers.

The Public Open Space concept forms a part of the general Public Spaces concept and refers to undeveloped land or land with no buildings that are accessible to the public.[177] It provides recreational areas for residents and helps to enhance the beauty and environmental quality of neighborhoods. These spaces are also available to all without charge and are normally publicly owned and maintained. In many cases, however, they are accessible during daylight hours only.[178] UN-Habitat recommends 15-20% of urban land to be allocated for public open space.

Types of public open spaces vary across cities and can broadly include the following categories:

- green spaces: parks (municipal, neighborhood), gardens, forests, recreational areas[179], courtyards, surrounding spaces of public facilities (social, religious, educational, etc.),[180]
- playing or gathering spaces: playgrounds, public beaches, schoolyards[181], sporting places (e.g., football yards, open swimming pools, etc), designed spaces for expression and public gathering (movable street furniture, amphitheaters, boards),[182]
- communal spaces[183]: riverbanks, waterfronts[184], town squares, plazas, libraries, spaces for communal learning and creativity.
- public commercial spaces: host markets and accessible commercial activities in fixed premises, public venues and other services (collective and not, public and private).[185]

Nevertheless, the list of public open spaces is non-exhaustive since it varies depending on the landscape, cultural characteristics as well as legal regulation in general. Regarding mountainous cities, among the public open spaces there might be also hill parks, ski areas, trails (walking & biking), etc.

USA and Canada provide quite an extensive list of public open spaces. In Jackson, Wyoming, more than 65% of the land is public meaning it is suitable for open spaces. Being called "outdoor spaces" under the Land Use Code, this category includes parks, arboretums, athletic fields not in stadiums, equestrian centers, nordic ski trails, downhill ski areas, outdoor receptions places though excluding golf course. In Aspen, Colorado, almost 50% of the land within and around the city is dedicated to open spaces[186] composed of recreational areas, trails, parks, etc. Fernie, British Columbia, under the concept of open space defines conservation areas, recreation reserves, ecological reserves and wildlife sanctuaries, parks, campgrounds and park reserves, open space and tot lots, sports and athletic fields, including golf courses as well as walkways and trails. In Banff, Alberta, open spaces are those located on public lands, among which there are: a provincial park, historical site, natural area, ecological reserve, wilderness area, heritage rangeland, forest reserve, forest recreation area, wildlife sanctuary, habitat conservation area, public shooting ground or public resort or for the

177 UN-Habitat (2018). SDG Indicator 11.7.1 Training Module: Public Space. United Nations Human Settlement Programme (UN-Habitat), Nairobi. https://unhabitat.org/sites/default/files/2020/07/indicator_11.7.1_training_module_public_space.pdf

178 Ibid.

179 UN-Habitat. (2019). City-Wide Public Space Strategies. A Compendium of Inspiring Practices. https://unhabitat.org/sites/default/files/2020/03/cwpss_compendium_20200116-1.pdf

180 Kollarou, Vasiliki & Athanasopoulou, Antonia & Kollaros, George & Lantitsou, Konstantina. (2017). Mid-size town's public open spaces and environmental quality. Fresenius Environmental Bulletin. 26. 1271-1280. https://www.researchgate.net/publication/313558686_Mid-size_town%27s_public_open_spaces_and_environmental_quality

181 Healthy Urban Communities in New England. (2023, January 19). US EPA. https://www.epa.gov/newenglandhc

182 UN-Habitat "My Neighborhood" Methodology: https://drive.google.com/file/d/1HzblcuXx8knZoVhGtrBMjzduSQQMdeAd/view

183 Kollarou, Vasiliki & Athanasopoulou, Antonia & Kollaros, George & Lantitsou, Konstantina. (2017). Mid-size town's public open spaces and environmental quality. Fresenius Environmental Bulletin. 26. 1271-1280. https://www.researchgate.net/publication/313558686_Mid-size_town%27s_public_open_spaces_and_environmental_quality

184 UN-Habitat (2018). SDG Indicator 11.7.1 Training Module: Public Space. United Nations Human Settlement Programme (UN-Habitat), Nairobi. https://unhabitat.org/sites/default/files/2020/07/indicator_11.7.1_training_module_public_space.pdf

185 Ibid

186 Open Space | Aspen, CO. (n.d.). https://www.aspen.gov/399/Open-Space

development of any natural resource.[187]

With regards to Europe, Swiss legislation varies from canton to canton. The Valais Document does not enshrine an "public open spaces" category while, for example, the same level of document of the canton of Vaud[188] includes public open space component aiming to stimulate the construction of attractive neighborhoods. The Valais Document broadly regulates forests, natural parks, lakes, campsites, ski areas, golf courses though not listing them as "public open spaces". At the commune level, Monthey under public open spaces ("espaces libres") define playgrounds and places for relaxation. Conthey, in its turn, lists promenades, squares, and sports grounds as public open spaces. French legislation[189] names open green space ("espace vert de pleine terre") as a space considered as open ground when any existing or planned structures do not hinder the management of rainwater and the reconstitution groundwater. Among them, there are open spaces and plantations, play and leisure areas.

Andorra defines natural parks, protected areas and ski resorts as open spaces.[190] Montenegro under public green areas in the settlement defines greenery on public areas, recreation grounds, children's playgrounds, parks, footpaths and lawns, bicycle paths.[191] North Macedonia widely governs public open spaces. It defines the standard of 40% for greenery per person, though, allows its variability depending on the city scale. Thus, for small towns, the standard of greenery is 12-14%, for medium-sized cities – 14-20% while for large cities it is 20-25%. Moreover, North Macedonia widely defines types of public open spaces, namely: public city parks, green squares, urban park-forests, suburban park-forests, arboretums, botanical gardens, gardens, urban ice fields, grass fields, protective and traffic greenery (e.g. green buffer zones between incompatible dedicated zones, industrial green buffer belts), sports and recreation on green areas (outdoor sports fields: tennis, football, and other sports, without stands), sports fields on large green areas (golf, training parks, ski fields, and paths, riding tracks, hippodromes, trim fields and paths, open swimming pools, recreational lakes), recreational parks and theme parks without buildings, outdoor zoos (no buildings), memorial green spaces and cemeteries, water areas, open watercourses, swamps, mudflats, forest areas, deciduous forests, forests as well as other green habitats, peatlands, grasslands and meadows.

In Kyrgyzstan and Tajikistan, the level of green open spaces within the built-up urban areas must be at least 40%, and at least 25% within the boundaries of the territory of residential or mixed development (including the total area of green areas of micro-districts, quarters). Thus, landscape and recreational areas correspond to the public open spaces concept. Kyrgyzstan states that public open spaces should include parks, forest parks, squares, gardens, boulevards, and embankments, environmental, recreational, historical, cultural, and natural heritage areas as well as areas occupied by natural monuments; natural and dendrological parks, botanical gardens, and reserves. In Tajikistan, the system of public open spaces includes: green recreation areas in residential buildings for everyday recreation of the population; green areas near places of residence for everyday recreation of the population; health and fitness activities, walks, games for preschool children; parks of regional and city-wide significance for recreation, cultural events, organizing exhibitions, sporting events, suburban areas for long-term recreation and tourism; zones, and places of mass short-term recreation near water bodies, in forest parks, garden and summer cottages, natural areas; forests, natural (undeveloped) river and stream valleys, lakes, agricultural landscapes; as well as specially protected natural areas, territories for conservations, national parks of reserves, natural monuments, and the natural monuments themselves.

This document contains an analysis of public

187 *Public Lands Act (Province of Alberta). (n.d.).* https://www.kings-printer.alberta.ca/1266.cfm?page=P40.cfm&leg_type=Acts&isbn-cln=9780779786367

188 *Plan Directeur Cantonal (Canton de Vaud). (2018, January 31).* https://www.vd.ch/fileadmin/user_upload/themes/territoire/amenagement/PDCn/PDCn4_VSO_180131.pdf

189 *Code de l'urbanisme.* https://www.legifrance.gouv.fr/codes/article_lc/LEGIARTI000031720549

190 *Reglament d'accessibilitat de 8-6-95 (Andorra).* https://ad.vlex.com/vid/reglament-d-311240510

191 *Zakon o planiranju prostora i izgradnji objekata. (2017).* https://www.gov.me/dokumenta/1603a1b7-1090-4e00-b7fd-e5e97607f030

open spaces in mountainous countries based on categories from "My Neighbourhood" Methodology.

3.2.2.1 Diversity of Public Open Spaces and Activities Therein

One of the basic principles to highlight under the public open spaces concept is diversity. The more types of public open spaces available in the city, the more comfortable the user will feel. This principle could be traced in the introduction in paragraph 3.2.2 which lists the public spaces applicable to specific cities and countries. In addition, the Jackson Documents state that the open space portion should be considered in the context of increasing the variety of sizes, types, and locations of open space throughout the town.

Also, it is important to not only have a variety of public open spaces but also to have a variety of activities for different ages, abilities, and interests in such spaces to attract users of every age, gender, and therefore make the environment of public open spaces welcoming. This may include places for civic, physical, and social activities, commercial structures, sanitation stations, and public restrooms, as well as the existence of wayfinding signages, child-friendly areas, public art, small street retail, etc.

The Kyrgyz Document within the diversity of activities concept establishes that on 15% of the park territory, it is possible to construct buildings that are functionally appropriate for the organization and direction of each park such as: catering establishments, exhibition halls, galleries, museums, clubs, theater, sports, and cultural facilities. Such creation of commercial facilities inside public open spaces will provide more amenities and services to the public and will potentially generate revenue for the government or other organizations responsible for maintaining the public spaces. It can also create job opportunities and stimulate tourism, which in turn will stimulate the local economy. Welcoming natural elements within the public open spaces is also found under the Jackson Documents which state that public open spaces should include playgrounds, swimming pools, tennis courts, pathways, and other outdoor recreation facilities. In the context of clear signages to help residents and tourists navigate in public open spaces, the Tajik SNiP 30-04-2021 "Landscaping" stipulates that outdoor advertising, information, and navigation elements must be installed on the streets, sidewalks, and rest areas in a visible manner but without hindering the movement of pedestrians.

Thus, the diversity of public open spaces and activities available in mountainous cities contributes to their unique character and appeal and can play a vital role in promoting social, environmental, and economic sustainability.

3.2.2.2 Accessibility and Distribution of Public Open Spaces

Public open spaces play a critical role in the well-being of the residents of compact neighborhoods since they promote recreational activities, improve livable conditions, and enhance the productivity of cities. It is recommended that any kind of public open space of those defined at the beginning of paragraph 3.2.2 have a minimum threshold of 9 m2 per person and be located within a five-minute walking distance. This guideline is observed in the North Macedonian Document, which defines 25 m2 per person as a strategic goal for green open spaces, and 40 m2 per person[192] as a long-term strategic goal. The document defines three types of cities (small (3,000-25,000 inhabitants), medium (25,000-100,000 inhabitants), and big (more the 100,000 inhabitants)) where the level of green open spaces varies between 12 and 25 %. Regarding accessibility standards, small green squares, blocks, or pocket parks (with an area of 0.1 to 0.5 ha) should be situated within 200 m or a 4-minute walking distance. Medium-sized parks, ranging from 0.5 to 5 ha, should be located within 500 m or an 8-minute walk. City parks, covering an area of 5 to 20 ha, are recommended to be situated within 800 m or a 12-minute walk, whereas large city parks, spanning from 20 to 200 ha, should be located within 1.6 km and be accessible within a 20-minute walk. City and suburban forests (ranging from 200 to 2000 ha) should be situated at no more than 5 km and be reachable within 30 minutes by means of transportation.

192 *The same standard of 40% is applicable under Chamonix Mont-Blanc Document.*

Under the Kyrgyz Document, the level of green open spaces of the building area must be at least 40%. At the same time, depending on the type of territory (citywide/residential area) and the size of the city (small, medium, and large), the area of green areas can vary from 6 to 10 m2 per person. At the same time, accessibility of city parks should be within 15-20 minutes. According to the Tajik Document, the level of greenery within the built-up areas of the settlement must be at least 40%, with at least 25% within the boundaries of the territory of residential or mixed development. In small, medium, big, and large cities the level of green spaces within the designated landscape area of common use should vary between 6 to 12 m2 per person. Additionally, landscaped recreational areas in residential areas that cater to the daily recreational needs of the population should be within walking distance of no more than 10 minutes. Green areas near residential areas, intended for daily recreational activities, physical education, health activities, walks, and preschool children's games, should be accessible by pedestrians within 20 minutes. District and citywide parks, used for recreation, cultural events, exhibitions, and sports events, must have transport accessibility of no more than 30 minutes. For suburban areas, long-term recreational sites, mass short-term recreational areas near water bodies, forest parks, and garden cooperatives, the vehicular accessibility should range from 40 to 60 minutes, depending on the size of the city.

3.2.2.3 Network of Public Open Spaces

The necessity to integrate public open spaces into a network that connects people, homes, and places within the neighborhood is crucial to ensure continuity and safe circulation of users. The Jackson Documents enshrine that public open space should act as a connector for the pedestrian experience whenever possible, meaning that the overall town open space and pathways systems should form a continuous entity. This could be achieved through special paving, distinct lighting, and landscape elements to accentuate a site's circulation system. The Tajik Document mentions that the landscape and recreational areas should form the natural frame of the settlement in the form of a unified system of open and green spaces and have convenient pedestrian and transport links with residential and public areas.

Thus, the network of public open spaces can help to promote social connections and a sense of community, as well as encourage physical activity and healthy lifestyles. Additionally, it can enhance the aesthetic appeal of the city and provide opportunities for environmental education and conservation. By strategically designing and connecting these public open spaces, mountainous cities can create a more livable and sustainable environment for all.

3.2.2.4 Designing Places of Respite

While walking down the street it is highly desirable to spaces to get together, sit, and interact. These are usually small areas separated from the major activities of the street aiming to provide places of respite from sensory information. According to the Kyrgyz Document, it is necessary to establish areas for short-term rest on boulevards and pedestrian alleys. The Tajik Document expands the list by adding riverbanks where such places of respite can be located.

3.2.2.5 Safe Public Open Space

Another important component of public open spaces is safety, consisting of the elimination of fear while using structures or facilities located therein, thus ensuring security and accessibility. Among the examples regarding safety, the screening techniques can be named. The Jackson Documents specify that whenever possible, public open spaces should be screened through landscaping or architectural elements (architectural walls, benches, etc.) to buffer pedestrian from automobiles, utilities, and parking lots but not to make them isolated or confined. The Žabljak Document establishes a protective green zone around the public open spaces which should act like a buffer with three levels depending on the source of pollution: the lowest plants, bushes, and tall trees. The bushes should completely cover the space between the trees and be of a type that tolerates shade well. In terms of surveillance, the Fernie Document promotes natural surveillance through the placement of open areas with clear lines of sight. The safety of public open spaces can also be promoted through lighting techniques. Thus, Banff Documents define that lighting

fixtures should generally be unobtrusive both day and night with neutral colors. Low-pressure sodium lights are prohibited while incandescent and metal halide fixtures are preferred. Also, while designing the lighting, the documents point out that the effect of spillover lighting from adjacent buildings and the reflection from snow in winter should be considered. Examples from paragraph 3.1.1 focused on infrastructure for safe and convenient walking and cycling should be also applied.

3.2.2.6 Reinforcing Local Identity

Local identity is a vital component in urban development and acts as an important aspect of the quality of functionality in the landscape.[193] The role of public open spaces in forming the local identity is to consider social dynamics and cultural specificities of the local community and heritage to generate a strong relationship between people and place. Thus, for example, the Banff Documents forbid the application of such building styles as Mediterranean, Californian, or Spanish construction and set the preference to those applicable for rocky mountainous environments. In the context of public open spaces, this means that the landscape materials (e.g., construction materials, plants) should reinforce the idea that the town is part of its surrounding National Park and at the same time, recognize the specifics of the sub-alpine climate.

The Andorran Document forbids the establishment of all types of urban furniture in public open spaces because they are incompatible with the nature of the proposed public architecture. Sizes, placement, graphics, and colors of panels and posters in public open spaces are allowed subject to correspondence with the character of the area. At the same time, posters that do not fit with the architecture should not be used. Moreover, the plan defines such public open spaces as Sant Cristofol d'Anyos Church, Casa Rull Museum, Bridge of St. Anthony, etc. as those that require protection, meaning that spaces around them should be integrated in a way to minimize the visual and the impact to the landscape. The Chamonix Mont-Blanc Document states the necessity to protect local aesthetic traditions, meaning that buildings cannot have a ridge line or continuous roof and facades of homogeneous treatment over a length of more than 50 meters.

3.2.2.7 Integration with Nature

The Integration of public open spaces with nature is highly important in terms of the mountainous region since it is aimed at protecting the ecological environment and preserving the unique regional culture by enhancing local natural features and supporting local biodiversity protection. Public open spaces should be visually connected with the natural environment, preserve the natural landscape, and complement rather than disrupt the environment created by the mountains. Thus, the Charrat Document provides a general definition that the planting and reforestation activities shall be carried out using local species. The Briançon Document establishes that existing public open spaces must be maintained or replaced with plantations of the same local species, which must be native and adapted to the environmental conditions. These species will be more suitable for the local landscape and ecosystems. Therefore, the hedges shall comprise several local species, including birch, poplar, ash, willow, hawthorn, Scots pine, cherry, and maple. The Chamonix Mont-Blanc Document specifies that in the rockiest part, planting should be composed of alpine plants while the Andorran Document ensures that public open spaces should coincide with naturally wooded areas, that preserve elements of the landscape, and that have suitable areas, due to their size and slope. The Žabljak Document defines that when choosing planting material, the sanitary-hygienic, architectural, urban, and aesthetic functions of landscaping should be considered. The Aspen Document defines that the landscape plan of the city should preserve existing significant vegetation and provide an ample quantity and variety of ornamental plant species suitable for the Aspen area climate. What is more, Aspen, under this topic, provides for the possibility of a community garden establishment,[194] which promotes integration with nature, enhances agricultural potential, and forms part of the urban gardening topic. Thus, citizens can commit to work and weed the space while the local government retains its ownership.

193 *Shao, Y., Lange, E., Thwaites, K. orcid.org/0000-0002-2597-4544 et al. (1 more author) (2017) Defining Local Identity. Landscape Architecture Frontiers, 5 (2). pp. 24-41. ISSN 2096-336X 10.15302/J-LAF-20170203 https://eprints.whiterose.ac.uk/119661/8/2017-Defining_Local_Identity-LAF.pdf*

194 *Aspen Community Garden Rules and Regulations. https://aspen.gov/DocumentCenter/View/9250/Aspen-Community-Garden-Rules-Regs*

3.2.2.8 Public Open Spaces for Hazard Mitigation

As highlighted in the segment on public areas, they fulfill functions in domains such as social, environmental, and economic aspects, and can also encompass the realm of hazard mitigation. Public open spaces can function as absorbents of excessive water, stormwater catchment basins, or just accommodate trees to block rockfalls and avalanches. In a mountainous context, they may act as disaster mitigation buffers. Thus, for example, under the Andorran Document, the unoccupied spaces can be utilized for the protection of people and buildings and only after the conduction of calculation of the probabilities associated with different intensities of hazards.[195]

3.3. BLOCK

UN-Habitat's "My Neighborhood" Methodology defines a block as the fourth dimension to conducting a full-scale sustainability analysis. It is an essential settlement form of the urban tissue and organization scheme of a city,196 supplementing public open spaces, streets, and neighborhood dimensions. The urban block itself consists of two interrelated pillars: plots which are the two-dimensional space, and buildings – as individual component parts that together create a three-dimensional space – the urban block. The urban blocks are usually surrounded by streets and public open spaces, thus creating an urban layout.[197]

The urban block is flexible and resilient, and it is one of the oldest and most important elements of city building.[198] It could take the form of a tower, a linear block, and the perimeter blocks[199] each of these being flexible enough to adjust to different built forms. The urban blocks can generate a mixed-use economy and can in general influence the urban layout and the way a city works.[200] Further analysis of sustainable urban design for blocks is conducted on the examples of mountainous cities, being adapted appropriately to the climate and respecting the natural environment, and by considering specifics of terrain, buildings heights, as well as risks from natural hazards, etc.

3.3.1. Vertical Zoning

To ensure a mixed-use environment and to prevent monofunctional pockets of urban development, the block design should consider the vertical zoning concept, meaning reserving lower levels (ground floor) for commercial uses and a range of activities. Moreover, assigning lower floors as non-residential areas (offices, commercial areas, parking, or storage201) will also serve as a shelter in case of avalanches,[202] or protect the upper (residential) floors in case of floods.[203] This is extremely important in terms of mountainous cities which are subject to the mentioned natural hazards.

The Jackson Documents encourage active uses, such as retail and service on the ground level, often with lodging, residential, or office on the upper floors. The Banff Documents name the ground floor as a section which most residents and visitors will have the most contact with. Thus, to enhance the pedestrian environment, store windows, ground-level restaurants, and other storefronts should be established.

The Monthey Document enshrines the assignment of ground floors for shops, offices, crafts, services, and commercial areas. This is specifically done to generate significant vehicle traffic, promote the relationship of buildings to urban spaces, and enhance the use of public space.

195 *Decret del 13-5-2020 d'aprovació del Reglament de construcció. (2020). https://www.bopa.ad/bopa/032069/Pagines/GR20200515_13_26_20.aspx*

196 *Oikonomou, Maria. (2015). The urban block as a potential for sustainable urban design. 69-77. 10.2495/SC150071. https://www.researchgate.net/publication/300636936_The_urban_block_as_a_potential_for_sustainable_urban_design*

197 *Oikonomou, M. (n.d.). The transformation of the urban block in the European City. https://www.academia.edu/10797196/The_transformation_of_the_urban_block_in_the_European_City*

198 *Pizzi, C. M. (n.d.). Dimensions of Urbanism: Urban Blocks. https://www.acsa-arch.org/proceedings/Annual%20Meeting%20Proceedings/ACSA.AMP.105/ACSA.AMP.105.35.pdf*

199 *Njagi, R. W. (1999). The Urban Block as a Tool for Urban Design. The Case of Parklands, Nairobi. http://erepository.uonbi.ac.ke/bitstream/handle/11295/90805/Njagi_The%20urban%20block%20as%20a%20tool%20for%20urban%20design%20The%20case%20of%20parklands%2c%20Nairobi.pdf?sequence=3&isAllowed=y*

200 *Oikonomou, Maria. (2015). The urban block as a potential for sustainable urban design. 69-77. 10.2495/SC150071.*

201 *Heigl, C. (2020, October 14). How Building Design Has Evolved in the Wake of Increased Natural Disasters. https://www.constructconnect.com/blog/building-design-evolved-wake-increased-natural-disasters*

202 *Muster, P. (n.d.). Recommended action in case of exceptional avalanche situations – SLF. https://www.slf.ch/en/avalanches/avalanche-science-and-prevention/recommended-action-in-case-of-exceptional-avalanche-situations.html*

203 *Staying safe when there's a natural disaster. (2021, August 5). https://www.smartraveller.gov.au/before-you-go/safety/natural-disasters*

Though the Tajik Document does not define the vertical zoning concept, the GNiP 31-01-2018 "Residential Multi-Apartment Buildings" allows the usage of ground floors of residential buildings for different activities, except for:

- specialized stores of mosquito-chemical and other goods, the operation of which may lead to pollution of the territory and air of residential buildings
- stores with the presence of explosive substances and materials therein
- shops selling synthetic carpets, auto parts, tires and motor oils
- specialized fish shops
- warehouses for any purpose, including wholesale (or small wholesale) trade
- all enterprises, as well as shops which work after 11 pm
- catering and leisure establishments with more than 50 seats, with a total area of more than 250 m^2 and with musical accompaniment
- laundries and dry cleaners (except for reception points, mini-laundries and self-service laundries with a capacity of up to 75 kg per shift)
- public restrooms
- funeral homes
- built-in and attached transformer substations
- some kinds of industrial premises.

3.3.2. Active Street Front Mainstreamed through Interesting Facades and Usage of Local Materials

Another important component within the block level is called active street front, which aims to promote active street frontage and a positive, engaging, safe, and pedestrian-friendly environment.

The Jackson Documents state that, when feasible, and when there is a clear public benefit, public pedestrian access should be provided through a block. This could be done by laying a path connecting two streets through a block, integrating of a pedestrian walkway with an open space or a retail amenity, laying an alley that is shared by pedestrians and automobiles, or creating a path to break up an unusually large block. Also, in addition to being active, the façade's design should be interesting so that such streets could be considered more attractive. This could be achieved through the local culture and traditional architecture.

The Banff Documents mention that consistent exterior materials and colors should be used on all building façades. Where a stone is used on a front façade, it shall be wrapped around the two sides a minimum of 2 meters or terminate at a jog in the building.

The Andorran Document specifies that all facades must be covered with traditional stone walls, at least, up to eighty-five percent (85%) of their surface. The remaining surface (15%) can be covered with traditional walls, adapting to the existing environment. Consequently, it is required that the heights and shapes of cornices, balconies, windows, viewpoints, and other elements follow the traditional rules of composition, with the prohibition of using materials that do not harmonize with the peculiar character of the area. The Andorran Document also states that all buildings must adapt to the existing environment following the traditional norms of composition and without using materials that do not harmonize with the character of the area in which it is located. This concept also correlates with two others – the usage of local materials which stresses the importance to use regional, local materials considering materials' lifespan and durability with less embodied energy as well as the reinforcement of local identity which promotes context-specific design elements using local materials, and colors.

Thus, the Jackson Documents though do not specifically restrict the use of any materials, still strongly encourages consideration of the inherent nature of materials and their appropriate application. The necessity of visual continuity in keeping with Western Character is stressed and it consists of painted or stained wood siding (horizontal lap or vertical board and batten, logs, stone, as natural rock or cut with a rough, matte finish, authentic stucco (scored and textured to provide a sense of scale) and metal (only as an accent material for a storefront or windows) with a matte finish.

The Conthey Document provides that constructions and their sites must have shapes,

colors, and fittings that harmonize with the surrounding constructions and the typology of the site. The Žabljak Document mentions that planned buildings should represent a reflection of traditional local architecture with the full application of local materials and methods of construction, as well as respond to all aspects of sustainable construction.

3.3.3. Mixed Urban Block

As previously indicated, it is among the functions of the building block to generate a mix-use of diverse housing options, encompassing various typologies, unit sizes, and tenancy models, with the aim of addressing the housing requirements of all individuals. Due to the hilly topography and paucity of viable land, on the one hand, it is difficult to facilitate expansion, and on the other hand, it is not easy to traverse between locations.

Therefore, by embracing the concept of live-work-play, dwellers can enjoy greater efficiency, convenience, and time savings.[204] In this regard, the Jackson Documents define three types of property uses (principal, accessory, and temporary) as well as their further mixture.

The Fernie Document allows commercial/multi-family residential development to create a mixed-use transition area between the retail commercial uses of the downtown to the south and the established residential Maintown neighborhood to the west and north. The Chamonix Mont-Blanc Document defines that mixed-use may be done only in the specific zone which allows a mixed occupation of residential houses and small business areas. The Kyrgyz Document also in a general manner enshrines the mixed residential development concept.

The Tajik Document enshrines the mixed development concept which enlarges: residential and public buildings, scientific institutions, educational institutions, business facilities, industrial enterprises and other production facilities (site area, as a rule, not more than 5 hectares) with non-flammable and non-explosive production processes, not creating noise, vibration, electromagnetic and ionizing radiation, pollution of atmospheric air, surface and ground waters exceeding the established norms. Examples from paragraph 3.1.4 are also applicable here.

3.3.4. Universally Accessible Block

Universally accessible block is another key component that provides accessible entrances for all. This is especially important in hill cities, as there may be different slopes of the terrain, which makes it challenging for persons with disabilities to move with ease. In the USA, the regulation of buildings and facilities accessibility is provided for on the national level.

Thus, 1991 ADA Accessibility Guidelines[205] adopted under the 1990 Americans with Disabilities Act (ADA) of 1990[206] defines the technical requirements. Except for the incline of the ramps (6-8%), it establishes the possibility to equip buildings with inclined stairway chairlifts, and inclined and vertical platform lifts (wheelchair lifts) for short distances. The document also establishes the static coefficient of friction ranging from 0.5 (for walking surfaces) to 0.8 (for ramps). In addition, Jackson Documents specify the necessity to create a minimal negative effect on the historic character or materials of buildings, though providing for barrier-free access to promote independence for people with disabilities to the highest degree practicable.

In Canada, the regulation of building accessibility takes place at the provincial level. Thus, British Columbia 2018 Accessibility Requirements Building Code[207] though does not define the necessary coefficient of friction (as done in the USA) but provides the slip-resistance of floor and tread finishes table in dry and wet states. Thus, carpet, rubber, sheet or tiles, sheet vinyl and non-slip granules are the preferable covering of ramps. It establishes that the door width in the open position should be not less than 0.85 cm. In Alberta, based on its 2014 Building Code, 2017 Barrier-Free Design Guide[208] was developed. It

204 Lau, S. S. Y. (2010). Physical Environment of Tall Residential Buildings: The Case of Hong Kong. https://link.springer.com/chapter/10.1007/978-90-481-9738-5_3

205 ADA Accessibility Guidelines (1991). https://www.access-board.gov/files/ada/adaag-2002.pdf

206 Application of these documents are directly referenced by Jackson and Aspen Documents.

207 British Columbia Accessibility Requirements Building Code. (2018). https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/construction-industry/building-codes-and-standards/guides/building_accessibility_handbook_updatedjune2021.pdf

208 Alberta Barrier-Free Design Guide. (2017). https://open.alberta.ca/dataset/8be7ac63-a101-4fe0-b3a0-8c09e0185a6b/resource/4c80d928-85ba-4a75-ac90-12a92ce61b05/download/ma-barrier-free-design-guide-fifth-edition-2017.pdf

defines that the width of the ramp should not be less than 0.87 meters with a slope not more than 8%. Moreover, at intervals of not more than 9 m, the ramps should be equipped with a level landing space the size of 1.5x1.5 meters.

In Europe, French legislation[209] defines two types of ramps to be used to access the building: removable and permanent ramps. Thus, regarding removable ramps, the slope should be up to 10% for a length less than or equal to 2 meters and up to 12% over a length less than or equal to 0.5 meter. As for permanent ones, their slope should range from 5% to 10% depending on the maximum length.Switzerland[210] provides for the possibility to establish ramps which slope should not exceed 6% (5% for industrial buildings) and their coating must ensure good adhesion. They must be equipped with a handrail with an easy-to-grip profile and placed at a height of 1 meter. Ramps with a width of more than 1.5 meters must be equipped with two handrails.

The Žabljak Document establishes that when designing public, business, commercial, and tourist facilities, access should be provided for persons with special needs on the ground floor level with external or internal ramps, minimum width of 90 cm, and a slope ranging from 5% to 8%.

The North Macedonian Document, in its turn, defines that the minimum width of the ramps should be 1.2 meter. Neither the Tajik nor Kyrgyz Documents cover the topic of accessibility of buildings for people with disabilities. Nevertheless, both countries have specific regulations of the norm to be applied.

Thus, Tajik GNiP 35-01-2012 "Accessibility of Buildings and Constructions for People with Disabilities" and Kyrgyz one dated 2018 "Designing a Living Environment with Consideration of Needs of Persons with Disabilities" establish obligations on the slope of ramps (5-10%), the need to install railings along the ramps, the width of doorways (at least 90 cm), places that should be equipped with lifts, etc. It is also enshrined that it is not allowed to use bulk or coarse-grained materials that prevent the movement of people with disabilities in wheelchairs or other using crutches for coverings of footpaths, sidewalks and ramps.

209 *Arrêté relatif à l'accessibilité aux personnes handicapées des bâtiments d'habitation collectifs et des maisons individuelles lors de leur construction (24 décembre 2015).* https://www.legifrance.gouv.fr/loda/id/JORFTEXT000031692481

210 *Règlement concernant les mesures en faveur des personnes handicapées dans le domaine de la construction. (1992).* https://www.lexfind.ch/tolv/176492/fr

3.3.5. Attractive Common Spaces

The attractiveness of common spaces could be achieved by including additional functions and spaces that encourage physical activities, play and social interactions while enjoying a pleasant space. Thus, the Kyrgyz Document establishes that on 15% of the territory of the park, it is possible to construct buildings that are functionally appropriate for the organization of each park: catering establishments, exhibition halls, galleries, museums, clubs, theater, sports, and cultural facilities.

3.3.6. Leveraging from the Existing Context

The lands and spaces abandoned during urban development leads to difficulty in managing the city, and inappropriate land planning and management allows for the invasion of green grounds on the outskirts of cities.[211] The usage of abandoned places possesses high potential for reconstruction and repurposing by integrating them into the community, and for creating stunning spaces by distinguishing their specific character. Urban wastelands provide the opportunity to make cities denser, so that they can accommodate the rising number of people.[212]

Nevertheless, there should be a distinct separation in reasons why the places became abandoned. Thus, for example, they might get abandoned due to an underdevelopment of territory (bad transport connections, shortages of water, electricity, etc.) followed by migration, or incidents related to natural hazards. So, in the case when the area becomes abandoned due to the absence of necessary facilities, there is a chance to convert them into useful places.

211 *Rajabi, A., Jamali, S. Y., & Rasouli, S. H. (2017). Analyzing and Categorizing the Abandoned Urban Lands (Case Study: Sari): Vol. 1 (1): 34-49.* https://sciarena.com/storage/models/article/Id6flbQjc6m-Y0lK9yWzlgJiWmHOAU5jHZnV9GsjkcJd6Xgy3Y2xo5hSJT4cg/analyzing-and-categorizing-the-abandoned-urban-lands-case-study-sari.pdf

212 *Graner, A. (2021, August 18). Why should we deal with abandoned urban spaces? Urbanet.* https://www.urbanet.info/abandoned-urban-spaces/

Since many old and abandoned and semi-abandoned buildings and empty lands disturb the environmental order and cause problems such as insecurity and environmental pollution, they become a site for garbage accumulation and construction waste and rubbish, which endangers the health of citizens. In the event the territories become abandoned due to the natural threats, there is always a chance such natural hazards can occur again.

The natural risks and their management should be considered. At the same time, they can be used in favor of people.[213]

By repurposing abandoned places, communities can not only breathe new life into forgotten spaces but also create valuable resources and opportunities for their residents. With a little vision and effort, abandoned places can become the building blocks of vibrant and thriving neighborhoods. Mostly because there are both advantages and disadvantages regarding the regeneration of buildings and urban areas, not many documents provide for the revitalization of degraded urban areas.

According to the Montenegrin Document, certain derelict areas that are not accounted for in local spatial and developmental plans, nonetheless present opportunities for their revitalization as sites of industrial, mining, military, or comparable activity for contemporary development purposes, can be revitalized.

The document stipulates that this must be accomplished expeditiously, particularly given that these locations are unlikely to be repurposed in the near future, to avert the displacement of essential urban functions from minor population centers.

3.3.7. Climate Responsive Block

Energy is indispensable for modern cities, and the rapid development of cities is often accompanied by a large consumption of energy, so creating energy-efficient cities is an important part of sustainable energy development.

Thus, to foster urban resilience building design, buildings should be optimized to contexts to minimize energy use and have a reduced impact on the natural environment. In the context of mountainous areas, which are suffering energy poverty where a household finds it difficult or impossible to ensure adequate heating in the dwelling at an affordable price,[214] there is still a room "ideal for reducing energy consumption while maintaining a high standard of living".[215]

To improve the building envelopes (walls and roofs),[216] it is recommended to use, among others, passive heating and cooling, proper window placement, insolation and insulation, natural ventilation options, specific roof material, broadly discussed in Chapter 3 of the Analysis of CIS Countries Building Codes. Regarding the regulations of mountainous countries referenced through this document, they due to their legal nature do not address climate perspective of buildings.

3.3.8. Green Roofing

Green infrastructure can be developed in different forms among which there is green roof being a strategy that, in the context of urban planning, is aimed to manage the volume of stormwater that comes from rain or melting snow that doesn't soak into the ground[217] (more effectively so where the substrate is deeper)[218] thus mitigating the risk of urban flooding.[219] They also facilitate reducing urban heat islands to cool urban areas[220] (the surface of a non-vegetated roof can reach 80°C in summer, while it fluctuates around 30°C with a green cover)[221] and, in some cases, potential

213 Rajabi, A., Jamali, S. Y., & Rasouli, S. H. (2017). Analyzing and Categorizing the Abandoned Urban Lands (Case Study: Sari): Vol. 1 (1): 34-49. https://sciarena.com/storage/models/article/ld6fIbOjc6m-Y0IK9yWzlgJiWmHOAU5jHZnV9GsjkcJd6Xgy3Y2xo5hSJT4cg/analyzing-and-categorizing-the-abandoned-urban-lands-case-study-sari.pdf

214 Katsoulakos, N. (2011). Combating Energy Poverty in Mountainous Areas Through Energy-saving Interventions (Mountain Research and Development, 31(4):284-292). https://doi.org/10.1659/MRD-JOURNAL-D-11-00049.1

215 EUROMONTANA 2010. Energy in Mountain Areas. Strategy Proposal. Position Paper of EUROMONTANA. Brussels, Belgium EUROMONTANA. http://www.euromontana.org/images/stories/documents/themes/2010-04-01_PositionPaperEnergy_EN.pdf

216 Pietrapertosa F, Tancredi M, Giordano M, Cosmi C, Salvia M. How to Prioritize Energy Efficiency Intervention in Municipal Public Buildings to Decrease CO2 Emissions? A Case Study from Italy. Int J Environ Res Public Health. 2020;17(12):4434. Published 2020 Jun 20. doi:10.3390/ijerph17124434

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220 Greening City Roofs Can Help Fight Climate Change – Here's Five Reasons Why. (2019, September 26). https://environmentaldefence.ca/2019/09/26/five-ways-greening-city-roofs-can-help-fight-climate-change/

221 Ville de Lausanne. (2019). Guide des toitures végétalisées. https://issuu.com/villedelausanne/docs/toitures-vegetalisees

carbon sequestration.

Green roofs also introduce biodiversity and green spaces to urban areas, with the potential to assist with ecological habitat connectivity. They are aesthetically pleasing and provide therapeutic qualities to development by bringing people and nature closer together, though they are less governed and rarely opted for in the mountains.[222]

Nevertheless, the Banff Documents provide for the possibility of green roofs installation since they act as buffers during storm events by slowing down and cleansing stormwater. They can be installed up to a 45-degree pitch with special construction techniques and native species that do not require irrigation should be chosen to be planted.

The Chamonix Mont-Blanc in 2021 introduced the green roofs ("toitures végétalisées") concept to ensure adaptation to climate change in urban areas.[223], [224]

222 *Un chalet modernisé devient miroir du Mont-Blanc. (2017, January 24). Batiactu. https://www.batiactu.com/edito/un-chalet-modernise-devient-miroir-mont-blanc-47739.php*

223 *Révision du PLU de Chamonix Mont-Blanc. (2021). https://chamonix.fr/documents/deplacements_urbanisme_logement/urbanisme/pdf/PADD2-09032021_DEBAT.pdf*

224 *France in 2007 during the Le Grenelle Environment – political meetings aimed to position on environmental matters on the legislative level, launched the development of Grenelle law 1 and 2 ("Loi Grenelle 1 et 2"). With these laws, the installation of green roofs was approved and was further detailed in the Unified technical document (Document technique unifié) on roof waterproofing as well as 2018 Professional rules for the design and construction of terraces and green roofs. And though the latter defines specifics of design and technical requirements of roofs to be vegetated, they are limited to application in a non-mountain climate, conventionally defined by the location of the building at an altitude greater than 900 m. To tackle this, the French legislative system provides for the development of a Book of Particular Technical Clauses (Le Cahier des Clauses Techniques Particulières) which details the technical provisions specific to the market and which are usually developed by private organizations in order to bring together the technical clauses of a public contract. Thus, in France, there is the 2019 Book of Particular Technical Clauses ETN No.100-647-19. Annex 1: Terraces and green roofs in mountain climate (altitude>900 m) which extends green roof regulation in mountain climates, on masonry elements only and with a slope between 1% and 20% inclusive.*

Regarding Tajikistan, its Document does not explicitly outline the utilization of green roofs in the construction industry. However, the regulations and guidelines for construction – SNiP 31-10-2021 "Roofs" 120.030.030 – govern such practices. Green roofs are intended for use on roofs where there is a technical floor with enough space to store inventory, containers, boxes, fertilizers, and other materials, as well as equipment for automated watering of plants.

The document specifies two types of green roof landscaping that are permitted:

1. direct planting of the lawn in which it acts as a waterproofing carpet. There it is necessary to use materials that are resistant to germination by plant roots and the effects of fertilizer chemicals. The norms recommend the use of woody shrubs and trees with a flat-rooted root system.
2. Another form of roof gardening is planting plants in flowerpots, and it is also allowed to use vertical gardening.

The document contains specifications according to which landscaping is arranged on the roofs which slope varies from 1.5 to 3%. For a green roof, it is necessary to provide additional loads from the substrate in a wet state (700 kg/m^3), plus a load from small architectural forms is also provided: plants and trees in tubs, decorative ponds, and fountains. Also, on the roof, in addition to green spaces, walkways, and children's or sports grounds, recreation areas could be arranged.

4

CONCLUSIONS: WHAT COULD BE APPLIED IN KHOROG AND TAJIKISTAN IN GENERAL

Urban and territorial planning is the basic building block for creating better urban spaces. It is an essential tool for shaping the physical and social environment of a city or town, and it plays a critical role in promoting sustainable development and enhancing the quality of life for its residents. By prioritizing the needs of people and communities, urban and territorial planning can help to create vibrant, livable, and resilient urban spaces that are responsive to the challenges of the 21st century. Thus, it involves a range of activities, from analyzing the existing urban fabric to identifying opportunities for growth and improvement. This document has analyzed four dimensions of the urban fabric to extract the best urban-planning-related practices with a focus on the mountainous terrain to be applied in Khorog. Further, the components of neighborhood, street, public open space, and block have been adapted to Khorog.

Neighborhood:

Despite being the first component assessed, it technically encompasses constituents of street, public open spaces, and block themselves. It generally promotes the permeability of urban fabric which can be achieved through well-designed walking and cycling infrastructure as well as public transit discussed further. Under the compatibility of uses component, the diversity of urban fabric operationalized into mixed-use block is promoted. It is generally suggested to retain the traditional character and history of the neighborhood through the consideration of architectural and urban planning traditions with a "human-scale" approach.

Moreover, the density component is defined under the neighborhood level and should be applied as follows in Khorog:

- central zone – 200-250 people/ha
- middle zone – 150-200 people/ha
- peripheral zone – 100 people/ha

Also, the neighborhood component covers affordable housing aiming to ensure that residents have access to safe, comfortable, and affordable living conditions. Though in Tajikistan the standards of affordable (social) housing regulation are in the process of definition through the bylaws, they would need to define the housing options, minimum square meters of net livable area, standards of living conditions, necessary utilities, etc.

Public Spaces:

The following two dimensions of the public spaces concept closely interlink and complement each other. Street and public open space are recommended to occupy half of the city territory to create a vibrant community. In the mountainous terrain context, they should adapt to the topography, connect different parts of the city, provide access to key services and amenities as well as accessible circulation for all residents, create a vibrant community, help to mitigate the impacts of climate change by serving as green infrastructure, promoting biodiversity, and enhancing ecosystem services. They can also help to reduce urban heat islands and improve air quality.

Streets of mountainous cities possess peculiar features that require special attention when designing and planning. Thus, the topographical features should be considered when laying the streets on the curves and slopes of the landscape. There should be a defined hierarchy to ensure that different types of streets are used for their intended purposes. Their efficiency is showcased through multiple route options for travelers, reducing travel times and increasing the efficiency of the transportation system. In the case of Khorog, it is advisable to enshrine urban socializing on the street level by making pedestrian streets suitable for movement and walking, communicating, performing artistic, cultural, and social manifestations, relaxation, buying and trading, and food. The streets should be pedestrian and cyclist friendly and should accommodate the needs of people with disabilities. Moreover, Khorog pedestrian streets, squares, and sidewalks should accommodate decorative paving, small architectural forms, decorative steles and sculptures (and their compositions), flowers, equipment with street furniture, trash cans, toilets, self-service stands for the sale of newspapers and magazines, various fencing of pathways from green spaces.

Thus, regarding the walking in Khorog, the sidewalks by their nature should be of reasonable width to accommodate different users (defined under Tajik legislation) and be equipped with ramps, tactile surfaces, and necessary lighting to make the movement during the dark time safe. Crossings should be visible from a distance to navigate the users, equipped with signage identifying the placement of the crossing, marked with a distinct color, be 2 meters in width, and be equipped with lighting. Also, to facilitate movement around the city, it is recommended to establish places of respite on boulevards, paths, and riverbanks.

The Cycling infrastructure in Khorog should be established based on the mitigation of excessive grades principle to accommodate the steep terrain of the city. Bike lanes should be established within the profiles of the street network, separated from motor vehicles and pedestrians by a width of 1.5 meters. Khorog should also be equipped with bike parking to promote cyclability. Such parking spaces should be easily observable, conveniently located to the bicyclist's destination, and adequately separated from motor vehicles and pedestrians. It is recommended to provide one bicycle parking space for every 5 vehicle spaces and make them of the following dimensions:

- 0.8 m for placing one bicycle along the sidewalk;
- 1.2 m for placing two bicycles (parallel) along the sidewalk; and
- 1.8 m for placing the bicycles transversely on the pavement.

In Khorog, the consideration of parking spaces as a component of street infrastructure should prioritize meeting functional requirements and minimizing negative impact on the urban landscape and pedestrian experience. It is recommended to provide various types of parking spaces, such as on-street, surface, tuck-under, underground, and garages, for vehicles including cars, motorcycles, motorbikes, minibuses, and buses. To minimize the impact on the environment, parking areas should be paved, incorporate landscaped islands to reduce large areas of asphalt and be screened or filtered by vegetation to limit off-site views. Adequate drainage systems should also be in place to accommodate snowmelt.

The Tajik Document specifies the required number of parking spaces according to the building type, and it is recommended to place them at the same level as the sidewalk. If this is not feasible, parking

areas should be equipped with ramps with a slope of no more than 5%, or in exceptional cases, up to 8%, with a minimum width of 1.4 meters.

Furthermore, the street environment in Khorog would benefit from the establishment of public transport lanes to provide a reliable and convenient mode of transportation. These lanes should be reserved as traffic lanes, marked and signed to indicate their exclusive use for public transport in Khorog. Along their routes, public transport stops should be established with a recommended width between 0.9 and 1.4 meters and 1.5 diameter which allows the maneuvering of a wheelchair. They should be marked to be visible from a distance and be equipped with benches.

The Public open spaces of Khorog are advised to be established in various forms to cater to the social and recreational needs of residents and visitors. These spaces should be distributed throughout the city within a 5-minute walking distance (400 meters) from households and leverage the unique natural environment provided by the mountainous terrain to create distinctive and attractive public spaces that offer diverse activities and amenities. This can include the establishment of catering and cultural establishments, outdoor recreational facilities, and other amenities. Signage should be provided to navigate residents and tourists in these areas, together with streets, sidewalks, and rest areas.

Creating a network of green and public spaces through special paving, distinct lighting, and landscape elements is an essential task of public open spaces. This network approach will help create a livable and sustainable environment for residents, promote social cohesion and a sense of community, as well as encourage physical activity and healthy lifestyles in Khorog.

To ensure safety and accessibility, it is advisable to include provisions in the legislation that require screening of public open spaces through vegetation or architectural elements. Such elements, including architectural walls, benches, lowest plants, bushes, and tall trees, should buffer pedestrians from automobiles, utilities, and parking lots but not make them isolated or confined.

When selecting planting techniques for buffering certain zones or general reforestation, it is essential to choose native species adapted to the environmental conditions of the Pamir Mountains.

Blocks:

The block level is the backbone of the whole system of recommendations since it provides the most granular and detailed level of analysis. At this level, planners and policymakers can identify specific challenges and opportunities within a neighborhood or community and develop tailored solutions that reflect the unique characteristics of the area. By focusing on the block level, urban and territorial planners can better understand the needs and preferences of residents, as well as the physical and social constraints of the built environment. This can help inform a wide range of planning decisions, from land use and zoning to transportation and infrastructure.

Given the limited availability of land in Khorog, it is recommended that degraded urban areas be revitalized after an evaluation of their safety regarding natural hazards (as done by UN-Habitat with site __). This will showcase ways to integrate them into the community and create stunning spaces by highlighting their specific characteristics. Moreover, depending on the chosen application of such abandoned land, they can be also applied as hazard mitigation zones.

Promoting mixed-use in the hilly city makes sense in the neighborhood dimension. By introducing the live-work-play concept, residents can enjoy greater efficiency, convenience, and save time for traveling. Therefore, it is advisable to widely apply the concept with limitations already incorporated in the Tajik Document (e.g., not to mix production facilities with flammable and explosive production processes, creating noise, vibration, electromagnetic and ionizing radiation, pollution of atmospheric air, surface, and ground waters exceeding established norms) with residential or public buildings.

Equally important in this context is the application of vertical zoning, meaning ground floors should be reserved for commercial uses and a range of activities. This will enhance the pedestrian environment, generate significant vehicle traffic, promote the relationship of buildings to urban

spaces, and enhance the use of public space. There is a possibility of such vertical zoning application in the Tajik legislation, although it is not specific in relation to small towns like Khorog. Moreover, to enhance the accessibility of buildings' entrances, they should be adapted to the needs of people with disabilities. Since Tajik legislation already incorporates this obligation, it is recommended to apply the standards on the slope of ramps (5-10%), and installation of railings and lifts, where applicable in Khorog. Coarse-grained materials should not be used for coating the ramps, and the necessary material could be chosen depending on the static coefficient of friction reaching 0.8, for example, non-slip granules.

It is also crucial to incorporate the culture and heritage of Khorog into its appearance, specifically by introducing local identity components. Based on the analyzed documents, it is recommended to use consistent exterior materials and colors on all building facades, while the heights and shapes of cornices, balconies, windows, viewpoints, and other elements should follow traditional rules of composition, with the prohibition of using materials that do not harmonize with the peculiar character of the area. Using local materials is also important not only for aesthetic purposes, creating a sense of place, but also to reduce the environmental impact of the construction process by minimizing transportation emissions and supporting local economies.

In addition to the recommendations provided in the Analysis of CIS Countries Building Codes related to the climate responsiveness of buildings, it is crucial to consider the application of green roof techniques in Khorog. They can act as an additional absorber of stormwater that comes from rain or melting snow that doesn't soak into the ground. Green roofs can ensure adaptation to climate change in urban areas and facilitate reducing urban heat islands to cool urban areas.

Moreover, this solution is highly recommendable also because the Tajik legislation already incorporates provisions on green roof governance, and no amendments are required to apply the concept.

In summary, the defined recommendations extracted from the urban planning documents of the fifteen study countries/cities will be interrelated with the Khorog Urban Design Guidelines and incorporated into the Khorog Urban Planning Rules to be further applied by legislators and urban planners while conducting urban development activities in the city.

5

ANNEX

5.1. REFERENCES

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5.2. LIST OF FIGURES

UN-HABITAT