



CiCoSA Implementation Guide





Circular Construction and Housing in Sub-Saharan Africa (CiCoSA) Implementation Guide

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This Implementation Guide is part of the CiCoSA Action Toolkit (Circular Construction and Housing in Sub-Saharan Africa), a guide on waste-wise approaches to sustainable building and construction in Sub-Saharan Africa. It was developed by UN-Habitat with the support of the Federal Ministry for Economic Cooperation and Development (BMZ), the Federal Republic of Germany to strengthen the sustainable building and construction sector, while also improving access to affordable housing and reducing the ecological footprint of cities.

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Preface

Africa is the world's second largest continent after Eurasia. 49 of these 54 nations are located in Sub-Saharan Africa. Africa is urbanizing faster than other regions. The urban growth in Africa is at around 3.55 % per year with the urbanization rate expected to reach 59% by 2050. The populations of countries in the Sub-Saharan African region are expected to continue growing rapidly, with projections indicating that they will almost double between 2022 and 2050, surpassing 2 billion inhabitants by the late 2040s. Although the current level of urbanization growth rate is one of the lowest worldwide, the region is experiencing rapid urban growth due to a high rate of urbanization.

Urbanization and rapid expansion of cities are creating visible environmental and social challenges. The generation and management of waste is one of the central concerns in urban agglomerations, particularly in the global South. Globally, waste is expected to grow to 3.40 billion tonnes by 2050. In Sub-Saharan Africa, the total waste generation is expected to more than triple in the same period which will have vast implications for the environment, health, and economy if no action is immediately taken.

At the same time, the region is also struggling to provide adequate housing to its population. The Sustainable Development Goals Report 2022 states that in 2020, 23% of urban dwellers in Sub-Saharan Africa (230 million out of over 1 billion people) lived in slums or informal settlements. The issue of affordability of housing becomes especially relevant for Africa. It is estimated that 75% of buildings needed in Sub-Saharan Africa by 2050 have yet to be built.

However, if waste and resources are effectively and efficiently managed, they represent an opportunity to transit to a circular economy, creating new jobs opportunity, saving precious resource and innovate affordable housing approaches.

CiCoSA, *Circular Construction and Housing in Sub-Saharan Africa*, project aims to strengthen the sustainable building and construction sector by

applying circular economy and low-carbon principles (waste wise approach) to the housing value chain, improving access to affordable housing and reducing the ecological footprint of cities in Sub-Saharan Africa.

The CiCoSA Action Toolkit includes a [CiCoSA Handbook](#) and a [CiCoSA Implementation Guide](#), dealing with circular solutions and resources efficiency in the building and construction sector in Sub-Saharan Africa, with a particular focus on Kenya, Namibia, and South Africa.

The CiCoSA Handbook delves into circular construction material options with a waste management perspective, within the Sub-Saharan African context. It examines benefits and risks of circular economy approaches to the building and construction sector, providing practical case studies that could be scaled up in the region as part of a sustainable urbanization strategy.

The CiCoSA Implementation Guide serves as a roadmap to navigate challenges on circular construction. This comprehensive resource is specifically tailored for policymakers in Sub-Saharan Africa. The guide outlines the various stages of a circular construction life cycle, from product manufacture and design to construction, operation, and ultimately, building's deconstruction.

Recommendations emphasize the crucial role of empowering local communities and fostering collaboration across sectors. By working together, policymakers, industry leaders, waste management professionals, and local communities can unlock the full potential of circular construction in Sub-Saharan Africa.

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Executive Summary

A looming construction boom in Sub-Saharan Africa presents a double-edged sword. While it signifies growth and development, the traditional reliance on virgin resources threatens to strain the environment. However, a strategic shift towards a circular economy, particularly the utilization of reused and recycled building materials, offers a promising solution.

This approach embraces sustainability at its core. By incorporating secondary materials into construction, the environmental impact is significantly reduced. Less resource extraction is needed, leading to the preservation of natural resources. Furthermore, construction and demolition waste, a major contributor to landfills and methane emissions, is minimized. This translates to a lower overall carbon footprint for the construction sector, aligning with global efforts to combat climate change.

The economic benefits are equally compelling. Recycled materials often require less energy to process compared to virgin materials, making construction more sustainable and cost-effective. This can lead to more affordable housing, a crucial factor for Sub-Saharan Africa's rapidly growing urban population. Additionally, a thriving market for recycled materials creates new economic opportunities in the waste management and construction sectors, fostering job creation and economic diversification. Imagine a future where local communities can not only contribute to a more sustainable construction process by supplying recycled materials, but also benefit economically through participation in the collection, processing, and distribution of these resources.

Despite its potential, challenges remain. Limited awareness about circular construction practices and a lack of readily available, high-quality recycled materials pose hurdles. Furthermore, fragmented regulatory frameworks and the prevalence of informal waste management systems create additional complexities. Addressing these challenges requires a multi-pronged approach. Raising awareness through targeted education and training programs can equip

stakeholders across the construction industry with the knowledge and skills necessary to embrace circular practices. Additionally, investments in infrastructure for collecting, sorting, and processing recycled materials are crucial to ensure a steady supply of high-quality secondary resources. Finally, policymakers need to develop and implement coherent regulatory frameworks that incentivize the use of recycled materials while streamlining the process for businesses and individuals operating within the construction sector.

The Circular Construction and Housing in Sub-Saharan Africa (CiCoSA) Implementation Guide serves as a roadmap to navigate these challenges. This comprehensive resource is specifically tailored to policymakers in Sub-Saharan Africa, considering the region's unique social, economic, and environmental context. The guide outlines the various stages of a circular construction life cycle, from product manufacture and design to construction, operation, and ultimately, building deconstruction. For each stage, the guide proposes specific policy recommendations that address the identified challenges. These recommendations emphasize the crucial role of empowering local communities and fostering collaboration across sectors. By working together, policymakers, industry leaders, waste management professionals, and local communities can unlock the full potential of circular construction in Sub-Saharan Africa.

By embracing the principles of circular construction as outlined in the CiCoSA Implementation Guide, emerging cities in Sub-Saharan Africa have the potential to unlock a future of sustainable development. This approach offers a win-win scenario, fostering economic growth, environmental responsibility, and climate change mitigation through a more responsible approach to building. It's a future where construction not only meets the needs of a growing population but also paves the way for a greener, more sustainable tomorrow.

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List of Abbreviations

ABMT	Appropriate Building Materials and Technology Centers	NDC	Nationally Determined Contributions
BMZ	German Federal Ministry for Economic Cooperation and Development	NEMA	National Environment Management Authority
CBO	Community-Based Organizations	NGO	Non-Government Organization
CDW	Construction and Demolition Waste	NHE	National Housing Enterprise
CiCoSA	Circular Construction and Housing in Sub-Saharan Africa	NSI	Namibian Standard Institution
CoG	Council of Governors	R&D	Research and Development
CSUDP	Civil Society Urban Development Programme	SDHUD	State Department for Housing and Urban Development
EPR	Extended Producer Responsibility	SSA	Sub-Saharan Africa
GHG	Greenhouse gas	UN SDG	United Nations Sustainable Development Goals
GIZ	The Deutsche Gesellschaft für Internationale Zusammenarbeit – German Development Cooperation		
IPR	Intellectual property rights		
KBRC	Kenya Building and Research Centre		
KGBS	Kenya Green Building Society		
KMA	Kenya Manufacturers Association		
KPI	Key Performance Indicators		
LCCA	Life Cycle Cost Analysis		
MSW	Municipal Solid Waste		
MURD	Ministry of Urban and Rural Development		
MSW	Municipal Solid Waste		
MWT	Ministry of Works and Transport		
NACHU	National Cooperatives Housing Union		
NCA	National Construction Authority		

1.

Introduction

1.1 Background

The built environment in the Sub-Saharan Africa (SSA) region is projected to face significant challenges in the coming decades. It is estimated that around 75% of the buildings that will make up the region's building stock by 2050 have yet to be constructed. Therefore, it is a critical moment to steer the development of the construction sector in SSA toward sustainability, avoiding the repetition of unsustainable practices seen in other parts of the world.

Without any intervention, rapid urbanization is set to significantly increase the demand for construction materials driving resource depletion. Additionally, the construction sector is a major contributor to greenhouse gas (GHG) emissions, relying heavily on non-renewable resources such as cement, steel, sand, gravel, and limestone, among others. The introduction of circular economy principles in the construction sector is a key component in supporting this transition to a more sustainable development path expected to deliver several environmental, economic, and social benefits.

Circular practices minimize waste and maximize resource efficiency. Construction and demolition activities generate substantial waste; therefore, integrating recycling and reuse into construction processes can reduce the amount of construction waste sent to landfills, simultaneously easing the burden on waste management systems and reducing associated methane emissions—a potent GHG. Further, by reusing and recycling building

materials, SSA can significantly reduce the demand for virgin materials, conserve these finite resources, and ensure their long-term sustainability. In this way, the adoption of circular economy principles in the construction sector can play a crucial role in reducing the industry's overall carbon footprint and ensuring resource availability over the long term.

Incorporating recycling and reuse practices in construction is not only an environmental imperative but also a strategic approach to achieving sustainable development. Circular economy practices have the potential to support inclusive socio-economic development. The recycling and processing of construction materials can create new job opportunities in the waste management and construction sectors, potentially reducing construction costs and making housing more affordable. The construction sector in SSA faces multifaceted challenges driven by the region's unique social, economic, and environmental circumstances. Rapid urbanization trends, extensive informal settlement growth patterns, resources overuse, and environmental constraints, all contribute to heightened climate vulnerability¹.

In addition, as highlighted in a recent study in Nairobi, Kenya, climate vulnerability is particularly high for vulnerable groups, such as women in informal settlements².

Social and economic disparities, such as lack of jobs, exacerbated poverty, and unsustainable resource extraction, underscore the need for inclusive

approaches to address the construction sector's challenges. The informal sector plays a crucial role in waste management, emphasizing the importance of integrating informal practices into formal strategies. The reliance on traditional building techniques, deeply rooted in indigenous heritage and cultural practices, embodies a rich architectural legacy that not only preserves cultural identity but also serves as a catalyst for innovation and sustainability ³.

Climate vulnerability further compounds challenges in SSA. Extreme weather events and rising temperatures threaten infrastructure resilience and exacerbate environmental degradation. As SSA continues to urbanize, the demand for construction materials intensifies, placing additional strain on natural resources and ecosystems. For example, sand, the foundation of human construction and a fundamental ingredient (in concrete, asphalt, glass and other building materials), like other natural resources, is limited. Ungoverned extraction is driving erosion, flooding, the salination of aquifers and the collapse of coastal defences ⁴.

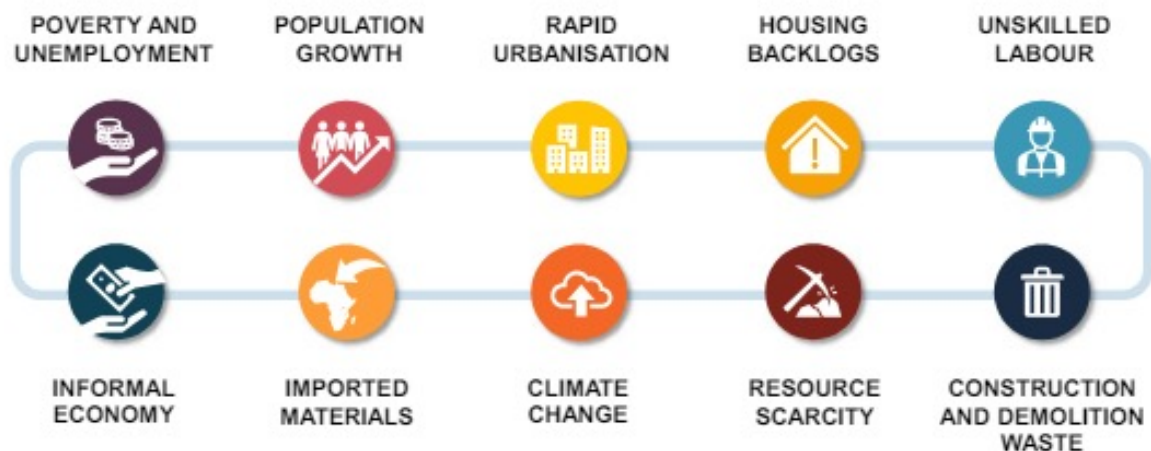
These special circumstances, which must be considered are illustrated in Figure 1 below.

Against this backdrop, the transition

towards circular construction in SSA offers a pathway to sustainable development. Construction material usage across Africa includes a blend of traditional artisanal methods and modern industrial production, with bio-based materials largely underutilized, particularly in urban areas, due to perceptions of their rustic nature. Currently, the demand for building materials in SSA relies heavily on imported, linear materials. However, transitioning towards locally sourced and processed materials has the potential to stimulate economic growth, create employment opportunities, and address vulnerabilities and poverty. This shift also aligns with principles of sustainable resource use, paving the way for more resilient and environmentally responsible urban development in SSA ¹.

By embracing circular economy principles and utilizing waste streams as building materials to replace unsustainable alternatives, the region can reduce dependency on imported materials, mitigate environmental impact, and create new opportunities for inclusive growth. Engaging local communities, integrating the informal sector, fostering partnerships, and incorporating indigenous practices are essential for realizing the full potential of circular construction in SSA.

FIGURE 1 Specific frame conditions in the building sector in SSA Source: ¹



SSA nations have a pivotal opportunity to align with the Paris Agreement and support global decarbonization efforts by integrating robust strategies for the building and construction sector into their Nationally Determined Contributions (NDCs). Prioritizing comprehensive building sector plans within their NDCs can accelerate the shift to sustainable construction practices. This approach not only enhances resilience, promotes energy efficiency, and fosters the creation of green jobs, but also positions African nations at the forefront of global initiatives to mitigate climate change and secure a sustainable future ⁵.

There are many publications dealing with decarbonization and circularity in the building and construction ⁵ sector, for example, the Global Status Report for Buildings and Construction ⁵, Circular Built Environment – Highlights from Africa ⁶ and the Circularity

and Sustainability in the Construction⁵ Value Chain ⁷ which primarily focus on the design of buildings and the use of sustainable materials. However, the utilization of waste as a secondary resource in the building and construction sector is not discussed in depth. The CiCoSA Handbook and the CiCoSA Implementation Guide aim to fill this gap.

It should be mentioned that there are other circular economy principles for the built environment, which are highly relevant and important, and they have been covered by many other works in this field, therefore they are not in-depth considered in the CiCoSA Action Toolkit. The CiCoSA Project focuses on the replacement of virgin building materials with secondary building materials recovered from waste streams, part of an integrated approach introducing a circular economy in the construction sector.

1.2 Aim of the implementation guide

“Circularity” has been discussed as a very powerful concept for transitioning national economies towards sustainability and decarbonization. Consequently, guiding the SSA construction industry toward a more circular model, which promotes the use of recycled materials as building materials, can positively impact the environment and foster inclusive socio-economic development. The transition will create new business opportunities for private sector actors and improve the living conditions of residents through the creation of formal and green job opportunities. Positive side effects of such a circular-orientated model for the construction sector are the GHG reduction, less environmental pressure on unsustainable extraction of resources and reduced contamination coming from unmanaged waste at dumpsites and haphazard waste disposal.

The need for inclusive and participatory approaches is essential for fostering a circular-oriented construction sector in SSA. Engaging local communities, including informal settlement dwellers and marginalized groups, from the earliest stages of circular construction initiatives is crucial. These initiatives should incorporate feedback mechanisms and ensure ongoing community involvement and strategy adaptation, providing equitable benefits and addressing socio-economic disparities.

Moreover, considering the cultural and traditional practices related to construction and housing in SSA is vital for the success of circular construction initiatives. Integrating indigenous knowledge systems and local building techniques can enhance the relevance and acceptance of circular construction approaches within communities.

Additionally, fostering partnerships and collaboration between governments, private sector actors, civil society organizations, research institutions, and international development agencies is essential for scaling up circular construction efforts and maximizing impact. These partnerships can leverage diverse expertise, resources, and networks to overcome barriers and drive collective action towards sustainable and inclusive development. The CiCoSA project, implemented by UN-Habitat and financed by the German Federal Ministry for Economic Cooperation and Development (BMZ), aims to contribute to the transition from the current linear construction model to a circular-oriented construction sector, focusing on waste management and circular economy perspectives. This implementation guide highlights the main challenges from a waste sector-related viewpoint in the transition to a more sustainable construction sector and identifies key enablers that can support this transition. It provides clear policy recommendations on how to raise awareness about circularity in the construction sector, the role of proper regulations in facilitating this transition, and how to incentivize innovation to develop tailor-made solutions for the local context in SSA. The guide also emphasizes the importance of an integrated approach, advocating for the inclusion of secondary building materials in policymaking to avoid siloed thinking. This implementation guide aims to provide a comprehensive toolkit to leverage opportunities for circular construction in SSA, laying the groundwork

for transformative action in the region.

In the following chapters, concrete actions for policymakers are proposed, along with step-by-step recommendations to guide the transition towards circularity and the use of recovered building materials in the construction sector at each stage of the circular construction lifecycle. The policy brief is envisioned as a toolbox for policymakers, enabling them to select the appropriate instruments to implement this transition. Depending on the initial stage of the construction sector, the specific conditions in each country, and the particular focus and goals of the transition, different instruments may be suitable for achieving the set policy goals for a circular economy transition.

2.

Policy Brief for Decision-makers

This chapter is designed for policymakers and decision-makers seeking a concise overview of specific policy recommendations for each stage of the circular construction lifecycle. These recommendations aim to facilitate the implementation of circular economy

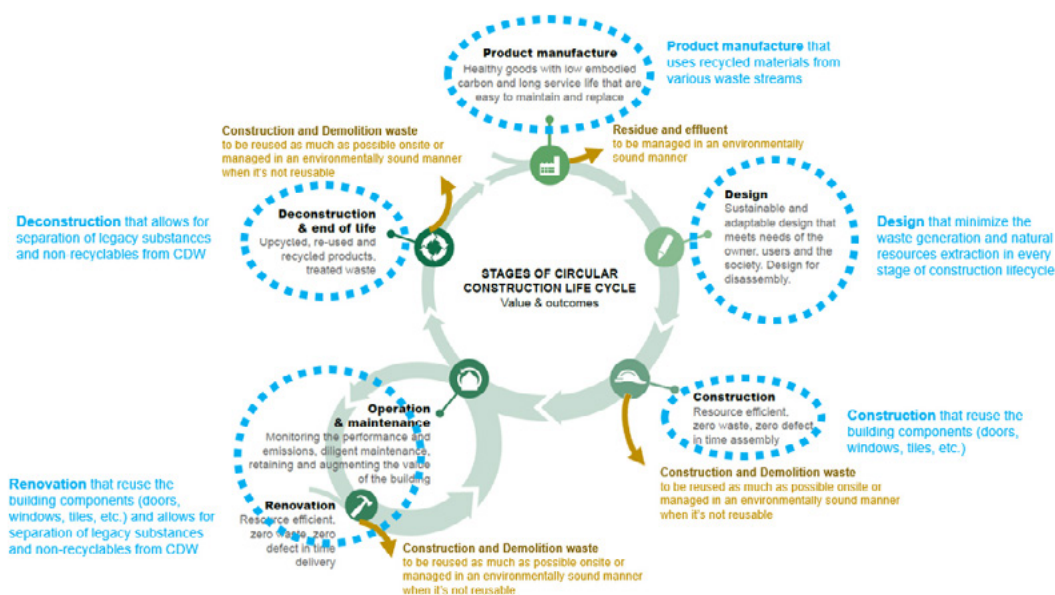
principles within the construction sector and can be used by policymakers as a roadmap to steer the circular transition. Detailed discussions on these recommendations and the barriers they address are further explored in chapters 5 and 6.

2.1 Stages of Circular Construction

Figure 2 below shows the different stages of a circular construction life cycle stretching from the production of construction materials, the design of buildings, the construction phase, the operation and maintenance of the building, up to the deconstruction of the building at the end of

its life. Suitable policies to promote circularity in the construction sector must address specific needs in order to transform a construction sector built on a linear model, into a circular-orientated model, as illustrated. This approach is especially critical in the context of SSA.

FIGURE 2 Stages of a circular construction life cycle Source: ⁷



2.1.1 Policy recommendation for the manufacture stage

Policy interventions at the manufacturing stage should prioritize and enable the adoption of recycled and sustainable materials over virgin resources. Considering the SSA context, recommendations include:

- Incentivizing partnerships between formal manufacturers and the informal sector to source reclaimed materials.
- Establishing microfinancing programs to support small-scale enterprises in adopting circular production methods.
- Implementing capacity-building initiatives to enhance local production of recycled materials and reduce dependence on imports.
- Facilitating the integration of informal building practices and materials into formal construction processes.

2.1.2 Policy recommendation for the planning and design stage

During the planning and design phase, policies should encourage planners, architects and designers to consider maximizing the use of recycled materials according to their specifications. In addition, building designs should promote ease of disassembly to facilitate future reuse and recovery of materials. Recommendations for the SSA context include:

- Mainstreaming and updating circular construction practices in formal and informal planning instruments like local ordinances and concept development (e.g., Building Utilisation Ordinance, Local Construction Manuals, Municipal Design Catalogue, Spatial Development Plans, etc.).
- Providing design grants and competitions targeted at local architects and designers to promote innovation in circular design.
- Investing in community-led design initiatives incorporating indigenous knowledge and traditional building techniques.
- Facilitating partnerships between formal design firms and community-based organizations to co-create sustainable and culturally appropriate building solutions.

- Developing educational programs and workshops to raise awareness among designers and communities about the benefits of circular design principles.
- Including vocational training and university curriculum on indigenous knowledge and circular traditional building techniques.

2.1.3 Policy recommendation for the construction phase

Policies promoting circularity in the construction phase should prioritize the use of reclaimed materials and waste reduction strategies. In the SSA context, recommendations include:

- Strengthening vocational training programs to equip formal and informal construction workers with skills in salvaging and utilizing reclaimed materials.
- Introducing tax incentives and subsidies for construction companies engaging in sustainable building practices, including the use of recycled materials.
- Establishing resource-sharing platforms to facilitate the exchange of construction materials and equipment, as well as of experiences and lessons learnt among formal and informal builders and contractors.
- Promoting community-led construction projects that prioritize locally sourced and recycled materials to enhance resilience and self-reliance.

2.1.4 Policy recommendation for the operation and maintenance stage

During the operation and maintenance stage, policies should promote resource efficiency and circular business models. Recommendations for SSA context include:

- Providing financial support and technical assistance to community-based organizations for the maintenance and repair of residential buildings using recycled materials.
- Introducing energy and water efficiency standards tailored to the socio-economic context of informal settlements and rural communities.
- Encouraging the adoption of circular business models such as material leasing and sharing among businesses and entrepreneurs.
- Establishing collaborative networks between formal and informal service providers to offer affordable and accessible maintenance services for residential buildings.

2.1.5 Policy recommendation for the deconstruction and end of life stage

At the deconstruction and end-of-life stage, policies should incentivize the recovery of materials over demolition. Recommendations for SSA context include:

- Mandating the inclusion of deconstruction and material recovery plans in building permits and regulations.
- Investing in decentralized material recovery facilities in urban and peri-urban areas to facilitate the recycling of construction and demolition waste.
- Promoting awareness campaigns and capacity-building initiatives to educate communities about the importance of salvaging and recycling building materials.
- Establishing certification schemes for recycled materials to ensure quality standards and to promote market acceptance.

3.

Stakeholders' mapping to implement circularity in the construction sector in SSA

This chapter provides a comprehensive overview of the key stakeholders involved in promoting circularity within the construction sector across SSA. Recognizing the potential of three primary waste streams –Municipal Solid Waste (MSW), Construction and Demolition Waste (CDW), and Agricultural Waste (AW) – as potential resources for building materials, it is essential to engage all relevant stakeholders in the transition towards sustainable construction practices.

Each waste stream presents unique opportunities and challenges, necessitating a thorough examination of stakeholder roles, potential conflicts of interest, and

barriers to adoption. By mapping out the diverse array of stakeholders involved in or impacted by the utilization of these resources, we can identify synergies, mitigate conflicts, and foster collaborative partnerships to drive positive change.

In exemplary case studies from Kenya and Namibia, we highlight the importance of stakeholders' engagement and partnership-building in advancing circularity goals. By identifying and mobilizing relevant stakeholders, we can harness collective expertise, resources, and influence to overcome barriers and accelerate the adoption of sustainable building practices.

3.1 Municipal Solid Waste (MSW)

3.1.1 Stakeholders in the MSW

A. National Authorities, Local Governments and Municipal Authorities

ROLE

National Authorities, Local Government and Municipal Authorities are responsible for national and local waste legislation enforcement and delivering MSW services, promoting circularity and the use of recycled materials in residential constructions. They also oversee waste collection, sorting, and disposal infrastructure, coordinate with the informal sector, in cases where it exists, and serve as a key stakeholder in the construction of residential buildings.

Interests & Barriers	Interests include promoting environmental sustainability, reducing landfill waste, and fostering economic development through recycling. Barriers may include budget constraints, lack of public awareness, and resistance to change MSW management practices due to existing long-term contracts with waste management companies or existing administrative structures.
Incentive for Change	Easier access to funding for infrastructure development, support from international organizations promoting sustainability, and pressure from civil society groups (e.g. NGOs, grassroots movements) for improved MSW management practices in municipalities.
Strategic Partnerships	Collaboration with NGOs for community outreach and education, partnership with private sector entities for investment in recycling facilities, and engagement with waste picker associations for integrating informal sector workers into formal waste management systems.

B. Informal Waste and Recovery Sector

ROLE	The informal waste and recovery sector plays a crucial role in collecting, sorting, and recycling valuable materials from MSW streams, often contributing significantly to waste recovery efforts. By formalizing their activities and integrating them into formal MSW management systems, these sectors can enhance recycling rates, promote sustainability, and advance circularity. This is especially important for residential buildings in socially vulnerable communities, such as those in informal settlements facing precarious conditions, where their contributions can lead to both economic and social empowerment.
Interests & Barriers	Interests include income generation, environmental conservation, and recognition of their contribution to circular MSW management. Barriers may include a lack of legal recognition, health hazards associated with poor working conditions, and limited access to markets for recycled materials.
Incentive for Change	Recognition of their contribution to MSW management, access to training and protective equipment, and inclusion in the formal economy, with fair financial compensation for their work.
Strategic Partnerships	Collaboration with local governments for inclusion in formal MSW collection and recovery schemes, partnership with NGOs for capacity building and advocacy, and engagement with businesses for access to markets and fair-trade practices.

C. Waste Management Companies

ROLE	Waste management companies, both formal and informal, are essential in the collection, transportation, and processing of MSW, particularly in large urban centers. Formal companies often invest in recycling facilities, while informal companies contribute significantly to waste collection and recovery efforts. Together, they play a crucial role in managing MSW, supporting recovery initiatives, and promoting sustainable waste practices in the region.
Interests & Barriers	While companies need permit for collection and recycle, there is an interest for the companies, including revenue generation from collection and recycling, to comply with environmental regulations. Barriers may include high initial investment costs for infrastructure and equipment and fluctuating market prices for recycled materials.

Incentive for Change	Access to funding or subsidies for recycling infrastructure, government contracts for waste management services, and public recognition for environmental stewardship can serve as drivers for change.
Strategic Partnerships	Collaboration with local governments for public-private partnerships in waste management, partnerships with manufacturers for sourcing recycled materials, and engagement with NGOs for community outreach and education.

D. Community-Based Organizations (CBOs) and Non-Governmental Organizations (NGOs)

ROLE	CBOs and NGOs play a crucial role in promoting sustainable waste management practices at the community level in SSA. Through sensitization efforts, hands-on activities, and training, they raise awareness about waste reduction, segregation, and recycling. They also support community-led recycling initiatives, helping to foster sustainable practices, particularly in residential areas.
Interests & Barriers	Interests include environmental advocacy, community development, and promoting social justice for marginalized groups. Barriers may include limited funding for projects, difficulties in reaching remote communities, and resistance to changing unsound waste management practices.
Incentive for Change	Access to grants or donations for project implementation, partnership opportunities with governments and businesses, and evidence-based research demonstrating the benefits of recycling.
Strategic Partnerships	Collaboration with local governments for waste management initiatives, partnership with businesses for funding and support, and engagement with educational institutions for awareness campaigns and research projects.

E. Manufacturers and Industry Associations

ROLE	Manufacturers and industry associations play a key role in driving demand for recycled materials from MSW in SSA. They utilize these materials as feedstock for producing building materials, thereby supporting a circular economy and promoting the use of recycled content in construction, including residential buildings.
Interests & Barriers	Interests include cost savings through material substitution, meeting sustainability targets, and enhancing brand reputation through green initiatives. Barriers may include concerns about material quality and consistency, supply chain disruptions, and regulatory uncertainties.
Incentive for Change	Access to incentives or tax breaks for using recycled materials, market differentiation through eco-friendly products, and collaboration opportunities with waste management stakeholders for a stable supply of raw materials.
Strategic Partnerships	Collaboration with waste management companies for sourcing recycled materials, partnership with research institutions for product innovation, and engagement with government agencies for policy advocacy and industry support.

F. Housing Developers and Builders

ROLE	Housing developers and builders in SSA play a crucial role in constructing residential buildings and have the potential to significantly contribute to circularity in the construction sector. By incorporating recycled building materials into their projects, they can drive demand for these materials and promote more sustainable building practices.
Interests & Barriers	Interests include cost savings through material substitution, compliance with green building standards, and meeting consumer demand for eco-friendly homes. Barriers may include concerns about material performance and durability, resistance to change in traditional construction practices, and limited availability of recycled materials.
Incentive for Change	Access to incentives or subsidies for using recycled materials, certification or labelling schemes for sustainable construction, and market differentiation through green building certifications.
Strategic Partnerships	Collaboration with waste management companies for a stable supply of recycled materials, partnership with architects and designers for sustainable building design, and engagement with government agencies for policy advocacy and industry support.

G. Investors

ROLE	Investors play a critical role by providing financial support and capital for waste management infrastructure and circular construction projects. Their investments enable the implementation of circularity initiatives in the MSW sector, driving environmental sustainability and economic development, particularly in the construction of residential buildings.
Interests & Barriers	Interests include potential returns on investment, alignment with impact investing goals, and diversification of investment portfolios. Barriers may include perceived risks associated with emerging markets, regulatory uncertainties, and concerns about project scalability.
Incentive for Change	Access to financial incentives or subsidies for sustainable projects, demonstration of positive environmental and social impacts, and partnership opportunities with governments and development organizations.
Strategic Partnerships	Collaboration with government agencies for public-private partnerships in waste management, partnership with industry stakeholders for project implementation, and engagement with local communities for social license to operate.

H. Companies Dealing with Virgin Building Materials

ROLE	Companies dealing with virgin building materials, such as cement, steel, and timber, are involved in the production, distribution, and sale of these materials for construction projects. With the rise of alternative building materials derived from recycled waste streams, these companies may experience shifts in their business models and market demand, influencing the construction industry's transition toward more sustainable practices.
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Interests & Barriers	Interests include maintaining market dominance, sustaining profit margins, and addressing evolving consumer preferences for sustainable construction materials. Barriers may include resistance to change in established business practices, concerns about the quality and performance of recycled materials, and uncertainty regarding regulatory compliance.
Incentive for Change	Access to incentives for adopting sustainable practices, diversification of product offerings to include recycled materials, and opportunities for market differentiation through eco-friendly branding.
Strategic Partnerships	Collaboration with waste management companies to explore opportunities for material substitution, partnership with research institutions for product testing and certification, and engagement with government agencies to shape regulatory frameworks conducive to circular construction practices.

3.1.2 Example Stakeholder groups in Namibia in the MSW sector

CATEGORY	INSTITUTION	DESCRIPTION AND RESPONSIBILITIES
National Government	Division of Environmental Assessment, Waste Management and Pollution Control, and Inspections - Department of Environmental Affairs and Forestry - Ministry of Environment, Forestry and Tourism	<ul style="list-style-type: none"> » The division is a regulatory authority for environmental matters, including waste management. » Implementing authority for the National Waste Management Strategy – to install a widespread culture of waste minimisation, expand recycling systems, and enforce improvements in MSW disposal standards. » Issuing licences for all waste disposal site.
Local Governments and Municipal Authorities	Regional Councils	<ul style="list-style-type: none"> » The second tier of governance operating at the regional government level in all 14 regions of the country. » Determining housing needs of and creating housing opportunities within settlements and growth points in rural areas primarily through land servicing initiatives (regional level). » Overseeing waste collection, sorting, and disposal infrastructure, in Village Councils and Settlements.

CATEGORY	INSTITUTION	DESCRIPTION AND RESPONSIBILITIES
Local Governments and Municipal Authorities	The Association of Local Authorities	<ul style="list-style-type: none"> » Local authorities are the third and final tier of the government structure, focusing primarily on the governance and management of urban areas. » Local authorities, including town councils and municipalities, are responsible for determining housing needs and for creating housing opportunities within their jurisdiction primarily through land servicing initiatives (at local level). » The Association of Local Authorities is the body representing all local authority members in Namibia. » Ensuring compliance with Building Regulations and standards and overseeing waste collection, sorting, and disposal infrastructure
State-owned companies	National Housing Enterprise	<ul style="list-style-type: none"> » Its core mandate is “the financing of housing for inhabitants of Namibia” and more generally “providing for the housing needs of such inhabitants”. » It may develop housing through its resources or in partnership with non-state implementors, » It may develop housing on unproclaimed land or through acquisition, and/or lease from Regional Councils and Local Authorities
	Build Together Programme – Housing Division, Ministry of Urban and Rural Development	<ul style="list-style-type: none"> » A programme under Housing Division, Ministry of Urban and Rural Development » Aiming to meet large-scale housing needs through an enabling approach to housing provision, especially for low-income and low/medium income families who do not have access to formal housing credits.
Informal Waste and Recovery Sector		<ul style="list-style-type: none"> » The informal Waste and Recovery sector is collecting, sorting, and recycling valuable materials from MSW
Private Sector	Collection companies	<ul style="list-style-type: none"> » Providing MSW collection services to private business and individual households » Transporting and disposing waste at designated landfill sites or treatment facilities approved by local authorities

CATEGORY	INSTITUTION	DESCRIPTION AND RESPONSIBILITIES
Private Sector	Recycling companies	<ul style="list-style-type: none"> » Implementing recycling activities and promoting circular economy
Non-Governmental Organization (NGOs)	Recycle Forum Namibia	<ul style="list-style-type: none"> » A non-profit membership organisation and network coordinating projects to promote recycling, and the reduction and reuse of waste in Namibia. » Promoting effective and sustainable waste management.
	Shack Dwellers Federation of Namibia	<ul style="list-style-type: none"> » A non-profit organisation, community-based network of housing saving schemes
	Namibia Housing Action Group	<ul style="list-style-type: none"> » It is a Namibian Service Organisation that aims to support and add value to the activities and processes of the Shack Dwellers Federation of Namibia in achieving their mission. » Striving to facilitate change in the livelihoods of urban and rural poor through pioneering pro-poor development approaches. Community mobilisation, project management and delivery, lobbying and advocacy, financial resilience and asset building, and data and mapping are the core activities.
	National Alliance for Informal Settlement Upgrading	<ul style="list-style-type: none"> » A multi-stakeholder platform for informal settlement upgrading and housing strategies, innovation, and critical evaluation of lessons learnt from practice. » Is a coalition between the Namibia Housing Action Group and the Shack Dwellers Federation of Namibia; Namibia Association of Local Authorities Officials; the Association of Local Authorities in Namibia; the Civil Society Organizations' Working Group on Land Reform; Ministry of Urban and Rural Development, and the Namibia University of Science and Technology. » Coordinating and scaling up efforts to improve living conditions in informal settlements nationwide.
Manufacturers and Industry Associations	Namibia Chamber of Commerce and Industry	<ul style="list-style-type: none"> » s a nationally recognised business support organisation - Representative body for the private sector nationwide » Advocating for a fair, equal, conducive, and competitive business environment across Namibia, through policy negotiations, stakeholder engagements, capacity building, and other membership services.

CATEGORY	INSTITUTION	DESCRIPTION AND RESPONSIBILITIES
Residents associations	Windhoek Residents Association; Swakopmund Residents Association; Walvis Bay Residents Association.	<ul style="list-style-type: none"> » Providing a platform for residents to engage with local authorities and ensure that their needs are addressed in areas such as service provision, urban development, and community safety. » Play a key role in fostering community involvement and advocating for improvements at the local level.
Investors	Twahangana Fund – Housing Division, Ministry of Urban and Rural Development	<ul style="list-style-type: none"> » Is a community-governed, independently audited, revolving fund that has received direct Government funding since 2000 » Providing finance to the members of the Shack Dwellers Federation of Namibia (see stakeholders of CDW) saving groups for land acquisition, servicing of land and construction of houses as well as small business loans.
	National Housing Development Fund - Ministry of Urban and Rural Development	<ul style="list-style-type: none"> » Is a division within the Ministry of Urban and Rural development that promote the establishment of Housing Revolving Funds by local authority councils and regional councils.
	Development Bank of Namibia	<ul style="list-style-type: none"> » Is the investor bank providing development finance for land and housing
	Commercial Banks	<ul style="list-style-type: none"> » Playing a key role in providing end-user finance, primarily focused on credit-linked housing provision. » May develop financial innovations to reach previously underserved income groups by creating platforms for pooling Corporate Social Responsibility initiatives.
	Department of Works - Ministry of Works and Transport	<ul style="list-style-type: none"> » Responsible to manage and implement government projects on behalf of other Offices, Ministries and Agencies and to administer the legislation, governing the entire construction industry. » Ensuring the development of state infrastructure, develop, implement and regulate sectorial policies related to construction, and maintenance of State assets » Overseeing the promulgation and implementation of national regulations and Acts related to the provision of Architects, Quantity Surveyors and Engineering Services.

3.2 Construction and Demolition Waste (CDW)

3.2.1 Stakeholders in the CDW

A. Construction Companies and Contractors

ROLE	Construction companies and contractors in SSA are responsible for generating CDW during construction, renovation, and demolition activities. Their adoption of waste minimization and recycling practices is crucial for promoting circularity in the CDW sector.
Interests & Barriers	Interests include cost savings through efficient waste management, compliance with regulations, and enhancing reputation through sustainable practices. Barriers may include a lack of awareness, logistical challenges in segregating waste on-site, and resistance to change unsound construction methods. An important barrier is also the lack of standards and specifications for secondary materials as this poses risks and potential liability for construction companies.
Incentive for Change	Access to training and capacity-building programs, recognition through industry certifications for sustainable construction practices, and potential cost savings through material reuse and recycling.
Strategic Partnerships	Collaboration with waste management companies (formal and informal) for waste collection and recycling services, partnership with suppliers for sustainable materials sourcing, and engagement with government agencies for policy support and incentives.

B. Waste Management Companies

ROLE	Waste management companies in SSA play a vital role in collecting, transporting, and processing CDW. They are in a perfect position to operate recycling facilities to recover valuable materials such as concrete, bricks, wood and metal, contributing to waste reduction and circularity in the CDW sector.
Interests & Barriers	Interests include revenue generation from waste management services, investment opportunities in recycling infrastructure, reduction of gate fees, and meeting environmental sustainability goals. Barriers may include high capital costs for recycling equipment, lack of know-how technical feasibility, market fluctuations in recycled material prices, and regulatory constraints.
Incentive for Change	Access to funding for recycling infrastructure development, partnership opportunities with construction companies for waste collection contracts, and alignment with corporate sustainability goals of clients.
Strategic Partnerships	Collaboration with construction companies for waste collection and sorting at construction sites, partnership with manufacturers for marketing recycled building materials, and engagement with government agencies for policy advocacy and support.

C. Government Agencies and Regulatory Bodies

ROLE	Government agencies and regulatory bodies in SSA develop and enforce regulations for CDW management. They set standards for waste sorting, recycling targets, and landfill diversion requirements, ensuring proper management of CDW and promoting circularity by using suitable waste streams as input resources for construction material.
Interests & Barriers	Interests include environmental protection, public health, and resource conservation. Barriers may include limited enforcement capacity, inadequate infrastructure for waste management, and lack of public awareness of the opportunities of the use of waste materials as construction materials might offer.
Incentive for Change	Access to technical assistance and capacity-building support, recognition for successful waste management initiatives, and alignment with international standards and best practices.
Strategic Partnerships	Collaboration with industry stakeholders for policy development, partnership with NGOs for public awareness campaigns, and engagement with research institutions for evidence-based policymaking.

D. Planners, Architects and Designers

ROLE	Planner, architects and designers in SSA play a crucial role in integrating principles of sustainable design and circular economy into building plans, especially for residential buildings (e.g. for social housing programs). They minimize waste generation and maximize material reuse by applying circular concepts in their project design, contributing to circularity in the CDW sector.
Interests & Barriers	Interests include creative design solutions, client satisfaction, and professional reputation. Barriers may include limited knowledge of sustainable design principles, client preferences for conventional materials, and cost considerations, which might arise using new building materials.
Incentive for Change	Access to training and professional development opportunities, recognition through industry awards for sustainable design projects, and client demand for green building certifications.
Strategic Partnerships	Collaboration with construction companies for project implementation, partnership with suppliers for sustainable materials sourcing, and engagement with government agencies for policy advocacy and support.

E. Recycling Industry

ROLE	The recycling industry in SSA processes CDW into recycled aggregates, bricks, and other building materials for use in construction projects. They supply recycled materials to the construction sector, promoting circularity and sustainability in the CDW sector.
Interests & Barriers	Interests include market demand for recycled materials, technological innovation in recycling processes, and environmental conservation. Barriers may include inadequate infrastructure for material processing, limited market awareness of recycled products, and competition from virgin materials.

Incentive for Change	Access to investment for technology upgrades and capacity expansion, collaboration with architects and developers for product design, and certification of recycled products for quality assurance.
Strategic Partnerships	Collaboration with construction companies for material supply agreements, partnership with waste management companies for feedstock sourcing, and engagement with government agencies for policy support and market incentives.

F. Residential Property Owners and Managers

ROLE	Residential property owners and managers in SSA oversee the maintenance and renovation of residential buildings. Their decisions regarding material selection and renovation practices can influence the demand for recycled building materials, contributing to circularity in the CDW sector, especially concerning residential buildings.
Interests & Barriers	Interests include cost savings on maintenance and renovation, tenants' satisfaction, and compliance with sustainability standards. Barriers may include a lack of awareness of sustainable building practices, higher upfront costs of recycled building materials, and resistance to change from tenants.
Incentive for Change	Access to financing for environmentally friendly renovations and upgrades of existing buildings, recognition through green building certifications, and tenant demand for sustainable living environments.
Strategic Partnerships	Collaboration with contractors for renovation projects, partnership with suppliers for sustainable materials sourcing, and engagement with tenants for education and awareness campaigns.

G. Investors

ROLE	Investors play a crucial role in financing recycling facilities, innovative construction technologies, and circular construction projects in SSA. Their funding enables the implementation of circularity initiatives and promotes sustainable development in the CDW sector, especially concerning the use of CDW waste streams as building material in residential buildings.
Interests & Barriers	Interests include financial returns, environmental impacts, and social benefits. Barriers may include perceived risks in emerging markets, regulatory uncertainties, and a lack of viable investment opportunities.
Incentive for Change	Access to information on market trends and investment opportunities, alignment with impact investing goals, and partnership opportunities with industry stakeholders.
Strategic Partnerships	Collaboration with government agencies for policy support and market incentives, partnership with industry stakeholders for project implementation, and engagement with local communities for social impact assessments.

3.2.2 Example Stakeholder groups in Namibia in the CDW sector

CATEGORY	INSTITUTION	DESCRIPTION AND RESPONSIBILITIES
Construction Companies and Contractors	The Construction Industries Federation of Namibia	<ul style="list-style-type: none"> » An autonomous, voluntary non-governmental and apolitical organisation. Its members include multi-national building and civil contractors (smaller contractors and SMEs), the retailers of building materials, manufacturers and suppliers of construction materials and equipment. » Representing specialist trades such as electricians, joiners, plumbers, painters and steelworkers, among others.
Non-Governmental Organization	Shack Dwellers Federation of Namibia	<ul style="list-style-type: none"> » A community-based network of housing saving schemes to improve the lives of the poor by securing affordable land and shelter and improving the living conditions of those excluded from commercial housing and financial processes, using a community-driven approach. » Working incrementally to secure affordable land, shelter and infrastructure services for low-income urban households across all 13 regions of Namibia.
	Namibia Housing Action Group	<ul style="list-style-type: none"> » A Namibian Service Organisation that aims to support and add value to the activities and processes of the Shack Dwellers Federation of Namibia in achieving their mission. » Striving to facilitate change in the livelihoods of urban and rural poor through pioneering pro-poor development approaches. Community mobilisation, project management and delivery, lobbying and advocacy, financial resilience and asset building, and data and mapping are the core activities.
	The Namibia Institute of Architects	<ul style="list-style-type: none"> » A non-profit statutory institution. » Its purpose is to serve the interest of architects in Namibia, to further and promote good architecture and ensure sound architectural practice among architects and the general public of Namibia.

CATEGORY	INSTITUTION	DESCRIPTION AND RESPONSIBILITIES
	Green Building Council of Namibia	<ul style="list-style-type: none"> » An independent, non-profit trust established in 2013 to lead the greening of Namibia's built environment. » Their mission is to promote, encourage and facilitate green building in the Namibian property and construction industry
	Recycle Forum Namibia	<ul style="list-style-type: none"> » A Namibian network promoting effective and sustainable waste management. » It is a non-profit membership-based organisation with the purpose of coordinating projects to promote recycling and the reduction and reuse of waste in Namibia.
Private companies	Formal and informal waste management companies	<ul style="list-style-type: none"> » Providing CDW collection services » Transporting and disposing waste at designated landfill sites or treatment facilities approved by local authorities » Implementing formal and informal through use of secondary materials in the construction sector and others.
Government Agencies and Regulatory Bodies	Decentralised Build Together Programme	<ul style="list-style-type: none"> » A revolving fund administered by Local Authorities and Regional Councils. » Providing support to the councils to ensure efficient, effective, adequate and affordable housing for all Namibians with particular emphasis on the low-income group of the population and to improve social and living conditions of the community within the concept of sustainable development. » Including four sub-programmes, namely: urban/rural housing loans; social housing (understood as housing for beneficiaries with special needs and/or indigent households); Single Quarters transformation; and informal settlement upgrading.
	Namibian Standards Institution	<ul style="list-style-type: none"> » Administering standards in Namibia, including the development of National Building Regulations. » Providing certification of local building materials. » Promoting standardization of products for the safety of consumers and protection of the environment for improved access to global markets.

CATEGORY	INSTITUTION	DESCRIPTION AND RESPONSIBILITIES
	Namibian Council of Architects and Quantity Surveyors	» It is a statutory body that is mandated by legislation to protect the public's interest regarding the services rendered by Architects and Quantity Surveyors
Real Estate Association	Namibian Property Association	<ul style="list-style-type: none"> » Is a member-driven organisation and the representative body and official voice of the commercial and industrial real estate sector in Namibia. » Aiming to build community and collaboration among Namibia's property players.
Investors	Commercial Banks, Insurance companies, Real estate companies, Government Institution Pension Fund	» Main roles are to provide capital for property investment.

3.3 Agriculture Waste

3.3.1 Stakeholder in the Agricultural Waste

A. Farmers and Agricultural Producers

ROLE	Farmers and agricultural producers in SSA generate agricultural waste such as crop residues from a diverse variety of crops and they generate agro-industrial byproducts. Their cooperation is essential for collecting, storing, and utilizing agricultural waste in circularity initiatives, for its use as building material in residential buildings.
Interests & Barriers	Interests include maintaining soil fertility, cost reduction in waste management, and potential revenue from waste valorisation. Barriers may include limited access to technology for waste collection and processing, lack of awareness of waste utilization opportunities, and labour constraints.
Incentive for Change	Access to training and extension services on sustainable agricultural practices, demonstration of economic benefits from waste utilization, and participation in cooperative ventures for waste management.
Strategic Partnerships	Collaboration with research institutions for technology transfer, partnership with agribusinesses for waste collection and processing, collaboration with construction material industry for the supply of raw material and engagement with government agencies for policy support and market linkages.

B. Agro-Processing Industries

ROLE	Agro-Processing industries in SSA produce agricultural products and generate waste streams such as husks, shells, and stems. They can implement waste management strategies to reduce, reuse, and recycle agricultural waste, contributing to circularity in the agricultural sector.
Interests & Barriers	Interests include cost savings through waste reduction, compliance with environmental regulations, and diversification of revenue streams. Barriers may include a lack of infrastructure for onsite waste management, limited market demand for waste-derived products, and competition from imported traditional building materials.
Incentive for Change	Access to funding for waste management infrastructure, recognition for sustainable production practices, and market incentives for waste-derived products.
Strategic Partnerships	Collaboration with waste management companies for waste collection and processing, partnership with farmers for waste supply agreements, and engagement with research institutions for product development.

C. Research Institutions and Agricultural Extension Services

ROLE	Research institutions and agricultural extension services in SSA conduct research on innovative uses of agricultural waste in construction materials. They disseminate knowledge to farmers and stakeholders, promoting the utilization of agricultural waste in circularity initiatives.
Interests & Barriers	Interests include scientific advancement, technology transfer, and societal impact. Barriers may include limited funding for research projects, difficulty in commercializing research findings, and lack of collaboration between academia and industry.
Incentive for Change	Access to research funding and grants, recognition for academic achievements, and partnerships with industry stakeholders for knowledge exchange.
Strategic Partnerships	Collaboration with agribusinesses for field trials and product testing, partnership with NGOs for community outreach and education, and engagement with policymakers for evidence-based policymaking.

D. Government Agricultural Agencies

ROLE	Government and Agricultural Agencies in SSA develop policies and programs to promote sustainable agricultural practices. They encourage the utilization of agricultural waste for alternative purposes such as construction materials, fostering circularity in the agricultural sector, particularly concerning the use of alternative building materials for residential buildings.
Interests & Barriers	Interests include food security, rural development, and environmental sustainability. Barriers may include competing priorities, limited resources for implementation, and resistance from stakeholders.
Incentive for Change	Access to funding for agricultural waste management initiatives, recognition for policy leadership, and alignment with international commitments on sustainable development.
Strategic Partnerships	Collaboration with research institutions for evidence-based policymaking, partnership with agribusinesses for technology transfer, and engagement with civil society organizations for stakeholder participation.

E. CBOs and Cooperatives

ROLE	CBOs and Cooperatives in SSA facilitate the collection, processing, and marketing of agricultural waste for use in construction materials. They can organize farmers and cooperatives to participate in circular economy initiatives, promoting sustainability in the agricultural sector, especially concerning the use of alternative building materials in residential buildings.
Interests & Barriers	Interests include community development, income generation, and environmental conservation. Barriers may include limited capacity for project implementation, competition for resources, and lack of market linkages.

Incentive for Change	Access to funding for capacity building and infrastructure development, recognition for community contributions, and support for market development initiatives.
Strategic Partnerships	Collaboration with government agencies for project funding and technical assistance, partnership with private sector entities for market access, and engagement with research institutions for product innovation.

F. Community Housing Cooperatives

ROLE	Community housing cooperatives in SSA organize collective housing initiatives and manage residential properties on behalf of community members. Their involvement can promote the use of recycled agricultural waste materials in residential construction contributing to affordable housing solutions to low-income families and circularity in both sectors, particularly concerning residential buildings.
Interests & Barriers	Interests include affordable housing, community empowerment, and environmental sustainability. Barriers may include limited access to financing, land tenure issues, and regulatory challenges.
Incentive for Change	Access to funding for housing development projects, recognition for sustainable housing practices, and support for cooperative governance structures.
Strategic Partnerships	Collaboration with financial institutions for housing finance, partnership with NGOs for technical assistance and capacity building, and engagement with government agencies for policy support and incentives.

G. Investors

ROLE	Investors play a crucial role in providing financial support and investment capital for waste management infrastructure, recycling facilities, and circular economy initiatives in SSA. Their funding enables the implementation of circularity initiatives and promotes sustainable development in the agricultural sector by using waste to produce building materials.
Interests & Barriers	Interests include financial returns, environmental impact, and social benefits. Barriers may include perceived risks in emerging markets, regulatory uncertainties, and a lack of viable investment opportunities.
Incentive for Change	Access to information on market trends and investment opportunities, alignment with impact investing goals, and partnership opportunities with industry stakeholders.
Strategic Partnerships	Collaboration with government agencies for policy support and market incentives, partnership with industry stakeholders for project implementation, and engagement with local communities for social impact assessments.

3.3.2 Example Stakeholder groups in Namibia in the agricultural sector

CATEGORY	INSTITUTION	DESCRIPTION AND RESPONSIBILITIES
Farmers and Agricultural Unions	Namibia National Farmers Union	<ul style="list-style-type: none"> » A development partner that enables policy and regulatory environment that supports circular construction objectives » Responsible to implement the National Urban Development Policy and the Physical and Land Use Planning Act, as well as providing incentives for private sector investments in housing and infrastructure » Also responsible implementing the Habitat Country Programme Document 2023-2027
Agro-Processing Industries	Namibia Agronomic Board	<ul style="list-style-type: none"> » Is the national federation of regional farmer's unions, established in 1992 to serve as a mouthpiece for all Namibian communal and emerging commercial farmers. » Aiming to increase food production for household security, enhance marketing of farming products to increase household income, increase participation and recognition of woman in farming, contribute to environmental protection and sustainable utilization of natural resources.
Research Institutions and Agricultural Extension Services	University of Namibia; International University of Management; Namibia University of Science and Technology	<ul style="list-style-type: none"> » Promoting the agronomic industry and to facilitate the production, processing, storage and marketing of controlled products in Namibia. » Facilitating own border control, including issuing of permits, checks and control of cross border flow of agronomic and horticultural products
Government Agricultural Agencies	Department Of Agriculture Development– Ministry of Agriculture, Water and Land Reform	<ul style="list-style-type: none"> » Main roles are research and community engagements in agriculture production and the management of natural resources. » Contributing to the development of Namibia's agricultural sector, providing a workforce that is trained to address the challenges of food security, sustainable farming, and agricultural innovation

CATEGORY	INSTITUTION	DESCRIPTION AND RESPONSIBILITIES
Cooperatives	Agra Namibia	<ul style="list-style-type: none"> » Is an agriculture cooperative which focus on crop and vegetable production and marketing. » Distributing products to the retail sector of Namibia.
Community Housing	Namibia Housing Action Group	<ul style="list-style-type: none"> » It is a Namibian Service Organisation that aims to support and add value to the activities and processes of the Shack Dwellers Federation of Namibia in achieving their mission. » Striving to facilitate change in the livelihoods of urban and rural poor through pioneering pro-poor development approaches. Community mobilisation, project management and delivery, lobbying and advocacy, financial resilience and asset building, and data and mapping are the core activities. » Can promote the use of recycled agricultural waste materials in residential construction.
Investors		<ul style="list-style-type: none"> » Providing financial support and investment capital for waste management infrastructure, recycling facilities, and circular economy initiatives in the agricultural sector.

3.4 Stakeholder Mapping in Kenya

The following table gives an example about the stakeholder mapping for the introduction of circular construction principles by using waste materials in the construction sector in Kenya. In this case no differentiation between the three waste streams (MSW, CDW, AW) has been done.

CATEGORY	INSTITUTION	DESCRIPTION AND RESPONSIBILITIES
National government	Ministry of Land, Public Works, Housing and Urban Development » State Department for Housing and Urban Development » State Department of Public Works	» A development partner that enables policy and regulatory environment that supports circular construction objectives » Responsible to implement the National Urban Development Policy and the Physical and Land Use Planning Act, as well as providing incentives for private sector investments in housing and infrastructure » Also responsible implementing the Habitat Country Programme Document 2023-2027
	Ministry of Environment, Climate Change and Forestry	» Its main roles are to enhance environmental, climate change and forestry governance, sustainably managed and resilient environment and forest ecosystems, » Also responsible to mitigate climate change impacts, expand agroforestry and commercial forestry, and ensure adequate and sustainable resources.
	Ministry of Transport and Infrastructure	» Responsible for policy initiatives and actions concerning roads, aviation, maritime, rail, housing, and urban development.
	Ministry of Youth and Gender Affairs	» Representing the needs and perspectives of youth and women, ensuring the participation of the youth and women.
	National Environment Management Authority	» Taking the lead in promoting sustainable waste management. » As the concept of a circular economy gains traction, the National Environment Management Authority's holistic approach aims to transform waste management methods and foster a more sustainable, resource-efficient, and economically viable future.

CATEGORY	INSTITUTION	DESCRIPTION AND RESPONSIBILITIES
	National Construction Authority	<ul style="list-style-type: none"> » Mandated to oversee the construction industry in Kenya and coordinate its development » It is the implementing body for Construction Waste Strategy. » Responsible for ensuring catalytic effect in construction projects through building synergies with other partners.
	National Treasury and Economic Planning	<ul style="list-style-type: none"> » The development partner responsible for investment for financing circular construction activities
	National Housing Corporation	<ul style="list-style-type: none"> » An institution providing expertise in housing development sector and implementing the government's housing policies and programs » Incorporating green construction mechanism in general.
Local Government - Implementation Partner	County Governments	<ul style="list-style-type: none"> » Mandated and responsible to provide land and Infrastructure for projects and enable approval of Special conditions for waste management
Government Authority - Coordination partner	Ministry of Interior and National Administration	<ul style="list-style-type: none"> » Is responsible to support in ensuring the safety and security of communities involved in the project. » Coordinating the various government agencies involved in the circular construction to align with national development goals.
	Kenya Mission to UN-Habitat - Ministry of Foreign Affairs	<ul style="list-style-type: none"> » Responsible on coordination of Government ministries, departments and agencies.
	Council of Governors	<ul style="list-style-type: none"> » Coordinating body among county governments. » Providing mechanism for consultation amongst county governments, information sharing on performance of the counties in execution of their functions, facilitating capacity building for Governors.
Regulatory institution	Kenya Bureau of Standards	<ul style="list-style-type: none"> » A regulatory institution providing standardization, metrology and conformity assessment services. » It is also responsible to promote standardization in commerce and industry. » Providing testing and calibration facilities.

CATEGORY	INSTITUTION	DESCRIPTION AND RESPONSIBILITIES
Informal Waste and Recovery Sector		<ul style="list-style-type: none"> » Collecting, sorting, and recycling valuable materials from MSW, CDW and AW.
Private Sector for waste management	Collection companies	<ul style="list-style-type: none"> » Providing MSW collection services to private business and individual households » Transporting and disposing waste at designated landfill sites or treatment facilities approved by local authorities
	Recycling companies	<ul style="list-style-type: none"> » Implementing recycling activities and promoting circular economy
Professional and experts' Association and Institution	Architectural Association of Kenya	<ul style="list-style-type: none"> » Association for professionals in the built and natural environment in Kenya incorporating Architects, Quantity Surveyors, Town Planners, Engineers, Landscape Architects and Environmental Design Consultants and Construction Project Managers and other experts in planning and environmental matters. » Coordinating activities among professionals in the built and natural environment, promoting integrity, advance standards in education and training, and establish Continuing Professional Development programs while encouraging collaboration among members. » Creating public awareness of member services, providing professional opinions on statutory violations, liaising with government and regulatory agencies on registration and licensing matters, and protecting the heritage of the built and natural environment through research, information dissemination, and revenue-generating
	Institution of Engineers of Kenya	<ul style="list-style-type: none"> » An institution for engineering professionals in the built and natural environment in Kenya » Promoting the development and application of engineering standards and advocating for best practices » Advocating for policies that support the engineering profession and addressing issues affecting the built environment and infrastructure development.

CATEGORY	INSTITUTION	DESCRIPTION AND RESPONSIBILITIES
	Kenya Institute of Planners	<ul style="list-style-type: none"> » Its main responsibility is to register Urban and Regional, Economic Development, transportation and Infrastructure, Environmental, Social and Community Planners and Urban Designers in Kenya » Is a partner in the development of county and other spatial plans and urban development plans
Construction and Contractors Companies	Private or semi-private (state-owned) companies	<ul style="list-style-type: none"> » An implementing body. » Its members include multi-national building and civil contractors (smaller contractors and SMEs), the retailers of building materials, manufacturers and suppliers of construction materials and equipment. » Representing specialist trades such as electricians, joiners, plumbers, painters, and steel workers, among others
Real Estate Companies	Private or semi-private (state-owned) companies	<ul style="list-style-type: none"> » Are representative body and official voice of the commercial and industrial real estate sector. » Beside profit oriented companies, they aim to build community and collaboration among property players
Civil Societies and Non-Governmental Organisations (NGO)	Kenya Alliance of Residents Associations	<ul style="list-style-type: none"> » An alliance to support in the formulation of legal frameworks and instruments » Mobilizing community voices
	Mazingira Institute	<ul style="list-style-type: none"> » Providing technical expertise in sustainable environmental practices and green technologies. » Developing sustainable practices in communities involved in the project.
	Civil Society Urban Development Platform	<ul style="list-style-type: none"> » Mobilizing resources for the community in project development and community participation. » Ensuring that community needs and perspectives are taken into account in project activities. » Implementing projects on the sustainable sector.

CATEGORY	INSTITUTION	DESCRIPTION AND RESPONSIBILITIES
	Slum Dwellers International (Muungano wa Wanavijiji)	<ul style="list-style-type: none"> » Empowering slum dwellers and urban poor communities, fostering climate action and creating more resilient, and climate-friendly inclusive cities. » Deploying capital in ways that make a positive contribution to sustainable development, using the Sustainable Development Goals as a basis for measurement.
	Niko Green/Trimax Architects	<ul style="list-style-type: none"> » Technical expertise in sustainable environmental practices and green technologies. » Helping measure, compensate for, certify and communicate the environmental, social, governance and carbon footprints of organizations, products and services
Research and academic institutions	University of Nairobi School of Built Environment	<ul style="list-style-type: none"> » Providing sustainable and innovative construction waste management solutions. » Provide technical expertise in housing design and construction.
	Jomo Kenyatta University of Agriculture and Technology	<ul style="list-style-type: none"> » Provide technical expertise in housing design and construction.
	Technical and Vocational Educational Training Institutes	<ul style="list-style-type: none"> » Contributing to creating quality jobs directly or indirectly to young people. » Provide training and capacity building to community-based organizations and other stakeholders involved, especially on the construction and housing sectors.
International organization	United Nations Human Settlements Programme	<ul style="list-style-type: none"> » Promoting socially and environmentally sustainable towns and cities. » Focal agency for all urbanization and human settlement matters within the United Nations system.
	United Nations Environment Programme	<ul style="list-style-type: none"> » Is an advisory and technical expertise in sustainable environmental practices and green technologies. » Contributing to find solutions to the triple planetary crisis of climate change, nature and biodiversity loss, and pollution and waste

CATEGORY	INSTITUTION	DESCRIPTION AND RESPONSIBILITIES
	United Nations Development Programme	<ul style="list-style-type: none"> » Is an advisory and technical expertise agency. » Supporting countries as they move towards low-carbon development pathways
	United Nations Office for Project Services	<ul style="list-style-type: none"> » Is an advisory and technical expertise agency. » Providing specialized services and translates environmental policies into actions.
Development Partner (International Organization), Financier	TearFund	<ul style="list-style-type: none"> » Is a development partner that supports communities to become resilient to shocks and stresses and work towards a better future for themselves and others.
	German Agency for International Cooperation	<ul style="list-style-type: none"> » Is a development partner that provides tailor-made, cost-efficient and effective services for sustainable development and investment for financing » Providing tailor-made, cost-efficient and effective services for sustainable development and investment for financing
	Federal Ministry for Economic Cooperation and Development (Germany)	<ul style="list-style-type: none"> » Building partnerships with other stakeholders and advocate for policy reforms and objectives of circular construction » Contributing to the eradication of poverty and hunger and promote healthy people in a healthy environment » Donor institution.
Private sector for investment	Financial institutions: Banks and Micro Finance Institutions	<ul style="list-style-type: none"> » Financing products for the development of waste management projects
	Kenya Private Sector Alliance	<ul style="list-style-type: none"> » A private sector institution that mobilises private sector investment and involvement in circular construction projects. » Advocating for projects alignment with national economic goals and priorities.
	Kenya Private Developers Association	<ul style="list-style-type: none"> » Providing expertise in the private housing development and management sector. » Developing partnership with private developers to implement the construction waste management strategy.

3.5 The role of the informal waste and recovery sector

In SSA countries, similar to other developing nations, the informal waste sector plays a crucial role in managing waste. The absence or limited existence of formal recycling systems creates numerous opportunities for informal workers throughout the waste management process, from collection and sorting to the sale of recovered materials.

The recovery and reuse of building materials such as bricks, metal, wood, and glass are particularly important in many SSA countries. These materials provide affordable construction options, especially for rapidly growing informal settlements. Informal waste workers actively collect and sell these materials, generating income and supporting livelihoods within the waste sector ^{3 8}.

To contribute to the UN SDG and foster a fair transition for the informal waste sector, it is essential to involve informal waste pickers. Promoting circular economy practices, particularly for transforming waste into building materials, can formalize informal businesses. This transition is especially important for vulnerable populations, such as women, children, and minorities, as it can significantly improve their living conditions ⁹. Enhancing collaboration between formal and informal waste management sectors can unlock significant potential for circularity and sustainable waste management. Formalization of informal waste workers, capacity building, and inclusion in waste management policies can foster greater efficiency and inclusivity in waste management practices.

An interesting opportunity is offered by investments in technological innovation tailored to the needs of the informal sector, which can improve waste collection, sorting, and recycling processes. Mobile apps for waste collection scheduling, low-cost sorting equipment, and decentralized recycling facilities can empower informal waste workers and enhance overall efficiency of their waste management practices ¹⁰.

To introduce a circular economy in the built environment in SSA countries, stakeholders of the building ecosystem have to be involved and cooperate closely. Such industry collaboration requires adaptations along the complete value chain, starting from the design of buildings to the construction, operation, renewal and repurposing of buildings ¹¹. The informal sector, due to its large presence in SSA, is an important stakeholder group, which has to be involved in order to support a transition towards circularity in the construction sector ³.

4.

General Barriers and Enablers of circularity in the construction sector

Moving from a linear, extractive, produce-use-discard model to a more circular approach will involve a paradigm shift and significant changes to existing business models. This chapter highlights the main barriers, and why the implementation of circular economic concepts in the construction sector is frequently hampered. In addition, this chapter also discusses enabling factors supporting the development of circularity

in the construction sector. Building on the barriers and enablers discussed in Chapter 3, specific actions are presented, categorized into regulatory aspects, capacity-building initiatives, and pilot projects or demonstrations. These examples show how in SSA circular economy concepts could be introduced in the construction sector to replace unsustainable building materials.

4.1 General barriers inhibiting circular economy in the construction sector

The following subchapters summarise the main barriers identified to prevent the development of a construction sector based on circularity.

4.1.1 Limited Institutions Enabling Circularity

As of other emerging markets, the development of a new sector necessitates the presence of supportive institutions to nurture its growth. These institutions, ranging from industry associations and research bodies to regulatory authorities, play pivotal roles in providing guidance and fostering enabling environment and innovation. In SSA, however, such

institutions dedicated to promoting circularity in the construction sector are either non-existent or in nascent stages, presenting a formidable barrier to progress.

The absence of established industry associations limits advocacy efforts and hinders the establishment of industry standards that incentivize the use of waste materials. Similarly, the lack of robust research institutions impedes the development of context-specific solutions and best practices. Without regulatory bodies to enforce standards and provide a legal framework, the adoption of circular practices remains fragmented and uncertain. Furthermore, it is essential to establish industry associations research institutions and regulatory bodies to build trust and

confidence among stakeholders, including investors and entrepreneurs. By creating a supportive ecosystem, these institutions can attract investment and drive innovation in circular construction practices. Thus, investing in the development of such institutions is paramount to overcoming the barriers hindering the widespread adoption of circular practices in the region. Clearly defined responsibilities between individual authority bodies and strong institutions is a key pre-condition in order to ensure that regulations are implemented.

4.1.2 Weak policy framework or inconsistency of policies

The use of waste as building materials is often not yet considered in existing policy frameworks for the building sector in SSA and globally. Its utilization is often confined to a legally grey zone, discouraging its adoption by project developers and construction companies. This ambiguity stems from policy frameworks that were not designed to accommodate waste resources as construction materials, exacerbating the reluctance to incorporate recycled materials into building projects.

In SSA, existing policies related to environmental regulations, construction standards, and waste management often lack coherence and consistency. This inconsistency arises from a historical focus on conventional building materials and practices, overlooking the potential of waste resources in construction. The fragmented policy landscape creates barriers to the widespread adoption of circular construction methods, hindering the transition to more sustainable building practices.

Furthermore, the informal nature of construction activity in SSA complicates regulatory enforcement and compliance. Informal construction practices make it challenging to monitor and regulate the use of waste materials. As a result, efforts to streamline and update policy frameworks must consider the

informal sector's role in construction and tailor regulations to accommodate informal practices while promoting sustainability and safety standards.

Addressing the policy inconsistencies requires a holistic approach that considers the unique socio-economic and environmental context of SSA. Policymakers must engage with local stakeholders, including informal builders, community leaders, and environmental experts, to develop context-specific policy interventions. These interventions should prioritize environmental sustainability, resource efficiency, social inclusivity, and inclusion of traditional building techniques, aligning with the region's development priorities and challenges and global goals and frameworks.

Moreover, capacity-building initiatives are essential to enhance local stakeholders' understanding of circular construction practices and their benefits. Technical assistance programs can provide training and support to small-scale builders and contractors, equipping them with the knowledge and skills necessary to implement innovative construction techniques using recycled materials.

By addressing policy inconsistencies and adapting regulatory frameworks to the SSA context, policymakers can create an

enabling environment for the adoption of circular construction practices. This shift towards sustainability not only mitigates environmental impact but

also fosters economic growth, social development, and resilience in the region.

4.1.3 **Unmature business models for the private sector**

The current business models for building materials are well established and designed for the use of new materials instead of considering the use of recycled materials. For the private sector, insufficient attractive business models exist, which could allow for an increased use of recycled materials. The prevailing absence of viable business models serves as a significant barrier to the development of circular concepts for the use of waste as building materials in the SSA. In many cases, the informal sector plays a crucial role in waste management, yet their integration into formal business models remains limited. Therefore, addressing this challenge requires a multifaceted approach that considers the unique characteristics of the SSA context ¹.

Often, business models become financially feasible when specific practices are mandated or when alternative solutions are rendered less appealing. For instance, the prohibition and imposition of fines for fly-tipping of construction waste, coupled with the accurate reflection of landfill costs, make it more advantageous for stakeholders handling CDW to ensure the segregation and recycling of recyclable fractions within the CDW.

4.1.4 **Limited awareness by stakeholders**

Stakeholders in the construction sector are often not aware of the opportunities of introducing circular economy concepts into the building sector. The building sector is generally considered a conservative industrial sector and shifts in perspectives and mindsets take time. Awareness-building activities and capacity-building efforts are required to position recycled building materials as

a viable alternative to reduce the use of unsustainable virgin building materials. Inadequate communication channels and limited dissemination of information contribute to the lack of awareness among stakeholders in the construction sector. As a result, there is a persistent reliance on traditional linear models of construction, which perpetuates resource depletion and environmental degradation.

4.1.5 **Limited Know-how and Technology**

In addition to the lack of awareness among stakeholders, a significant barrier to the adoption of recycled building materials is the absence of sufficient know-how and technology for processing waste into usable construction materials. Many

stakeholders in the construction sector lack the expertise and technical knowledge required to implement processes for recycling and incorporating waste materials into construction projects effectively. This knowledge gap extends to understanding

the appropriate technologies for processing and refining recycled materials to meet quality and safety standards ⁶.

Without adequate technology and expertise, the quality and consistency of recycled materials may be compromised, undermining confidence in their suitability for construction purposes. This limitation hampers the widespread adoption of recycled materials in construction projects and perpetuates reliance on traditional building materials.

Addressing this barrier requires targeted efforts to enhance technological capabilities and build expertise within the construction industry. Investing in research and development initiatives focused on innovative recycling technologies and sustainable construction practices is essential. Furthermore, supporting demonstration projects and pilot initiatives that showcase

the feasibility and effectiveness of using recycled materials in construction can serve as valuable learning experiences for industry professionals. By leveraging technology and expertise to optimize the recycling process and improve the quality of recycled materials, stakeholders can overcome this barrier and unlock the full potential of circular construction practices. To reach this goal the public sector has a crucial role in facilitating such showcase projects.

Moreover, it is important to note that in the context of implementing circularity in the construction sector in SSA, the existence of know-how related to traditional building techniques using secondary can be highly beneficial. This expertise often embodies valuable circularity principles that should be built upon and adapted into solution-oriented, locally relevant technologies.

4.1.6 Overcoming Cultural Resistance to Circular Construction Practices

The use of recycled building materials can also face cultural barriers. For example, recycled materials could be seen as inferior compared to new building materials, which impacts negatively new buildings as a status symbol. Such barriers can be deeply rooted in societies and overcoming them can be a challenging process. The symbolism associated with new buildings as a representation of wealth, progress, and social status further perpetuates the preference for conventional building materials. The desire to showcase modernity and affluence using newly manufactured materials reinforces existing cultural biases against recycled alternatives.

This is also one of the reasons why SSA's traditionally low-carbon building techniques have been phased out and replaced by Western modern construction modalities, affecting the environment but also impacts local economies and communities. By sidelining traditional practices, the region risks losing valuable cultural heritage and the potential for sustainable development that is

attuned to local conditions and resources.

To reverse this trend, there must be a renewed focus on integrating traditional building techniques with modern practices, creating a hybrid approach that values sustainability, local expertise, and cultural heritage. By doing so, SSA can develop a more resilient and environmentally responsible construction sector that meets the needs of its communities while addressing the pressing challenges of climate change.

Addressing these cultural barriers requires a multifaceted approach that involves not only promoting the technical and environmental benefits of recycled materials but also challenging prevailing attitudes and perceptions. Awareness-raising campaigns, educational initiatives, and community engagement programs can play a crucial role in shifting societal norms and fostering greater acceptance of recycled building materials.

While these efforts are essential, it's also crucial to engage local communities and stakeholders in meaningful dialogue about the benefits of circular construction is equally important. Understanding the cultural significance attached to new buildings and status symbols can help tailor communication strategies to address specific concerns and misconceptions.

Furthermore, highlighting successful case studies and projects that have effectively incorporated recycled materials can serve as powerful examples to inspire confidence and dispel doubts. By showcasing the durability, aesthetic appeal, and sustainability of recycled building materials in real-world applications, it becomes easier to overcome cultural resistance and promote wider adoption.

Additionally, leveraging partnerships with influential community leaders, architects, and developers can help amplify messaging and garner broader support for circular construction practices. Involving key stakeholders early in the process and soliciting their input can help build a coalition of advocates who champion the use of recycled materials and drive positive change within their communities. Engaging influential stakeholders in advocacy efforts is also crucial; their support can help reshape cultural perceptions, normalize the use of recycled materials, and catalyze broader acceptance (again) of circular construction practices within society.

4.1.7 Weak stakeholders' networks for circularity

Functioning circularity requires well-established stakeholder networks between all actors along the supply chain to ensure that recycled building materials find their way from waste generators to the final users. Important stakeholders are, for example, waste generators,

recycling companies, planning and building authorities, project developers, architects and construction companies. Such networks for recycled building materials many times do not exist, and their formation requires time and experience to guarantee frictionless functioning.

4.1.8 High cost, low returns and limited access to capital

Implementing projects that recycle waste into building materials often requires significant upfront investments. Due to the competitive environment in the construction material sector, companies investing in such projects typically encounter low profit margins. This constellation makes it difficult for investors to access capital at acceptable costs and constitutes a significant barrier to the use of recycling materials for buildings. Traditional financing institutions often perceive circular construction projects as risky ventures, particularly in regions where regulatory frameworks are still evolving, and market demand for recycled materials is uncertain ⁸.

The long-term economic viability of circular construction projects may be undermined by the prevailing market dynamics, where the cost of conventional building materials remains comparatively low. This disparity in pricing creates a disincentive for developers and contractors to prioritize the use of recycled materials, as the financial benefits may not outweigh the perceived risks and uncertainties.

4.1.9 Administrative burdens limiting the use of secondary construction materials

Certification of secondary construction materials can be a challenge, often due to administrative burdens and complex regulatory requirements. The lack of standardized certification processes and the absence of clear guidelines contribute to uncertainty and inefficiency in the use of recycled materials. Additionally, bureaucratic hurdles, such as lengthy approval procedures and cumbersome documentation requirements, further impede the adoption of secondary construction materials. Moreover, the cost associated with obtaining certifications and complying with regulatory obligations can be prohibitive for smaller enterprises and informal sector actors. This disproportionately affects local entrepreneurs and small-scale operators, limiting their ability to participate in circular construction initiatives. Streamlining administrative procedures,

simplifying certification processes, and providing technical assistance to navigate regulatory requirements are essential steps to alleviate these barriers.

Harmonizing certification standards and promoting mutual recognition agreements across SSA countries can facilitate cross-border trade in recycled materials and promote regional cooperation. By reducing administrative burdens and promoting regulatory coherence, stakeholders can unlock the full potential of secondary construction materials, driving economic growth, and fostering sustainable development across the region. However, cross-border trade will only be feasible for lightweight construction materials, whereas mineral recyclables, due to their weight and associated logistics costs, must be processed and utilized locally.

4.1.10 Challenges of informal workforce dependency in promoting Circular Economy in Africa

The construction sector in many African countries often engages a workforce that operates informally and may face challenges related to formal education and commercial skills. While small informal and formal contractors dominate the market, they struggle to access large-scale formal projects without working as subcontractors for larger companies. The formal sector

depends on the cheap labour provided by the informal sector, creating a symbiotic relationship. To promote sustainable development in the African construction sector, it is crucial to consider the local context, including the reliance on the informal economy, and tailor practices accordingly ¹.

4.1.11 Overcoming Material Scarcity: a Barrier to Circular Construction in Developing Nations

Globally, the prevalent lack of reusable material stock in existing buildings poses a significant obstacle to implementing circular economy concepts within the construction sector. This is also relevant to

SSA region. When buildings are demolished, the resulting waste often lacks high-quality components suitable for recycling, especially where the separation of different material fractions is neglected. Unlike

their counterparts in developed countries, where surplus material stock facilitates reuse, developing nations frequently confront scarcity in materials crucial for circular initiatives. In informal settlements, where material availability is particularly limited, the challenge of sourcing materials for recycling is even more pronounced. This insufficiency severely impedes the transition towards circular construction practices, as there are inadequate resources available for re-purposing or recycling. Consequently, the absence of a robust material stock undermines efforts to adopt circular economy principles in construction within developing nations. Addressing this fundamental challenge necessitates innovative strategies to enhance material availability and promote sustainable resource management practices tailored to the unique contexts of these economies ⁸.

It is important to recognize that construction standards and the types of materials used evolve over time. Materials that were commonly utilized a few decades ago are often no longer in use today, even if they were segregated during the demolition process and meet material specifications. Consequently, there is a frequent need to repurpose materials for alternative uses. The disparity between construction and demolition activities, particularly during periods of high construction activities, such as in SSA can exacerbate this issue. As a result, a minimal portion of the required building materials are sourced from secondary materials derived from circular construction practices, despite a significant proportion of demolition waste being recycled.

4.2 General enablers to promote circularity in the construction sector

The success of transitioning to a circular economy in the construction sector relies heavily on the presence of enabling factors that facilitate the adoption and implementation of circular principles. These general enablers serve as foundational pillars upon which sustainable practices can

thrive and contribute to the transformation of the construction industry. In the following subchapters, we explore key factors that play a vital role in promoting the introduction of circular economy concepts, addressing barriers, and fostering innovation within the construction sector.

4.2.1 Locally adapted business models

Circularity in developing countries often fails due to the absence of locally adapted business models. The design of functioning business models tailored for a specific local context is crucial for fostering the growth of an industry sector based on and dedicated to circularity in the construction sector. By creating business frameworks that consider local resources, market conditions, social and economic realities, the sector can

evolve into a purpose-driven industry that successfully implements circular practices.

This requires a paradigm shift from existing business models, which are based on a linear oriented construction sector, to depose resources at the end of life. Currently, linear business models are primarily designed to maximize the material throughput. It is completely opposed to circularity-orientated

business models, which aim to limit the resource throughput, whenever possible. For such circular business models, the conversion from waste to usable building materials, the trade of recycled building materials as well as other connected services offer a multitude of business opportunities, if frame-conditions for the profitability of such business models exist.

How such small changes in the frame conditions allow the creation of a profitable business model, is shown by the example of the municipality of Berkeley in California. Berkeley municipality pays to the company, Urban Ore, for each tonne of recovered building material from waste, before it is

landfilled, the same amount as the landfill tipping fee would be. These practices allow a profitable business model for a private company without any additional cost burden for the municipality¹². In cities in SSA, similar solutions with existing gate fees for waste management could be designed to allow the diversion of waste towards its recovery as a building material. It could be a legally possible solution for fly-tipping if the CDW is considered as waste. In addition, the business model mentioned above, may be feasible with preconditions, such as law enforcement and compliance.

4.2.2 Technological enablers facilitating the use of waste as building material

The use of waste materials in the building sector and a circular economy in general also depends on the availability of data, data management as well as suitable technologies, allowing to process waste streams to building materials. Technological advances are improving considerably the implementation of circularity in the construction sector. Interesting technologies such as sensor technology, blockchain, digital tools for data gathering and management as well as artificial intelligence, are helping to connect suitable waste streams with potential users in the construction industry. These tools enable more efficient tracking, sorting, and repurposing of materials, paving the way for smarter and more sustainable construction practices. For example, the

development of sharing platforms can connect owners of buildings, which will be demolished, with construction companies and other actors in the construction value chain, in order to maximize the reuse of construction and demolition waste.

The use of digital product passports (DPPs) in the building sector for example, is a way to have all relevant information always available, like quantity, characteristics, toxicity, etc., and the used building materials in new and existing buildings. Buildings can be seen as material banks, that allow for optimised planning for refurbishment of buildings, and recovery reuse and recycling of building materials.

4.2.3 Technological enablers facilitating the use of waste as building material

The transition to a circular-orientated construction sector requires the involvement of stakeholders from all stages of the value chain in the construction sector as well as the involvement of local and national authorities and international supportive partners. Tools and measures to allow collaboration between relevant stakeholders

are recommended in order to improve communication, capacity-building, enable knowledge transfer and increase data availability across the complete value chain.

To achieve this, the international community plays a crucial role in leveraging good practices from around

the world and facilitating knowledge and technology transfer. Partnerships with international research institutions and multilateral organizations can support the

sharing of expertise and mobilization of resources, contributing to the successful implementation of a construction sector oriented towards circularity.

4.2.4 Taxes, levies and charges

Tax tools and other financial instruments are highly effective in driving the transition from a linear to a circular construction sector. Local and national governments can use mechanisms such as reduced value-added taxes on renovation projects, tax exemptions or reliefs for the use of recycled building materials, and levies on

less sustainable materials. Additionally, imposing taxes (gate fees) on landfilling materials that could otherwise be recycled offers a powerful incentive. These measures make circular construction practices more affordable and help accelerate the shift towards sustainability in the sector.

4.2.5 Macro-economics and commodity price volatility of building materials

Macroeconomic instability and price volatilities in international commodity markets for building materials can be strong enablers for the use of waste materials in construction. Supply chain interruptions, such as those experienced during the COVID-19 pandemic, as well as conflicts or geopolitical uncertainties, can significantly impact prices and the reliability of building material supplies. Utilizing locally available recycled materials offers a valuable way to mitigate these volatilities and promote broader use. Increasing the use of locally produced materials not only reduces dependency on global supply chains but also strengthens a country's ability to meet its own demand. Nevertheless, as already mentioned, in SSA, due to the high construction activities and rising demand

in the coming decades, there is a mismatch between the supply of potentially recoverable materials from waste streams and the anticipated demand. Recycled materials are likely to cover only a small portion of the future building material needs in the region.

Similar to the previously mentioned supply volatilities, fluctuations in prices on international commodity markets—such as for cement, steel, wood, and glass—have a significant impact on the competitiveness and attractiveness of recycled building materials. When global commodity prices rise, the relative competitiveness of locally produced recycled materials improves, making them a more appealing and cost-effective alternative in reducing construction expenses.

4.2.6 External support and assistance from international cooperation

Knowledge transfer through external support and international cooperation is a key enabler for introducing recycled building materials in new markets. Learning from other countries' experiences and leveraging knowledge from established institutions such as universities, industry associations,

or private sector players can accelerate the adoption of recycled materials in SSA. While these international lessons must be adapted to fit local contexts, they can significantly speed up the process of introducing recycled building materials and foster the growth of circular construction practices.

4.2.7 Cost savings and avoided costs

Recycled building materials can significantly reduce construction costs by serving as substitutes for expensive materials like concrete or steel. Additionally, savings can arise from avoiding expenses such as landfill fees, which vary depending on local waste regulations. These savings are influenced by two factors: how waste is defined and whether landfill gate fees are applied and high enough to make recycling financially beneficial. The specific cost savings depend on the material being replaced, processing costs, and potential landfill fees, making cost reductions context specific. To evaluate the economic viability of recycled building materials, a Life Cycle Cost Analysis (LCCA) is an effective approach. LCCA examines not only initial costs but also long-term maintenance, operation, and disposal expenses, providing a full picture of cost-effectiveness. It is also essential to consider economic externalities, such as environmental benefits (e.g., reduced carbon emissions, conservation of resources, etc.) and social impacts like job creation in the recycling industry, which can further support the case for using recycled materials in construction.

Another key driver for cost savings is the balance of market supply and demand. Market dynamics, including the availability of and demand for recycled materials, greatly influence cost efficiency. Efforts to stimulate demand, such as government incentives, public procurement policies favouring recycled materials, and consumer awareness campaigns, can help reduce prices. These measures promote the competitiveness of recycled materials compared to virgin materials, increasing the long-term cost-saving potential as demand grows and the market becomes more established.

Finally, the incentivized innovation and increased efficiency triggered by the increased use of waste streams as a building material is an important factor. Continued innovation in recycling technologies and processes can lead to cost reductions and improved efficiency in the production of recycled building materials. Investments in research and development, scaling up of recycling facilities, and adoption of good practices can lower production costs and enhance the affordability of recycled materials.

4.2.8 Harnessing the potential of waste pickers to drive Circular Construction in Sub-Saharan Africa

Integrating informal waste pickers into the transition from a linear construction sector to a circular construction system can be a vital step in promoting the use of recycled waste streams as building materials in SSA. By involving waste pickers in the collection and sorting of materials, which can be used to produce alternative construction materials, such as wood, glass, and metal, communities can increase the availability of these resources for

construction purposes. Supporting waste pickers with training, resources, and formal recognition can enhance their efficiency and effectiveness in diverting valuable materials from landfills. This collaborative approach not only addresses waste management challenges but also creates economic opportunities for waste pickers and contributes to the development of a more circular and just economy in the region.

4.2.9 Reintroducing Circular Practices through Agricultural Waste and Integrating Vocational Training in Sub-Saharan Africa

Promoting circularity in the construction sector of SSA requires not only the adoption of modern technologies but also a return to more sustainable, locally adapted practices. A key component of this shift is the use of agricultural waste as a building material. With agriculture being a major economic activity in SSA, a significant amount of organic waste is generated each year, including rice husks, maize stalks, and sugarcane bagasse. These materials hold immense potential as construction inputs and can significantly reduce the environmental footprint of the building sector.

Traditional knowledge in rural communities already includes practices of utilizing agricultural by-products for construction, such as using straw or plant fibres in adobe or cob structures. These methods align perfectly with circular economy principles, as they rely on locally sourced, renewable, and biodegradable materials. However, modern construction practices have largely moved away from these techniques, often in favour of imported materials that are less sustainable.

Reintroducing these agricultural waste-based materials into mainstream construction practices could help address several challenges simultaneously. For one, it would reduce reliance on expensive, non-renewable materials like cement and steel. Secondly, it would mitigate the environmental problem posed by agricultural waste disposal, which often involves open burning, contributing to air pollution and carbon emissions.

To successfully implement this, vocational training institutions in SSA must integrate knowledge of circular construction techniques, especially those using agricultural waste, into their curricula. Training the next generation of builders, architects, and engineers on how to process and utilize these materials effectively will ensure that circular construction practices are not just a niche approach but part of the mainstream industry.

Furthermore, vocational schools should collaborate with local businesses, research institutions, and international partners to develop new technologies and processes for turning agricultural waste into durable, high-quality building materials. Such initiatives could include the development of low-cost, waste-based building blocks or panels, which could serve as affordable alternatives to traditional concrete and brick in low-income housing projects.

Governments can support these efforts by offering subsidies or incentives to companies and educational institutions that promote the use of recycled agricultural materials in construction. In addition, certification programs that ensure the safety and durability of these materials could build trust and increase their adoption in the wider construction industry.

By focusing on the circular use of agricultural waste, SSA can not only reduce Environmental pressure but also enhance local economies through job creation and resource efficiency. This approach leverages the region's agricultural abundance to solve its construction challenges, all while promoting sustainability.

5.

Roadmap for integrating Circular Economy concepts into the construction sector in Sub-Saharan Africa

This chapter aims to offer actionable policy recommendations for promoting circularity in the construction sector across Sub-Saharan Africa. These recommendations provide a flexible “toolbox” that policymakers can adapt to the specific needs and conditions of their region or country. The measures proposed here are not one-size-fits-all solutions but rather a set of options that can be tailored to meet local challenges, development goals, and priorities.

The transition toward a circular economy in the construction sector involves not only the adoption of new technologies but also changes in regulatory frameworks, capacity building for key stakeholders, and the demonstration of innovative approaches. Policymakers are encouraged to integrate these measures into their broader strategies for sustainable development, urban planning, and environmental protection.

The proposed recommendations are divided into three key categories:

- **Regulatory Framework:** Establishing clear regulations that support the use of recycled and sustainable materials in construction, encourage waste management and reduction, and incentivize circular building practices.
- **Capacity Building:** Investing in education and training programs to build the technical skills needed to implement circular construction practices and ensuring that stakeholders understand the economic and environmental benefits.
- **Innovative Demonstrations:** Promoting pilot projects, case studies, and demonstration sites that showcase the potential of circular construction practices, especially through the use of local materials and waste streams.

5.1 Regulatory framework: Advancing circular practices in Sub-Saharan African construction sector

The governance of circular economy enforced by a suitable and tailor-made regulatory framework is a key facilitator to introducing circular economy concepts in the construction sector in SSA. The regulation provides the legal certainty that private actors need to innovate and adapt their business models towards

circularity¹⁶. Such a regulatory framework should comply with a couple of general characteristics to be effective and consistent.

These overarching features of a successful regulation to introduce circularity in governance structures are¹³:

- Clear definition of roles and responsibilities in the government structure. Who does what.
- Development of a circular economy structure with clear goals and a strategic vision.
- Implementation of regulatory instruments based on multi-level governance to strengthen coordination across different levels of national and regional governments.
- Strengthening of policy coherence across different policy spheres, like waste management, climate mitigation and economic development.
- Facilitation of collaboration between the complete stakeholder spectrum, like public sector, private and informal sectors, investors, non-profit organizations, etc.
- Strengthening of territorial linkages between urban and rural areas

5.1.1 Public procurement regulation demanding recycled building materials

Public procurement regulations mandating the use of recycled building materials offer a strategic avenue to foster sustainability in SSA's construction sector. By setting mandatory targets, specifying material requirements, and implementing certification procedures, governments can drive market demand for recycled products. Challenges include ensuring market availability, raising awareness, and enforcing compliance. Effective implementation requires robust policy frameworks, stakeholder engagement,

and enforcement mechanisms to realize the environmental, economic, and social benefits of using recycled materials in public projects. Such regulations play a crucial role in promoting resource efficiency, reducing waste, and advancing the transition towards a circular economy in the region¹.

5.1.2 Revisiting building codes and standards to favour circular design and building techniques

Revisiting building codes and standards promoting the use of recycled building materials is crucial for advancing sustainability in SSA's construction sector. By integrating requirements and incentives incorporating recycled and secondary materials into building design and construction techniques, governments can stimulate the adoption of circular practices. Challenges include updating codes to accommodate recycled materials

and traditional building techniques, ensuring quality and safety standards, and facilitating access to recycled resources. Effective revision of building codes requires collaboration among policymakers, industry stakeholders, and waste management authorities. Through updated standards that prioritize recycled materials, SSA can reduce resource depletion, minimize waste generation, and accelerate the transition towards a circular economy in construction.

5.1.3 Construction products certification

Strengthening building codes and enforcing construction product certification is essential for promoting quality, safety, and sustainability in the construction sector of SSA. Enhancing these codes and requiring certified materials encourage the use of standardized, high-quality products that meet both performance and environmental criteria. Key challenges include aligning local codes with international standards, establishing effective accreditation systems,

and ensuring compliance with certification requirements. Collaboration between regulatory bodies, industry associations, and certification agencies is necessary to develop clear guidelines. By prioritizing certified products, SSA can improve building quality, enhance resilience to environmental stresses, and build confidence in the construction industry, leading to safer and more sustainable built environments.

5.1.4 Controlling the use of unsafe and toxic substances in products

Control over the use of unsafe and toxic substances in construction products is imperative for ensuring the safety and sustainability of building materials in SSA. Implementing regulations that restrict or ban the use of harmful chemicals and materials helps protect human health, safeguard the environment, and mitigate the risk of exposure to hazardous substances during construction and occupancy. Challenges include identifying and assessing hazardous substances, establishing regulatory

frameworks, and enforcing compliance throughout the supply chain. Effective control measures require collaboration between regulatory agencies, industry stakeholders, and scientific experts to develop comprehensive standards and testing protocols. By prioritizing the use of non-toxic and eco-friendly alternatives, SSA can promote healthier living environments, reduce environmental pollution, and advance sustainable development in the construction sector.

5.1.5 **Fostering extended producer responsibility for products, components and materials used in construction applications and product-service systems**

Extended Producer Responsibility (EPR) schemes for construction materials incentivize manufacturers to design products that can be more easily recovered and reused after demolition. This might involve strategies like modular designs that make disassembly easier or the introduction of digital product passports that improve material traceability for reuse as secondary materials. By incorporating EPR principles, producers are encouraged to minimize waste, prioritize resource efficiency, and enhance the recyclability of construction materials.

Additionally, EPR fosters collaboration among manufacturers, designers, and recyclers to develop innovative approaches to sustainable design and end-of-life management. This collaborative model promotes circularity in the construction industry, encouraging eco-friendly practices and reducing the sector's environmental impact. EPR also increases transparency and accountability in the supply chain, empowering consumers and policymakers to make more informed choices regarding the environmental footprint of construction materials. Effective implementation of EPR initiatives in SSA could address challenges like waste management and resource scarcity while fostering sustainable development.

5.1.6 **Establishing national policy frameworks and regulations to manage and prevent the generation of construction and demolition waste**

Establishing comprehensive national policy frameworks and regulations is crucial for promoting the use of recycled materials in construction projects across SSA. These frameworks provide the necessary legal and institutional mechanisms to incentivize and regulate the integration of recycled materials into building processes. It would reduce reliance on virgin resources and mitigate environmental impacts.

National policies should prioritize the adoption of circular economy principles within the construction sector, emphasizing the importance of recycling and reusing materials to minimize waste generation. Regulations can mandate the incorporation of recycled content requirements in construction standards and building codes, encouraging builders and developers to prioritize the use of recycled materials in their projects.

Furthermore, policy frameworks should support the development of infrastructure and supply chains for recycled materials, ensuring their availability and accessibility to construction stakeholders. This may involve establishing certification processes, quality standards, and procurement guidelines to promote confidence in the use of recycled materials.

By establishing robust policy frameworks and regulations promoting the use of recycled materials in construction, SSA countries can foster a sustainable and circular construction sector, contributing to resource efficiency, environmental conservation, and economic development.

5.1.7 Developing regulations and certification processes, guidelines and criteria enabling the qualification of building materials with recycled and recovered content

Developing regulations and certification processes are essential to ensure the quality and reliability of building materials with recycled and recovered content in SSA. By establishing clear guidelines and criteria for the qualification of such materials, governments can promote their widespread adoption in construction projects, advancing the transition to a circular economy and reducing environmental impact.

Regulations should specify the minimum requirements for recycled content in building materials, as well as standards for their production, processing, and performance. Certification processes can verify compliance with these standards, assuring builders, developers, and consumers regarding the quality and sustainability of recycled materials.

Furthermore, guidelines and criteria should address issues such as material composition, durability, safety, and environmental impact, ensuring that recycled building materials meet or exceed the performance of virgin materials. This may involve conducting life cycle assessments and environmental impact studies to evaluate the overall sustainability of recycled materials throughout their lifecycle.

By developing comprehensive regulations and certification processes for building materials with recycled content, SSA countries can create a supportive regulatory environment for sustainable construction practices. The development will facilitate the widespread adoption of recycled materials, driving innovation, promoting resource efficiency, and contributing to the development of a circular economy in the construction sector.

5.1.8 Implementing Pre-Demolition Audits for Buildings of a Certain Size

Requiring pre-demolition audits before the demolition of buildings of a certain size is crucial for advancing sustainable resource management in the construction sector. These audits offer significant advantages by identifying opportunities to reclaim and reuse materials, thereby reducing waste and promoting resource efficiency.

Pre-demolition inventories provide building owners and designers with valuable information on reuse opportunities, allowing them to identify materials that can be salvaged and repurposed for future projects. This process encourages collaboration between building owners, demolition contractors, and other stakeholders, supporting the effective circulation of resources within the industry.

For demolition contractors, pre-demolition audits offer clear guidance on which building elements should be carefully dismantled to maximize material recovery. This proactive approach not only minimizes environmental impacts but also enhances the recovery of valuable materials for reuse.

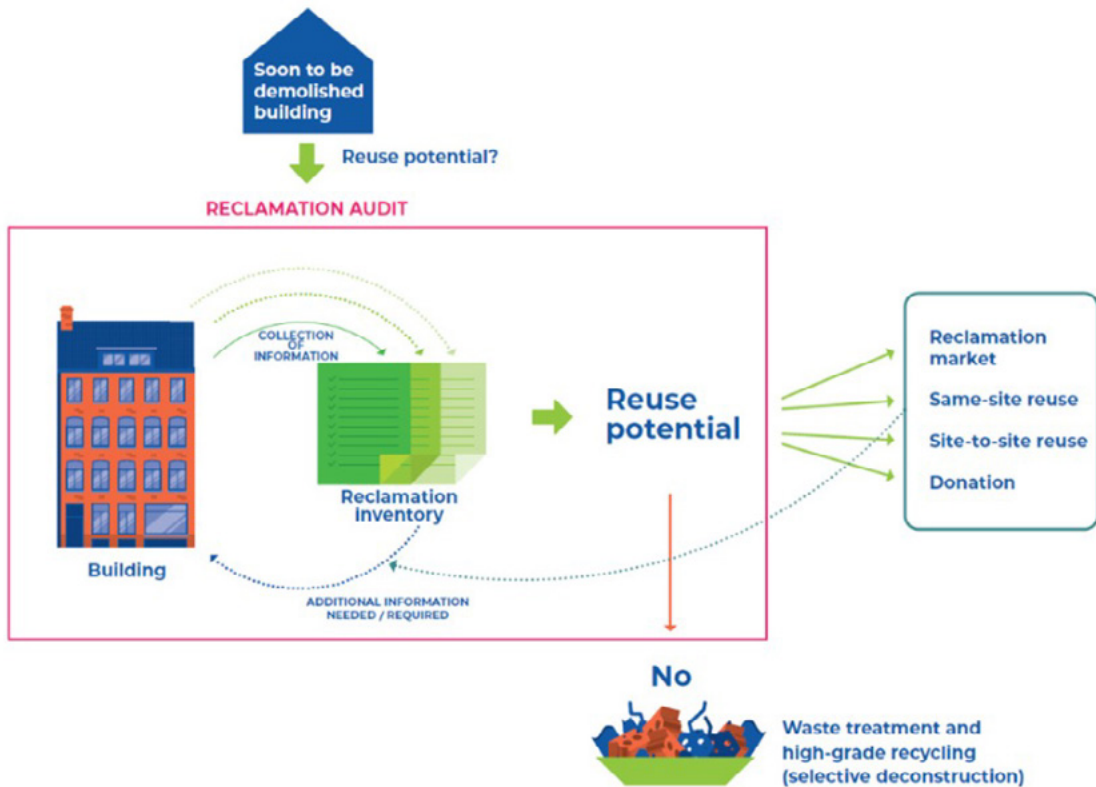
Moreover, pre-demolition audits serve as essential decision-making tools, helping to identify reclamation strategies and determine the best destinations for recovered materials, whether for recycling, repurposing, or reuse. By integrating these audits into demolition workflows, stakeholders can reduce waste generation, increase material reuse, and align with sustainability goals.

Overall, pre-demolition audits allow for the identification of recyclable, reusable,

or repurposable waste streams, ensuring that fewer materials are sent to landfills. Implementing this practice across SSA countries could significantly enhance sustainability, reduce environmental footprints, and contribute to more responsible construction practices.

The following Figure 3 shows a decision-making tool for discussing effective reclamation strategies and determining the final destination of recovered products shows ¹⁴.

FIGURE 3 Decision-making tool for pre-demolition audit ¹⁴



5.1.9 Introducing a quality label for secondary construction materials

The use of a voluntary quality label for secondary construction materials can be a highly effective tool to build trust among potential users to consider alternative material usage, instead of virgin building materials. Quality labels assure the performance, durability, and safety of recycled construction materials, addressing concerns related to the reliability and suitability for construction projects.

By introducing quality labels for secondary construction materials, stakeholders can enhance transparency and credibility in the marketplace, facilitating informed decision-making among builders, contractors, and project developers. These labels serve as indicators of compliance with established quality standards and specifications, reassuring users about the integrity and suitability of recycled materials for their intended applications. For example, these quality labels can be used on price lists in

order to show potential buyers the quality standard of the recycled building materials ¹⁵.

Quality labels promote market differentiation and value proposition for recycled construction materials and encourage their uptake and integration into construction projects. It can support distinguishing high-quality recycled materials from inferior alternatives, incentivizing manufacturers and suppliers to adhere to stringent quality requirements and invest in product improvement and innovation.

Furthermore, quality labels contribute to the professionalisation of the recycled construction materials sector, fostering trust and confidence among industry stakeholders. By aligning with recognised quality standards

and certification processes, secondary construction materials gain recognition and acceptance within the construction industry, paving the way for their widespread adoption and utilization in construction projects.

In summary, the introduction of quality labels for secondary construction materials offers a valuable mechanism to enhance market acceptance, promote transparency, and stimulate demand for recycled materials in the construction sector. By establishing clear quality criteria and standards, stakeholders can unlock the full potential of recycled materials, advancing sustainability objectives and fostering a circular economy in the construction industry.

5.1.10 Taxes on the extraction or import of virgin construction materials

To promote the shift towards using secondary building materials, taxing the extraction or import of virgin building materials can disincentivize their use and support the adoption of recycled alternatives. Implementing such taxes in other countries has proven to significantly reduce the reliance on virgin materials and encourage the use of recycled building materials. For instance, taxes could be applied to the use of gravel, sand, or stones, incentivizing the use of processed CDW as a replacement for these virgin resources. Ideally, the revenue from these taxes could be allocated to funding Research and Development projects aimed at enhancing circularity in the construction sector ¹⁶.

The imposition of taxes on virgin construction materials serves as a powerful mechanism to internalize the externalities associated with resource extraction and depletion. By incorporating the environmental costs of virgin material usage into their market price, such taxes reflect the true ecological impact of these activities and provide a strong economic incentive for stakeholders to explore alternative, more sustainable options.

Furthermore, revenue generated from these taxes can be strategically reinvested into initiatives that promote circularity and innovation within the construction sector. This could include funding research and development projects focused on advancing recycling technologies, enhancing material recovery processes, and developing new methods for repurposing construction waste. By channelling funds back into the industry, governments can stimulate the growth of a robust circular economy ecosystem while simultaneously driving job creation and economic growth.

Moreover, taxation can catalyse market transformation by reshaping the cost dynamics between virgin and recycled materials. As the price of virgin resources increases due to taxation, recycled alternatives become more economically competitive, driving up demand for secondary building materials and encouraging investment in recycling infrastructure. This, in turn, fosters innovation and entrepreneurship in the circular economy space, leading to the emergence of new business models and opportunities for sustainable growth.

In summary, taxes on the extraction or import of virgin construction materials represent a powerful policy tool for advancing sustainability objectives in the construction sector. By aligning economic incentives

with environmental goals, governments can accelerate the transition towards a more circular and resource-efficient built environment, unlocking numerous benefits for society, the economy, and the planet ¹.

5.1.11 Differentiating regulatory impact on newly built buildings and existing building stock

It is essential to differentiate between regulations that impact the circularity of newly built buildings and those that affect the generation and use of secondary materials from the existing building stock in SSA.

By recognizing these distinctions, policymakers can tailor regulatory interventions to address specific challenges and opportunities associated with each scenario.

1: Impact on newly built buildings:

Regulations targeting newly built buildings focus on promoting circular design principles, sustainable construction techniques, and the use of recycled materials from the outset. These regulations may include incentives for incorporating recycled content in construction products, requirements for modular and disassembly-friendly designs, and certification processes for eco-friendly building materials. By incentivizing circularity at the design and construction stages, policymakers can encourage the adoption of sustainable practices and minimize resource depletion and waste generation in future building projects.

2: Impact on Existing Building Stock:

Regulations affecting the generation and use of secondary materials from the existing building stock aim to facilitate the repurposing and recycling of materials from demolished or renovated structures. These regulations may include mandates for conducting pre-demolition audits before demolition, requirements for reclaiming and salvaging reusable materials, and incentives for integrating recycled content in building renovations. By promoting the circular reuse of materials from existing buildings, policymakers can reduce landfill waste, conserve resources, and mitigate the environmental impact of demolition activities. Additionally, these regulations create opportunities for job creation, economic development, and sustainable resource management within the construction sector.

Differentiating regulatory impact on newly built buildings and existing building stock enables policymakers to implement targeted interventions that address the unique challenges and opportunities associated with each stage of the construction lifecycle. By adopting a holistic approach to regulation, SSA countries can accelerate the transition towards a circular economy in the construction sector, fostering sustainable development and resilience in the built environment.

5.2 Capacity Building: Empowering circular awareness in the Sub-Saharan African construction sector

Lack of knowledge about circular concepts in the construction sector and technical possibilities to process waste streams to secondary building materials and replace virgin building materials are very relevant hurdles for a transition from a linear construction sector towards a

circular construction sector. Awareness-raising, capacity building and knowledge transfer are key instruments to steer this transition phase. The following policy recommendations can play an important role in overcoming the current deficiencies ^{17 1}.

5.2.1 Early engagement with stakeholders to foster effective collaboration

Due to the high complexity and interdisciplinarity in the process of integrating circular economy concepts in construction works, early engagement with relevant stakeholders is a key requirement for its success. In this way, knowledge gaps between different actors along the value chain can be addressed and circular planning steps can be included in the overall project planning process at an early stage.

Due to the fragmentation of the construction sector such stakeholders' engagement at an early stage can overcome the current thinking in silos and facilitate the achievement of circular economy outcomes at a later stage of the project cycle. Involving demolition contractors early in the project's design phase can significantly enhance the future recovery rate of secondary construction materials.

Early stakeholders' engagement fosters a sense of ownership and commitment to circularity goals, ensuring diverse perspectives are considered and integrated into decision-making processes. By involving

stakeholders from the outset, projects are better equipped to identify synergies, anticipate challenges, and optimize resource utilization throughout the construction lifecycle.

Additionally, early collaboration enables the co-creation of innovative solutions that address specific challenges and opportunities within the local context. By leveraging the collective expertise and experience of stakeholders, projects can explore novel approaches, technologies, and business models that maximize the value and impact of circular interventions.

In summary, early engagement with stakeholders is a fundamental strategy for promoting effective collaboration and advancing circularity in the construction sector. By fostering a culture of inclusivity, transparency, and shared responsibility, projects can unlock new opportunities for innovation, sustainability, and resilience in the built environment.

5.2.2 Knowledge and good practice sharing

To overcome the lack of knowledge among stakeholders relevant to the introduction of circularity in the building sector, sharing good practice cases, experiences, encountered barriers, and other supporting information

is crucial. This can be achieved, for example, through showcases, demo days, and the creation of knowledge exchange platforms between the private and public sectors and among policymakers to

understand success factors, challenges, and opportunities provided through circularity.

Establishing dedicated online repositories and forums can serve as centralized hubs for accessing resources such as case studies, research findings, technical specifications, and regulatory guidance related to circular construction practices. These platforms not only provide stakeholders with easy access to up-to-date information but also empower them to make informed decisions and adopt best practices in their projects and operations.

Moreover, organizing regular workshops, seminars, and networking events can create opportunities for stakeholders to engage directly with experts, share insights, and exchange ideas on innovative approaches to circular construction. By promoting interactive forums for knowledge sharing, stakeholders can enhance awareness, understanding, and collaboration, thereby facilitating collective problem-solving and co-creation of solutions tailored to local contexts.

Furthermore, strategic partnerships between industry associations, academic institutions, research organizations, and government agencies play a pivotal role in driving knowledge-sharing efforts forward. Collaborative initiatives that leverage the expertise and resources of multiple stakeholders can accelerate the development and dissemination of good practices, standards, and guidelines for implementing circularity in the building sector. By fostering a collaborative ecosystem, these partnerships enable continuous learning and innovation across the construction value chain.

In summary, promoting knowledge and good practice sharing is essential for building capacity and driving innovation in the adoption of circular construction principles. By creating platforms for collaboration, facilitating peer learning, and nurturing strategic partnerships, stakeholders can harness collective wisdom and expertise to accelerate the transition towards a more sustainable and resilient built environment.

5.2.3 Training and capacity building

The lack of knowledge about technological solutions, business models, or environmental, social and economic benefits of circularity in the construction sector, is one of the key barriers to a successful introduction of circular concepts in the building sector. Therefore, capacity building and training of all actors in the value chain is a key requisite to overcome these knowledge gaps. Such activities can be dedicated workshops, social media campaigns, podcasts, public relations, training courses, and others. These capacity-building measures should be offered continuously to gradually increase the knowledge about the opportunities of circular economy in all stakeholder groups. These include, among others, actors like unskilled workers, planners, architects, waste management companies, investors to key policymakers in the relevant ministries.

In addition, interactive training modules and immersive learning experiences can enhance stakeholders understanding of circular principles and their practical applications in construction projects. By incorporating hands-on exercises, case studies, and real-world simulations, training programs can provide participants with tangible skills and insights that empower them to champion circularity within their respective roles and organizations.

Furthermore, fostering collaboration between industry associations, educational institutions, and vocational training centres can amplify the impact of capacity-building efforts. By leveraging their collective expertise and resources, these partnerships can develop comprehensive training curricula, share best practices, and coordinate outreach activities that

reach a diverse audience of stakeholders across the construction value chain.

Moreover, integrating circularity into formal education and professional development programs and educational system can ensure a pipeline of skilled talents equipped to drive sustainable innovation in the construction

sector. By embedding circular principles into academic curricula, certification programs, and professional accreditation standards, educational institutions and industry bodies can cultivate a culture of lifelong learning and continuous improvement that supports the transition to a circular economy.

5.2.4 Develop regional networks for knowledge transfer

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5.2.5 Promote local entrepreneurs to develop viable business models based on Circularity

The private sector is a key stakeholder to take advantage of the business opportunities of the circular economy in the construction sector. For the scaling-up of successful solutions, the innovative

strength of entrepreneurs is a crucial enabler to increase the use of profitable solutions, based on viable business models. Policymakers can support through a wide set of policy instruments

local entrepreneurs, which can leverage ease of business opportunities, arise by valorising waste as a building material. Such policy instruments are regulation, taxation, or standardization, as well as direct support of entrepreneurs through subsidies or other financial incentives ¹¹.

In the context of SSA, where economic dynamics and resource availability differ from industrialized countries, promoting local entrepreneurship for circular construction requires tailored strategies. Policymakers can support emerging entrepreneurs by providing targeted capacity-building programs that address specific challenges and opportunities prevalent in the region. This may include training initiatives focused

on low-cost construction techniques, sustainable resource management, and community engagement practices suitable for the local context.

Moreover, facilitating access to microfinance schemes, technical assistance, and market linkages can empower aspiring entrepreneurs, especially from marginalized communities, to develop viable circular business models. By leveraging indigenous knowledge, traditional building practices, and community networks, local entrepreneurs can unlock innovative solutions that align with the socio-economic realities of SSA while advancing the circular economy agenda in the construction sector.

5.2.6 International partnerships for external support and knowledge transfer

While circular economy concepts in the construction sector are often highly site-specific, with local framework conditions playing a crucial role, their introduction in regions where they have not been widely applied can benefit greatly from international knowledge transfer. International partnerships can be mutually beneficial for the development and adoption of circular economy practices. Developed nations often have advanced technologies, innovative strategies, and well-established regulatory frameworks that can serve as valuable examples for developing nations. These countries have experience in implementing circular economy principles in various sectors, including construction, and can guide best practices, policies, and

technologies. On the other hand, developing nations may offer unique insights, such as locally appropriate solutions, traditional practices that align with circularity, and a deep understanding of resource constraints and socioeconomic dynamics.

By fostering collaboration and knowledge exchange between developed and developing nations, both sides can learn from each other's experiences and challenges, accelerating the transition towards circularity on a global scale. Additionally, such partnerships can promote inclusivity and equity in the circular economy transition by ensuring that the benefits are shared across different regions and communities.

5.2.7 Involving collective organisations of the urban poor, like cooperatives, federations and social movements

In promoting economic capabilities and improving the socio-economic situation of the urban poor, it's crucial to engage collective organizations like cooperatives, federations, and social movements. In SSA, where informal waste management is prevalent and urban poverty is widespread,

these collective organizations play a crucial role in shaping sustainable development initiatives. By involving them in circularity efforts within the construction sector, we can tap into their local knowledge, resources, and networks to drive meaningful change.

These organizations are uniquely positioned to bridge the gap between communities and policymakers, advocating for inclusive policies that prioritize the needs of marginalized groups. Moreover, they can facilitate the dissemination of circular economy principles at the grassroots level, empowering community members to actively participate in sustainable practices. Through capacity-building initiatives, these collective organizations can enhance their technical expertise in waste management, recycling, and sustainable construction techniques. By providing training, access to resources, and networking opportunities, we can empower them to become key stakeholders in the circular economy transition.

Furthermore, fostering partnerships between collective organizations, government agencies, NGOs, and other stakeholders can amplify the impact of circularity initiatives. By collaborating on projects, sharing best practices, and leveraging each other's strengths, we can create synergies that drive systemic change and promote inclusive urban development.

Overall, involving collective organizations of the urban poor is not only essential for promoting circularity in the construction sector but also for advancing social equity, economic empowerment, and environmental sustainability in SSA.

5.3 Innovative Demonstrations: Showcasing circular construction solutions in Sub-Saharan African

In SSA, the construction sector stands at an important crossroads, facing the urgent need for sustainable and resilient solutions to address pressing environmental and socio-economic challenges, as climate change, biodiversity loss or resource depletion. As the region strives to meet the growing demand for infrastructure and housing, there is a unique opportunity to promote innovation and showcase circular solutions that harness the potential of recycled waste as building materials.

The concept of a circular economy offers a promising pathway towards sustainable development, where resources are utilized more efficiently, and waste is minimized

through reuse, recycling, and repurposing. However, translating these principles into tangible action requires innovative demonstrations that not only prove the feasibility of circular solutions but also inspire stakeholders to embrace change and shift their mindset. This chapter focuses on showcasing innovative demonstrations that exemplify the transformative potential of circularity in SSA construction. From Incentivizing local research and development (R&D) initiatives to facilitating technology transfer and fostering strategic partnerships, these demonstrations represent a bold step towards a more sustainable and inclusive built environment.

5.3.1 Incentivizing of local R&D and pilot projects

In SSA, Incentivizing local R&D initiatives and pilot projects is crucial for driving the wide-spread adoption of circular economy concepts in the construction sector

and transitioning towards sustainable building practices. These initiatives serve as testbeds for developing and refining innovative technologies, methodologies,

and materials that leverage recycled waste as viable building alternatives to traditional, unsustainable sources. Additionally, these demonstration projects help shift mindsets by showcasing how waste can be seen as a valuable resource in construction. By focusing on R&D and pilot projects, stakeholders can explore novel approaches to processing waste streams into high-quality construction materials, providing an alternative to traditional, unsustainable sources. This approach addresses the region's need for affordable, eco-friendly building solutions while fostering a broader acceptance of recycled materials as viable options.

Moreover, these projects provide valuable opportunities for local entrepreneurs, innovators, and communities to actively participate in shaping the future of their built environment, fostering a sense of ownership and empowerment. Additionally, by showcasing successful pilot projects, stakeholders can demonstrate the economic, environmental, and social benefits of adopting circular practices, inspiring broader industry buy-in and paving the way for scalable solutions across the region. Through targeted incentives and support mechanisms, such as funding, technical assistance, and regulatory incentives, governments and organizations can catalyse a culture of innovation and experimentation, accelerating the transition towards a circular construction sector in SSA.

5.3.2 Matching investors and local entrepreneurs for circularity-based business models

In SSA, facilitating the alignment between investors and local entrepreneurs is essential for fostering the development and scaling of circularity-based business models in the construction sector. Matching the right investors with innovative entrepreneurs who are committed to circular economy principles can unlock significant opportunities for sustainable growth and impact. By connecting investors who prioritize environmental and social sustainability with entrepreneurs who are pioneering circular solutions, such as the use of recycled waste as building materials, synergies can be leveraged to drive investment in projects that generate both financial returns and positive societal outcomes.

Moreover, this matchmaking process serves to bridge the gap between capital providers and grassroots innovators, enabling the flow of funding and resources to where they are most needed. Through targeted initiatives, such as investor pitch events, matchmaking platforms, and impact investment networks, stakeholders can facilitate meaningful connections and partnerships that catalyse the development and adoption of circular business models in the construction sector. By fostering collaboration and alignment between investors and entrepreneurs, SSA can unlock the full potential of circularity-based innovations, driving sustainable development and economic prosperity across the region ¹³.

5.3.3 Support digital solutions for promoting circularity in the construction sector

In SSA's construction sector, harnessing digital solutions offers interesting opportunities for driving circularity and maximizing resource efficiency. However, it is important to recognize that the adoption of digitalization may face challenges in

regions where socio-economic factors, such as poverty, limit access to technology. Embracing tailored digital technologies, like DigiYard, can revolutionize processes, improve transparency, and bolster sustainability across the construction

value chain. DigiYard, for instance, provides innovative platforms facilitating the efficient management of construction waste, enabling material tracking, and encouraging the utilization of recycled resources ¹⁸

Through strategic support mechanisms, including training initiatives and incentives for technology adoption, SSA countries can empower construction stakeholders to

leverage digital tools effectively. Embracing digitalization not only boosts productivity and cost-efficiency but also fosters circular practices by optimizing resource allocation, curbing waste, and promoting material reuse. By investing in customized digital solutions tailored to address sector-specific challenges, SSA can pave the way for sustainable progress and accelerate the transition toward a circular economy.

5.3.4 Improve intellectual property rights

Fostering circular solutions in SSA's construction sector and enhancing intellectual property rights (IPR) is paramount. Strengthening IPR frameworks can incentivize innovation and investment in sustainable technologies and practices. By providing legal protection for novel ideas and designs, IPR safeguards the interests of innovators and encourages the development and dissemination of circular solutions. Moreover, robust IPR regimes foster confidence among investors, paving the way for increased funding and

partnerships to support the implementation of innovative projects. Additionally, by ensuring fair and equitable access to intellectual property, IPR frameworks can facilitate technology transfer and knowledge sharing, driving collaboration and capacity building within the region. Ultimately, improving intellectual property rights in SSA's construction sector is essential for unlocking the full potential of circular innovations and accelerating the transition toward a sustainable and resilient built environment.

5.3.5 Promote technology transfer for circular solutions in the construction sector

To enhance the region's transition to sustainable construction practices, promoting technology transfer from industrialized countries is crucial. Leveraging the expertise and advancements made in recycling waste materials into viable building components can significantly accelerate the adoption of circular solutions in SSA's construction sector. By facilitating technology transfer initiatives, such as knowledge-sharing partnerships, joint research and development projects, and technology licensing agreements, SSA countries can access proven technologies and methodologies for recycling waste into building materials. Additionally, capacity-building programs and technical assistance can support local stakeholders in adapting and implementing these technologies effectively.

Technology transfer facilitation not only fosters innovation and economic growth but addresses environmental challenges by reducing reliance on virgin materials and minimizing waste generation. Ultimately, promoting technology transfer for circular solutions in the construction sector is essential for building resilience, promoting sustainable development, and achieving long-term prosperity in SSA.

5.3.6 Developing relevant, reliable and replicable circular Key Performance Indicators to measure circularity in the construction sector

To effectively measure progress toward circularity in the construction sector, it is essential to develop relevant, reliable, and replicable Key Performance Indicators (KPIs). These KPIs provide metrics to assess the implementation of circular economy principles and guide improvement efforts. Standardized indicators capture key aspects of circularity, enabling stakeholders to evaluate performance, identify improvement areas, and benchmark progress over time. Reliable KPIs also enhance transparency and accountability, allowing stakeholders to communicate circularity efforts to investors, policymakers, and the public ¹⁷.

Engaging a diverse range of stakeholders, including industry experts, policymakers, researchers, and community representatives, is crucial for developing a comprehensive set of circular KPIs. Collaborative workshops, expert consultations, and stakeholder engagement sessions facilitate the identification of relevant metrics aligned with SSA contexts. Drawing insights from existing frameworks, standards, and best practices informs the development of robust KPIs that capture the multidimensional aspects of circularity in construction.

Ensuring the reliability and replicability of circular KPIs is paramount for their effectiveness and adoption. This involves establishing clear methodologies, data collection protocols, and reporting mechanisms for consistent measurement and comparison across projects, regions, and periods. Standardization efforts, such as industry guidelines and certification schemes, further enhance the reliability and credibility of circular KPIs, instilling confidence among stakeholders and promoting widespread adoption.

Developing a set of relevant, reliable, and replicable circular KPIs tailored to the SSA context enables stakeholders to monitor progress, drive continuous improvement, and demonstrate leadership in advancing circular practices in the construction sector. Concrete examples of circular KPIs include metrics for waste diversion rates, recycled content in construction materials, energy efficiency improvements, and water conservation measures. These KPIs serve as powerful tools for driving innovation, promoting collaboration, and catalysing the transition toward a more sustainable and resilient built environment in the region ¹⁹.

6.

Conclusion and Outlook

This implementation guide for circular construction using waste material potentials of three primary waste streams –Municipal Solid Waste, Construction and Demolition Waste, and Agricultural Wastes in SSA, presents a promising pathway toward sustainable development and circularity in the construction sector in the region. By promoting the use of recycled and secondary building materials, this guide aims to encourage the reduction of resource depletion, minimize waste generation, and contribute to decarbonization efforts. The integration of circular economy principles in the construction sector is essential for addressing the rapid urbanization and associated challenges in SSA, such as housing shortages, environmental degradation, and economic disparities.

The outlook for circular construction in SSA is optimistic. As governments, private sector stakeholders, and communities increasingly recognize the environmental, economic, and social benefits of circular practices, there is a growing momentum towards adopting sustainable construction methods. The shift not only supports the region's sustainable development goals, but also enhances resilience to climate change, fosters job creation, and promotes healthier living environments.

The importance of implementing circular construction practices cannot be overstated for the development of SSA. Sustainable building methods can significantly reduce the carbon footprint of the construction sector, conserve natural resources, and alleviate the pressure on landfills. Additionally, by

fostering local industries around recycling and green construction, there is potential for substantial economic growth and improved quality of life for communities.

To ensure the successful implementation of the recommendations outlined in this guide, stakeholders must take immediate and decisive action. The next steps include raising awareness among key stakeholders, developing supportive policies and regulations, investing in the necessary infrastructure, and fostering partnerships between governments, private sector actors, and civil society organizations. Capacity building and education programs will also be vital in equipping local communities with the knowledge and skills needed to engage in circular construction practices.

In summary, the implementation guide provides a comprehensive framework for transitioning towards circular construction in SSA. Its adoption will not only address pressing environmental and social challenges but also pave the way for a more sustainable and prosperous future. By taking proactive steps now, stakeholders can ensure that the benefits of circular construction are realized, contributing to the long-term development and resilience of the region.

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