United Nations
Bureau International des Expositions
Shanghai 2010 World Exposition Executive Committee
東方出版中心

Shanghai Manual

A Guide for Sustainable Urban Development of the 21st Century

城市,让生活更美好
Better City, Better Life

Shanghai Manual

A Guide for Sustainable Urban Development in the 21st Century

FOREWORD – UNITED NATIONS

The Shanghai Manual for Better Cities is a concrete outcome of the World Expo 2010, Shanghai, China - Better City, Better Life. It is a product of fruitful collaboration between the Municipal Government of Shanghai, the Bureau International des Exhibitions and the United Nations. It addresses one of the most pressing challenges of our time – how to foster sustainable, livable and harmonious cities.

The World Expo 2010 Shanghai provided not only a platform for exhibitions and cultural exchanges, but also a forum where broad-ranging discussions on themes central to sustainable development took place and practical solutions to problems explored, based on lessons learned and best practices. I wish to commend United Nations agencies and Chinese partners that collaborated during the Expo in organizing thematic forums on sustainable urban development. At those forums, we received the insights of renowned academics, experts and practitioners, innovative ideas of business leaders, and the visions of mayors for the cities of tomorrow. This wealth of knowledge and experience has been truly enriching. The aim of this Manual is to support mayors and urban managers as they try to foster sustainable urban development in their communities. Through this Manual we seek to place effective policy tools and best practices at their disposal. This support is essential because cities are at the forefront of finding and testing development solutions. Cities are the most vibrant centres of human energy and creativity. They are at the nexus of new ideas, innovation and the knowledge economy. Moreover, cities are at the leading edge of efforts to address the challenges of climate change, and it is in cities that initiatives of the new green economy are being piloted.

Let us work together to implement forward-looking strategies of our cities with our combined dedication and vigour. It is our hope that with feedback and inputs from mayors, urban planners and managers, this Manual will become a living document, to be revised and improved while incorporating new visions, lessons learned and best practices.

Sha Zukang
Under-Secretary-General
Secretary-General for the Conference on Sustainable Development (Rio+20)

FOREWORD – BUREAU INTERNATIONAL DES EXPOSITIONS

A World Expo has as its ultimate goal the creation of a lasting legacy of education, innovation and cooperation. The success of such an event lies in the significance of the material and the intangible opportunities that are created for both the host city and country and for its ability to resonate beyond borders and people. In this sense, Shanghai 2010 was an outstanding event and this manual is one example of the spirit that drove it.

By selecting a theme such as *Better City, Better Life*, Shanghai 2010 was able to create a powerful virtuous cycle were the theme and of the universal objectives of Expos (i.e. to help create better cities) were one and the same. This choice has produced a powerful effect, where the messages and contents of the theme were amplified by the staging of the Expo itself, and, in turn, the Expo could be better appreciated for its direct contribution to the development of better urban environments.

This manual is an important and novel outcome of the legacy of Shanghai 2010. It fulfils the joint aspiration of the UN, the organizers of Shanghai 2010 and the BIE to work together to distil the lessons and the outcomes developed both within and beyond Expo 2010. With the view to maintain the same inclusive attitude of Shanghai 2010 - which for the first time in the history of Expos has invited cities to participate along national governments - this manual has included best practices that were not presented within the site or the forums of Expo 2010.

For this reason the BIE is indebted to both the UN, the City of Shanghai and the Chinese governments for working together to develop a framework and a set of materials that would foster and promote a better understanding of the objectives and values of Expos in general and of the achievements of Shanghai 2010 in particular.

While the UN has traditionally participated in Expos, in Shanghai 2010, for the first time it played an active role in orchestrating a global dialogue for the construction of better cities. To this end, it joined the Expo organizers and the BIE to co-organize the high profile international forums and to prepare the Shanghai Declaration. The depth of expertise and the reach of the UN were critical assets to help create the foundations for a lasting legacy of cooperation on urban sustainable development connected to Shanghai 2010.

When our organizations first discussed the idea of this manual, there was an agreement that the international community had failed to implement many of the social,

environmental and economic goals and objectives that were agreed upon within major international conferences. With this manual, our wish is to provide a concrete and practical contribution to fill a need of better training, knowledge sharing and expertise and to support urban managers in the decision-making process that helps achieve greater quality of life in their city and beyond.

Vicente González Loscertales
Secretary General

FOREWORD – CITY OF SHANGHAI

World Expo 2010 Shanghai China was a magnificent gathering of human civilizations. Built around the theme of *Better City, Better Life*, it championed the Expo concept of understanding, communication, gathering and cooperation and created a fascinating kaleidoscope of world civilizations. It will be marked in history as a successful, wonderful and unforgettable World Expo.

Expo Shanghai left behind a rich heritage. Through exhibitions, forums and various activities, participants showcased their achievements, shared urban best practices, disseminated advanced urban management concepts and arrived at important consensus. Eco-friendly, green and low carbon development is gaining new ground after having been put under the spotlight and into practice at the Expo. Meanwhile, technological innovation, sustainable development and the call for making the earth a better place have become our common aspiration, all of which are going to impact cities of the future in greater breadth and depth.

UN agencies, the BIE and Chinese scholars spent over one year putting together intellectual legacies of Expo Shanghai, and their hard work crystallized into this Shanghai Manual. Aiming at promoting Expo values, it details the experiences and practices of cities across the world in addressing common challenges and achieving harmonious development based on a wide selection of Expo cases, and is therefore of great theoretical and practical value. It is my belief that the Manual will pass on the Expo legacies and become a guidebook for city authorities and researchers over the world in their quest for innovative models of urban development, economic efficiency, eco-friendliness as well as social justice and harmony.

Han Zheng
Mayor of Shanghai

ACKNOWLEDGEMENTS

This Manual has benefited greatly from the contributions of many people. The idea for the Manual itself was the inspiration of Sha Zukang, Under-Secretary-General of the United Nations Department of Economic and Social Affairs (UNDESA). This initiative was immediately embraced by the Secretary General of the BIE, Vicente González Loscertales, and by the Executive Vice Mayor of Shanghai, Yang Xiong, with the view of establishing a legacy for the theme of the Expo that would directly benefit urban leaders.

The authors benefited from the substantive guidance of Tariq Banuri, former Director of the Division for Sustainable Development of UNDESA. The project leader and editor was Mohan Peck. The support of Juwang Zhu and Tan Jian was instrumental in the completion of the project. We wish to gratefully acknowledge the work of several lead authors in drafting various chapters of the Manual, namely, Federica Busa, Warren Karlenzig, Prasad Modak, Jose Monroy, Carlos Felipe Pardo and Mohan Peck.

The Manual owes much to experts from a number of United Nations offices and agencies who were kind enough to review chapters and provide comments, suggestions and inputs. These include: Arab Hoballah, Rob de Jong, Soraya Smaoun, Maike Christiansen, Patricia Kim of UNEP; Axumite Gebre-Egziabher, Gulelat Kebede and Joseph Hooper of UN Habitat; Sanjay Acharya and Doreen Bogdan of ITU; Matthias Eck, F. Russell-Rivoallan, Hans D'Orville of UNESCO; Anne Miroux, Monji Hamdi and Dong Wu of UNCTAD; and Choudhury Rudra Mohanty of UNCRD.

Grateful acknowledgement goes to the Vice Mayor of the City of Shanghai, Yang Xiong for his unstinting support. We wish to also thank Zhu Yonglei, Deputy Director General of the Bureau of Shanghai World Expo Coordination and his staff from the Shanghai Expo Forum Affairs Department, in particular, Wang Jun, Cheng Jian and Yu Hongyuan. The Expo Bureau also organized seven teams of Chinese experts who reviewed the chapters of the Manual and made noteworthy contributions. They leaders of these teams were: Zhou Zhenhua, Director, Development Research Center, Shanghai Municipal Government; Yang Jiemian, President, Shanghai Institute for International Studies; Wu Jianzhong, President, Shanghai Library; Chen Chao, Vice President, Shanghai Library, Wu Zhiqiang, Assistant President, Professor, Tongji University; Li Guangming, Professor, Tongji University; Zhang Min, Professor, Shanghai University.

Finally we wish to appreciate the constant support provided by the BIE, and in Vicente González Loscertales, Secretary-General, and Federica Busa, Counselor to the BIE Secretary-General. The BIE strongly encouraged the development of a thematic legacy that would promote a better understanding of the theme “Better City, Better Life” through education, cooperation and progress.

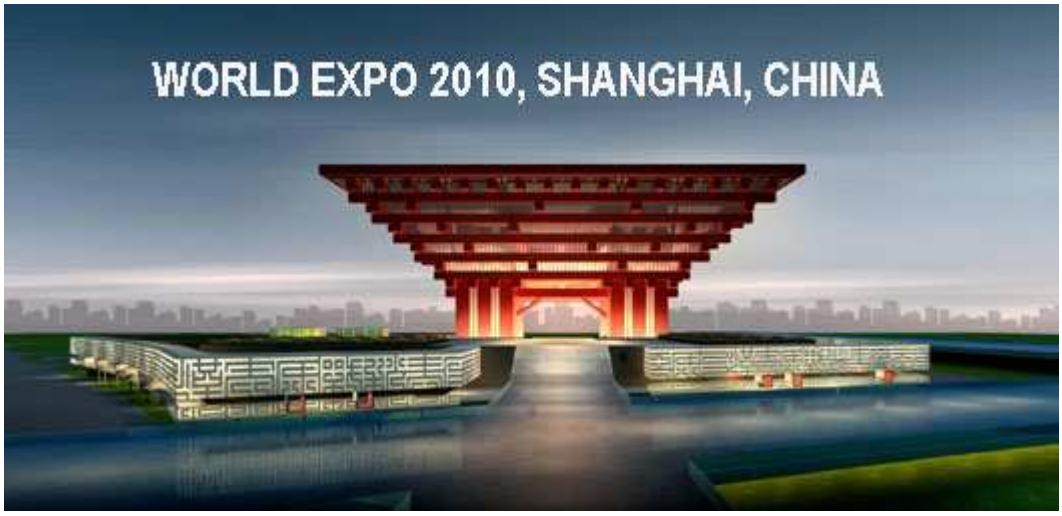
INTRODUCTION

PURPOSE

This manual is intended to provide a resource on sustainable urban development to mayors, urban planners and decision-makers of cities around the world. As a leader you want to make your mark and leave some meaningful legacy of your efforts toward building a better city. You may ask yourself: What do you want to do? What is your vision of what you want the city to become? How do you inspire the managers of your administration so that they all pull together in the same direction? How do you build and maintain political momentum with the communities that you govern?

There are many examples of innovative leadership from mayors who have faced the same or similar challenges as you face. In this manual we try to distill the lessons of some of those experiences and provide practical advice on policies and best practices. This manual is not a theoretical discussion; it is based entirely on practical solutions to real world challenges. It does not describe business as usual approaches to urban management; it provides innovative ideas, tactics and solutions that have been successfully applied at the city level.

From the outset, we wish to acknowledge that all cities are different and policies that work in one may not work in another. All cities have different development conditions, infrastructure, institutions, assets, challenges and levels of stakeholder engagement. Mayors are invited to choose from the menus of policy options those measures that may be most relevant to their respective cities.



The iconic China pavilion at Expo 2010 Shanghai.

SHANGHAI WORLD EXPO AND URBAN SUSTAINABILITY

The existence of this manual is indebted to the World Expo 2010 held in Shanghai dedicated to the theme "Better City, Better Life." The Shanghai Expo addressed the urgent need to improve urban planning, management and livability. An innovative dimension of this global event was a series of theme forums that were convened to explore key urban challenges and solutions. The theme forums were organized by the Shanghai 2010 World Exposition Executive Committee, various entities of the United Nations system, a number of national level Chinese government Ministries, and the Bureau International des Expositions (BIE), which is the intergovernmental organization responsible for overseeing World Expos.

Much of the intellectual input to the manual is derived from those theme forums as well as the pavilions at the Expo site. The urban development topics explored at the theme forums included:

- Urban governance: harmonious cities and livable life
- Economic transformation and urban-rural relationships
- Information and communication technologies and urban development
- Cultural heritage, creative cities and urban regeneration
- Science and technology innovation and urban futures

- Environmental protection and urban responsibilities[1]

This manual adopts the vision of harmonious cities that was developed at the Expo after much discussion and debate within the theme forums. It is a reflection of the challenges that have been faced by Shanghai and other cities around the world. It covers many themes which can be applied and contextualized depending on the development conditions of a city.

The concept of harmonious cities of the Shanghai Expo acknowledges that we aspire to build cities that establish harmony between diverse people, between development and environment, between cultural legacies and future innovations. A City of Harmony reveals itself when people are in harmony with nature, society, and themselves, and when there is also harmony between generations.

Through Expo 2010, the city of Shanghai offered a platform to catalyze the energies and the visions of the world on how to build future cities with global wisdom. Shanghai was ideally suited for this task because of the combination of its size, its rapid development and the millenary tradition of China, which reflect the different challenges faced by the majority of cities in the world. Furthermore, as the first Expo to take place in the developing world, Shanghai was a perfect venue to bring together diverse experiences and build the necessary bridges that can help improve the cities of tomorrow.

To this end, it dedicated a 25 hectare area to the presentation of urban best practices, which enabled cities to take part in the Expo by presenting a real project that they had successfully implemented to improve quality of life. The Urban Best Practices Area was both a laboratory for learning and exchanging on urban innovation, but also offered cities unique opportunities to know each other better and to plant the seeds of future cooperation.

The Shanghai Expo stands at the cross roads of global efforts to connect both developed and developing worlds, East and West, North and South, rich and poor, urban and rural, and the past with the future.

Better City, Better Life, the guiding theme of Expo Shanghai 2010, reflects a global aspiration that continues to resonate beyond national borders and into the future. Indeed, *Better City, Better Life*

was always meant to be more than an Expo slogan: it is a manifesto for 21st Century sustainable urban development.

THE STRUCTURE OF THE MANUAL

The chapters in this Manual reflect the topics that were analyzed in the depth during the thematic forums that were organized during the Shanghai Expo. Each chapter in this publication focuses on a particular theme. There is a discussion of issues and challenges faced by city leaders followed by a description of policy options and measures that have been successfully employed in cities to address those challenges. This is followed by the presentation of a number of practical case studies outlining the experience of cities in implementing a mix of policy measures. The case studies and best practices compiled in the manual use examples from large cities in both developed and developing nations. Resources for further information are also included.

The case studies and best practices are at the heart of this Manual and we have therefore given great attention to the selection criteria.

- Each case study presents a practical example of how a city faced a development or sustainability challenge and arrived at a successful solution.
- The beginning of the case study provides some context on the relevant history of the city and the development conditions that affected the nature of the challenge.
- The case study describes the policy options & measures that were employed by city leaders to solve the challenge, including how they may have been adapted to local conditions.
- The outcome of the project is outlined – how was it successful and what was its impact on the sustainable development of the city.
- Measures employed to engage urban stakeholders, either in developing the strategy for the project or in overcoming implementation problems, are explained. Where information is available, we outline how community stakeholders benefited from the project.
- A section entitled “lessons learned” is always included. This section highlights the key takeaway points that one mayor might wish to pass along to another mayor who was planning a similar project.

- Where possible we strive to include successful case studies from rapidly, growing cities in developing countries, as mayors in these cities face the greatest challenges. Strong case studies from Europe and North America are also included so as to achieve regional representation.

A number of case studies were presented from Shanghai Expo 2010, derived either from the Expo Forums, the Urban Best Practices Area or the Expo pavilions. We have included additional case studies in order to make the Manual most relevant to the urgent needs of cities. It is the plan of the United Nations to continue to improve and enhance this document, so that it becomes a living resource for sustainable urban development.

A chapter on envisioning sustainable and harmonious cities has been added as this is often the first practical step that cities can take toward re-imagining their future. A number of major cities around the globe have recently taken it upon themselves to develop new urban master plans looking out to 2030. This in itself may be an indication of the pressures and rapidly changing economic, social and environmental conditions that cities are currently experiencing.

A separate chapter on mega-events has also been added in recognition of the fact that these events are an additional form of best practice that a city can choose to accelerate urban transformations. Case studies of the 2008 Beijing Olympics, the 2010 Shanghai World Expo, European Capitals of Culture, and major United Nations Conferences are presented as learning experiences.

A number of reports and manuals have been previously produced on some of the topics covered in this publication by other United Nations (UN) agencies and international/national organizations, including UN Habitat, UN Environment Programme, Local Governments for Sustainability (ICLEI), the US Green Building Council, the Organization for Economic Co-operation and Development (OECD), the World Bank, the Asian Development Bank and the UN Centre for Regional Development (UNCRD). We try to include links to these publications for readers' further information.

WORLD EXPO 2010 SHANGHAI CHINA
SHANGHAI DECLARATION

31 October 2010

WE, participants and friends from all reaches of the globe, drawn by the theme "Better City, Better Life," have gathered in Shanghai and jointly fashioned the first World Expo in a developing country organized under the auspices of the Bureau International des Expositions. During these 184 days, we have explored, envisioned and simulated the mosaic of urban life through the wonderful exhibitions of the pavilions, the instructive showcases of urban best practices, the in-depth intellectual exchanges in the forums and the brilliant cultural events.

WE have come to realize that people's understanding and pursuit of a better life are both the foundations and the engines of urban development.

WE are also convinced that it is necessary to re-examine the relationship between people, cities and our planet.

WE agree that, in tackling the challenges of urban development, innovation offers solutions and the concept of "Cities of Harmony" embodies our dreams.

At present, with more than half of humankind living in cities, our planet has entered the urban age. Rapid urbanization and industrialization have offered to humanity the abundant fruits of modern civilization, but at the same time they have brought unprecedented challenges. Population explosion, traffic congestion, environmental pollution, resource shortages, urban poverty and cultural conflicts are becoming urban problems with a global scope. For historical and current reasons, these phenomena are especially prominent in many developing countries. The Shanghai Expo responded to the times by selecting cities as its theme. It also introduced the first-ever Urban Best Practices Area and Virtual Expo to pursue a ground-breaking exploration of the possible solutions to the common dilemmas faced by humankind.

Today, as this grand gathering comes to a close, we sing high praise for the important value of the World Expo as a platform to confront these challenges and as a vehicle for dynamic exchange and interaction between civilizations. We enthusiastically issue this Shanghai Declaration as a summary of the substantive achievements of the Shanghai Expo and an expression of the shared aspirations of people around the world for a "Better City, Better Life."

We aspire to build cities that establish harmony between diverse people, between development and environment, between cultural legacies and future innovations. A City of Harmony reveals itself when people are in harmony with nature, society, and themselves, and when there is also harmony between generations.

To this end, we join together in proposing:

To Establish an Ecological Civilization Oriented toward the Future

Cities should respect nature, consider the urban ecological environment as an asset, integrate environmental issues into urban planning and administration, and accelerate the transition to sustainable development. They should promote the use of renewable energy sources and build low-carbon eco-cities. They should strongly advocate for conservation of resources and promote environment-friendly manufacturing. Cities and their citizens should join together to create sustainable lifestyles and an ecological civilization in which people and environment co-exist in harmony.

To Pursue Inclusive and Balanced Growth

Cities should balance economic growth and social development; seek to achieve an optimal relationship between social equity and economic efficiency; strive to create an institutional environment of shared rights and interests, equal opportunity, and fair competition; and work to reduce inequities in income. They should enable all residents to share the fruits of urban development and fully realize their personal growth.

To Promote Scientific and Technological Innovation as a Path to Development

Cities should strengthen scientific research and technological innovation, as well as establish and improve systems for using new technologies. They should accelerate the application of scientific findings in order to improve the quality of people's lives and create new industries and jobs. They should leverage scientific research and technological innovation to build up the capacity of cities to prevent and mitigate urban and natural disasters. They should apply principles of openness and mutual benefit in strengthening scientific and technological exchanges and collaboration to promote urban development around the world.

To Build a Smart and Accessible Information Society

Cities should recognize that information and communication technologies are essential to a vibrant social, economic and cultural life of the city. Cities should invest in information and communication technology infrastructure so as to strengthen services across multiple sectors, and to build an intelligent digital nervous system supporting urban operations. They should strengthen the use of information technology in education, reduce the digital divide, and increase the access of residents to information.

To Foster an Open and Sharing Multicultural Society

Cities should endeavor to protect tangible and intangible cultural heritage and encourage the development of multicultural Society. Like the ocean that embraces all rivers, cities should keep an open spirit and actively engage in intercultural exchanges and interactions. Cities should pursue cultural innovation based on respect for cultural traditions and the preservation of cultural diversity, so as to generate lasting momentum for urban and human development.

To Build Friendly and Livable Communities

Cities should promote a harmonious and friendly social environment, and build civil, safe and livable urban neighborhoods through rational planning. They should provide high-quality public services in employment, healthcare, education, housing, social welfare and other areas. They should encourage public participation in urban planning and governance, take into consideration the practical and psychological needs of migrants to the cities, and eliminate social barriers and conflicts.

To Pursue Balanced Urban-Rural Development

Cities should coordinate balanced development with rural regions through the provision of services and infrastructure. Cities should strive to reduce the urban-rural gap, take into consideration the interests of disadvantaged social groups, and encourage and aid the integration of rural populations into the city. More efforts should be taken to improve and optimize urban-rural linkages as well as regional networks. Cities should actively initiate urban-rural dialogue to achieve harmony in their interactions.

WE THEREFORE call upon the world to pursue the efforts we have undertaken in the Shanghai Expo: to promote sustainable urban development, to foster cooperation and exchanges among cities and regions, and to share experiences and lessons in urbanization.

WE propose to undertake initiatives for knowledge sharing and capacity building for cities around the world as they tackle the economic, social and environmental challenges of the 21st century. One such initiative will create educational materials for future city planners and managers by compiling the intellectual contributions of the Shanghai Expo.

WE propose that October 31st, the day of the closing ceremony of World Expo 2010 Shanghai China, should be nominated as World Better Cities Day, so that the ideas and practices of the Shanghai Expo will be recalled, renewed and advanced in the future, inspiring humankind in its enduring pursuit of urban innovation and harmonious development!

CHAPTER 1 - TOWARDS A HARMONIOUS CITY WITH SUSTAINABLE COMMUNITIES[1]

1. ENVISIONING A SUSTAINABLE CITY

Developing a vision and a plan for what you want your city to become is the essential first step for pursuing new pathways towards transformation.

The year 2010 marked the start of numerous 20+ year urban sustainability or green economic planning processes. Some of the outcomes include a series of roadmap documents, master plans and updates from regions and cities such as South Korea with the *2030 Smart Grid Roadmap*; Sydney, Australia with *Sustainable Sydney 2030*; New York City with the *PlaNYC update*; and Nairobi with the *Nairobi Metro 2030*, among others.

The purpose of the visioning process is to create a fertile environment for developing new ideas that work. The process can be as simple as visualizing the ideal community and documenting this vision with individuals in a visioning group and then within a larger multi-stakeholder group. Stakeholder groups should consist of government officials, business representatives, citizen group representatives, individual citizens, and, if possible, academic and subject matter experts. These civic leaders should gather as much information as possible from prior community meetings and vision sessions. If a city has not had a public visioning session, leaders should organize one. It is important to do whatever it takes to create a broad and specific vision of what citizens want their city to look and feel like five, ten, twenty and thirty years into the future.

How the vision will become reality is not important during the visioning stage. The important part is developing and maintaining a cohesive vision that includes all major views of stakeholders. Of course, some interest groups might initially have conflicting visions. Participants should focus on the overarching points of general agreement as the basis for a long-term vision for urban sustainability.

Communication with peers in other cities that have implemented similar projects can be informative. Direct contact should be sought with participants from other city sustainability efforts whenever possible. Communicating with the people directly involved will often lead to more candid responses and a more realistic and current view of the challenges that programme or

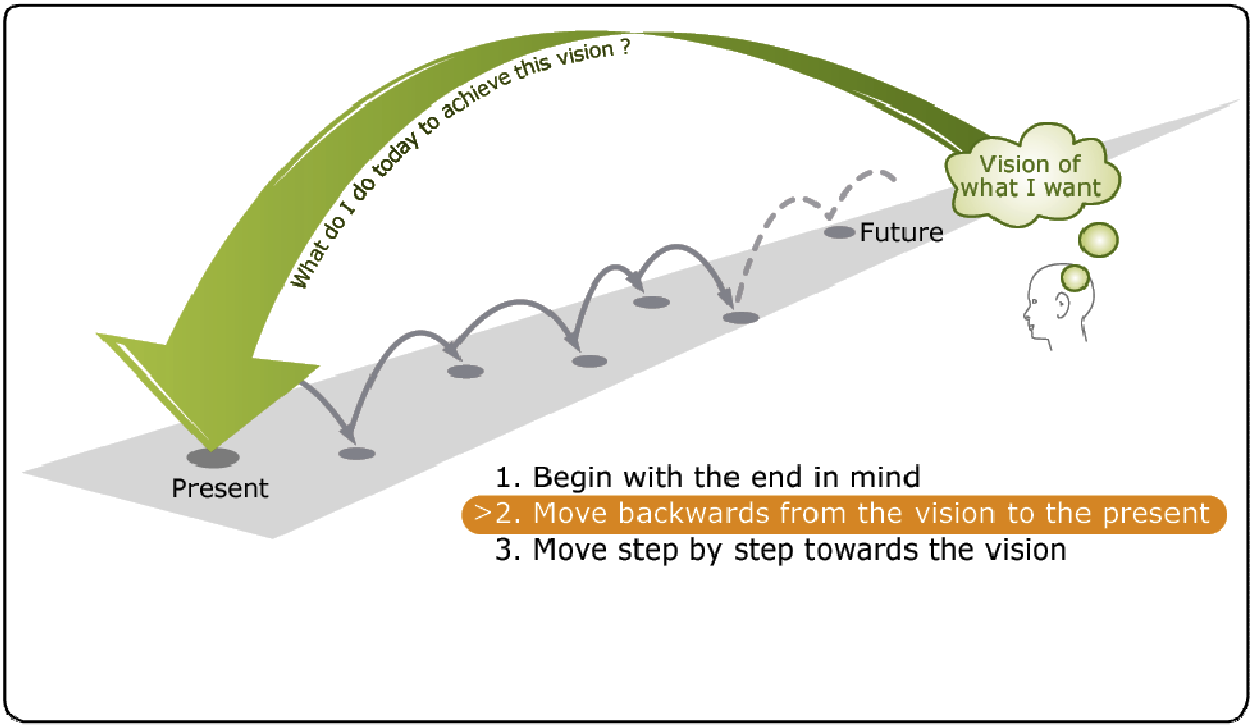
[1] This chapter was authored by Warren Karlenzig and Mohan Peck, with valuable input and contributions from Wu Jianzhong and Federica Busa.

project implementations faced. This involves asking simple questions such as: "Does that project or programme work well? Why or why not?"

The circumstances faced by each community might be different enough so that what can be challenging to implement in one can still work well in another. Projects and documents from the international non-governmental organization ICLEI - Local Governments for Sustainability, for example, provide a rich resource for studying and learning from successful projects. More than 700 cities, towns, counties, and their associations from around the world are members of ICLEI.[2]

You may therefore wish to begin by answering the question: "What is the vision for your city?"

Figure 1.1 The process of backcasting.



Source: http://www.naturalstep.org/backcasting

2 "Cities to Last", Mary Dengler, Carlos Rodriguez Cascal, Eds., Club of Rome, March, 2009, p. 45: http://www.clubofrome.at/archive/cities_to_last.pdf

1.1 BACKCASTING TO ACHIEVE THE VISION

Methodologies and frameworks exist that help urban leaders in the process of establishing an over-arching vision towards sustainability. This process starts with getting a better understanding of what the community wants, and ends with a consensus of an overall vision. Once the vision is established, a process known as "backcasting" can be utilized.

Forecasting is the process of predicting the future based on analysis of current trends. Backcasting approaches the challenge of discussing the future from the opposite direction. Rather than trying to predict what happens in the future, we decide upfront what we want our future to be. Then we can make decisions and take steps to turn that future into a reality. It is a process of starting from a vision of success, then looking back to today to identify the most strategic steps to achieve success. After envisioning a successful result in the future, you ask, "What can we do today to reach that result?". Policy pathways are then developed to determine different ways in which these "visioned" futures can be achieved. A backcasting approach can avoid dependency on any single path and increase flexibility and innovation in decision-making for policy makers.

Backcasting will help to ensure that your actions and strategy are taking you in the direction you want to head. It is a planning methodology that is particularly helpful when problems at hand are complex and when present trends are part of the problems. In order to find flexible strategies for the transition, it is important not to try to view the future situation in detail, but rather to find guiding principles, which can act as a frame for many possible futures. See Table 1.1 below which describes the goals and backcasting developed by the city of Portland, Oregon in the US.

Table 1.1 Sustainability Plan Goals for Portland, Oregon

Activity/service	Sustainability Principle	End point goal	10-year goal	5-year goal
Electricity use	Reduce greenhouse gas emissions; reduce consumption of fossil fuels	100% green power by 2020; 50% reduction in electricity use compared to 2007	75% green power; 35% reduction in electricity use	40% green power; 20% reduction in electricity use
Water use	Reduce depletion of aquifer reserves; Reduce sewer overflows	Water use equals amount of water that falls on city annually by 2020	65% reduction in water use	45% reduction in water use
Paper use	Reduce use of natural resources	Less than 5000 sheets of 100% recycled paper used per department per year by 2015	Same as end goal	6000 sheets used per department per year

Both the visioning exercise and the backcasting exercise require multistakeholder involvement to be meaningful and useful.

1.2 IMPORTANCE OF COMMUNITY ENGAGEMENT

Urban planning efforts need to ensure input from citizens and local institutions in order to effectively spur sustainable economic development, enhance social cohesion, preserve culture and build an educated public. Because the decisions of the visioning process potentially impact many people over generations, sustainability implementation requires an especially strong foundation.

Planners in the 21st century can no longer rely solely on top-down management processes that are organized and carried out exclusively by professionals. Public participation, representing the diverse interests of communities and businesses, leads to better planning and public policy development.

Urban governments need established mechanisms that enable communities and businesses to make suggestions and receive responses. These include opportunities to participate in public debates on the future planning of their cities and their regions. The ability for government, business and civil society leaders to listen and continually learn from each other is increasingly important if cities are to be successful.

Visioning processes need to be as inclusive as possible. In this regard, urban leaders should encourage and support the active involvement of civil society organizations representing relevant groups in order to increase the effectiveness of policies aimed at improving the lives of urban dwellers, particularly the poor or those living in slums. Local organizations of the urban poor and non-governmental organizations have proven that their collective efforts can improve housing, infrastructure and services, greatly alleviating and reducing urban poverty.[3]

Participation from broad spectrums of citizen groups can also benefit budgeting processes for city services. The Asian Development Bank, for instance, is using a "participatory budgeting" approach by which a community planning strategy includes community group and citizen representatives, along with local governments agents, that collectively share in setting priorities for planning public expenditure budgeting formulation. These formulations include funding for such services as roads, drainage and other public works.[4]

1.3 ESTABLISHING GOALS AND MEASURING PROGRESS

Successful urban sustainability planning and management requires the establishment of goals and tangible measures across a number of sectors and activities, in order to assess performance. Cities actively and regularly monitor sustainability management in a wide number of areas, including:

- water quality and water supply;
- access to fresh food and farmers' or producers' markets;
- solid waste diversion including recycling and composting rates;
- access to parks and open space;
- air quality;
- access to education,
- health and family services;
- energy supply including the amount and types of renewable energy provided as part of utility electric power "grid";
- growth of green economy, including products, jobs and services;
- housing affordability;

[3] "World population monitoring, focusing on population distribution, urbanization, internal migration and development," United Nations Economic and Social Council, January, 2008, p. 29

[4] "Managing Asian Cities: Sustainable and Inclusive Urban Solutions", Asian Development Bank, 2008, p. 83

- sprawl;
- urban land footprint;
- urban eco-footprint; and
- access to public transit.

For instance, with the onset of global climate change, many cities are also beginning to actively measure greenhouse gas emissions as part of carbon reduction programmes and as a precursor to more strategically integrated climate action or low-carbon plans. The basic measurement goals of climate action plans consist of:

- establishing baseline emission and inventory forecasts;
- adopting emission reduction targets;
- implementing policies and measures; and
- measuring and verifying results.[5]

1.4 IMPORTANCE OF AN INTEGRATED APPROACH ACROSS ALL DEPARTMENTS OF LOCAL GOVERNMENT

Scalable sustainable urban development uses integrated strategy and management techniques that span traditional departmental "silos," creating cross-discipline collaboration and efficiencies. Departments that must be included in this integrated approach include:

- land use and transportation planning;
- energy and water utilities;
- building and infrastructure;
- public space greening and maintenance;
- waste, air and water resource management; brownfield management;
- food systems; and
- open space management, including parks.

Integrated planning and management systems are examined in more detail in Chapter 8, *Using Information and Communication Technologies for Smart and Connected Cities*. On the management level and across operational systems, information and communications technologies

5 "Cities to Last", Mary Dengler, Carlos Rodriguez Cascal, Eds., Club of Rome, March, 2009, p. 130: http://www.clubofrome.at/archive/cities_to_last.pdf

are being deployed to monitor and control the use of resources across cities in land uses, natural systems, buildings, transportation systems and infrastructure. The uses of information and communications technologies as applied to urban sustainability management are also examined in Chapter 2, *Delivering Effective Urban Management*.

Community engagement should become an integral part of the culture and practices of the institutional framework. With a new appreciation of critical inter-dependencies, city agencies, departments and utilities require greater alignment across municipalities with associated planning, budgeting and financing. Such strategic integration will ultimately benefit city and metropolitan government operations, as well as businesses and citizens, enabling cities to maintain and improve global competitiveness.

Furthermore, the complexity of the challenges faced by large cities requires the use of integrated strategies within city functions and departments. For instance, waste management strategies need to be developed in conjunction with waste-reduction programmes, including recycling, composting and business and resident education about consumption and waste minimization (see Chapter 5 - *Municipal Waste Management: Turning Waste into Resources*).

In the domain of planning urban transportation, the effective regional coordination of land use is necessary as the movement of people and goods and the impact of traffic are not confined within the boundaries of the city. Planning for new highways and roads needs to be coordinated with options for access to the public transportation system, including rail and bus rapid transit systems, as well as non-motorized transport options, such as walking and bicycling (see Chapter 4 – Sustainable Urban Transport).

2. CASE STUDIES

A view of downtown Sydney and its harbour.

2.1 SYDNEY, AUSTRALIA -- SUSTAINABILITY PLAN VISIONING PROCESS

Sydney, Australia's "Sustainable Sydney 2030" offers an integrated urban sustainability plan based on input from thousands of the city's residents, workers, students, planners and other experts. Sydney's inclusive approach and its resulting sustainability plan represent an example of a small, relatively wealthy city. However, its efforts can be viewed more universally for the purpose of visioning exercises in all cities, including large cities in developing countries. In 2009 Sydney had a population of 177,000, with a metro area of more than four million inhabitants.[6]

[6] http://www.cityofsydney.nsw.gov.au/AboutSydney/CityResearch/AtAGlance.asp

In terms of developing and communicating a vision for sustainability, the Sustainable Sydney 2030 plan is prefaced by describing some of the wishes for the city that were expressed during its stakeholder meetings. "Sydney people want a city…."

- "where people walk"
- "that tells its history"
- "with well-planned public transport"
- "which lifts the spirits"
- "that provides public access to the harbour's edge"
- "with self-contained communities"
- "which is a place for people of all walks of life"
- "that is respectful of diversity—cultural, religious, age, gender, sexuality and family structure"

These wishes are followed by a preface about the importance of acknowledging the Aboriginal community which lived in and around the Sydney area "for many thousands of years." This community was also consulted in relation to the development of the Sustainability Plan and its vision.

The actual vision statement of Sustainable Sydney 2030 includes three sections: "Green," "Global" and "Connected."

The *Green* part of the vision states that: "Sydney will be internationally recognized as an environmental leader with outstanding environmental performance and new 'green' industries driving economic growth." The Green vision also states the goals of reducing greenhouse gas emissions, reducing the region's urban footprint and protecting native ecologies.

The *Global* part of the Sydney vision begins with: "Sydney will remain Australia's most significant Global City and international gateway with world-class tourism attractions and sustained investment in cultural infrastructure, icons and amenities." This section then describes

the need to accommodate business activities connected to high quality jobs while supporting the quality of life needed to attract and maintain innovation.

The final vision section, *Connected*, adds: "Sydney will be easy to get around with a local network for walking and cycling, and transit routes for connecting the City's villages, City Centre and the rest of Inner Sydney." The Connected section of the Sustainable Sydney 2030 vision affirms that the City's neighborhoods shall be strong focal points, and that the city will be diverse and inclusive, celebrating and supporting its indigenous people. The section concludes with a description of how the city will commit to partnerships and cooperation between government, the private sector and the community, as well with other Australian and international cities for cultural, trade and other exchanges.[7]

The vision portion of Sustainable Sydney 2030 is followed by four major sections: "Ten Targets," "Five Big Moves," "Ten Strategic Directions" and "Ten Project Ideas."

The Ten Targets present measureable or quantifiable goals. These targets, which are intended to be reached by the year 2030, include:

1. reduce greenhouse gas emissions;
2. meet local electricity and water demand;
3. develop additional housing;
4. develop affordable housing;
5. create 97,000 additional jobs;
6. have 80 per cent of commuting by public transport;
7. have 10 per cent of trips by cycling and 50 percent of trips by walking;
8. every resident should be 10-minutes in walking from a main street;
9. every resident within a three-minute walk within a "green link;"

[7] "Sustainable Sydney 2030", "The Vision Snapshot", 2010, pp. 2-8
http://www.cityofsydney.nsw.gov.au/2030/theplan/

10. 45 per cent of people believing “most people can be trusted.”

Goals presented for 2030 provide an opportunity for backcasting, or determining what strategic directions and corresponding steps need to be taken in order to make such goals a reality by the target date.

Next, “Ten Strategic Directions” provide the Sustainable Sydney 2030 plan an ideological framework for action, while reflecting the Vision statement’s more general aspirations for the city:

1. A globally competitive and innovative city
2. A leading environmental performer
3. Integrated transport for a connected city
4. A city for pedestrians and cyclists
5. A lively and engaging city center
6. Vibrant local communities and economies
7. A cultural and creative city
8. Housing for a diverse population
9. Sustainable development, renewal and design
10. Implementation through effective partnerships

Each of the Ten Strategic Directions includes an “action/ project idea.” For example, the strategic direction of “a cultural and creative city” includes the idea of an “Eora Journey” (the indigenous people of inner Sydney were the Cadigal people of the Eora languages group). The Eora Journey advocates the development of a shared and participative cultural walk. The walk, which extends from the Sydney Harbour to the Redfern area, celebrates indigenous culture and includes an indigenous cultural center proposed along the route. The plan involved polling citizens about the

importance of cultural diversity (84 per cent said they believed that a diverse mix of people and cultures in the city is important).

Lessons Learned

The Sustainable Sydney 2030 plan represents an integrated planning process led and initiated by research and a public process that combined multi-stakeholder visioning (a wide variety of citizens including indigenous group representatives, other experts, government, and business) with action-oriented aspirations. Sustainable Sydney 2030 created the foundations of a process that developed tangible goals for 2030 grounded in current available information, including data on social attitudes and beliefs. Out of these well-managed processes, Sustainable Sydney also produced quantifiable plans for potential projects and strategic aims that collectively reflect or further develop the plan's visions, aspirations and goals.

2.2 NAIROBI METRO 2030

A view of Nairobi, Kenya.

Strategy Development Process

Like many other cities, Nairobi undertook a visioning process for its future development that looks out to 2030. The process began in 2003 and concluded in 2008. In many developing countries, the capital city is central to the economic development of the country and therefore may have a national level ministry responsible for planning its growth and development. This is the case for Nairobi. The greater metropolitan area accounts for 60 per cent of the national economy and 60 per cent of the country's urban population.

In developing the Nairobi Metro 2030 plan, consultations with stakeholders were organized to leverage broad participation and to build a sense of community ownership. Dialogue was achieved through structured meetings, solicitations through the media, and circulation of briefs on different topics. Information, views, comments, suggestions and recommendations were widely circulated. Structured meetings were organized with all levels of government, community

associations, the private sector, civil society and faith-based organizations. Experts were also sent to Singapore, China, Australia and New Zealand to capture global best practices.

Vision and Mission

The Vision of Nairobi is to be a world class African metropolis by 2030. It will strive to create a world class working environment with a wide range of jobs, transport options and communication infrastructure. It is a vision of a world class living environment with modern housing, healthcare, cultural amenities and recreational facilities. It wants to provide high quality office, production and storage space supported by a full range of ancillary services and information infrastructure. This vision should be supported by innovative and reliable local government institutions that are service oriented.

The Mission for Nairobi is to be the best managed metropolis in Africa. To do so, it must:

1. build a robust, internationally competitive, inclusive economy;
2. build infrastructure to support development; and
3. strengthen national, regional and global linkages.

Advantages and Challenges

Nairobi has many competitive advantages. It has a strategic geographic location that is a gateway to East and Central Africa. It enjoys good weather all year round. It is host to many international corporations, international development organizations and United Nations organizations. It has invested heavily in institutions of higher education. It is home to research organizations with a global reputation. It has multi-ethnic diversity and culture. It is surrounded by national parks and nature sanctuaries that are global tourist destinations.

Yet the city also has many urgent challenges that it hoped to address in its vision and strategy. It has a non-competitive metropolitan economy with old and decaying legacy industries. There is significant poverty with low human development indices, such as lack of access to housing and services, and high unemployment resulting in poor quality of life. Persistent resource scarcity, especially water and land, impede provision of economic and social infrastructure and services for housing, transport and energy. An unfavorable investment climate hamstrings the private sector. The city management is hampered by ineffective operational and financial performance, poor coordination of development planning, and inadequate budget. Poor land use planning and management often leads to conflicts and construction delays. Access to and connectivity of urban transport mobility are inadequate. Modern technologies suffer from a low adoption rate, while many neighborhoods and river systems are highly polluted. High levels of crime have led to insecure communities and business losses.

Action Plan

The city of Nairobi intends to achieve its vision through a range of integrated initiatives that address the challenges that currently restrain urban development. The plan calls for building an internationally competitive economy to ensure the metropolitan region's prosperity. Key to this will be the creation of regional and global service hubs for business, trade and finance. The plan also foresees providing better support to the Diplomatic District with improved services. Another element would be fostering tourism through investments in hotel facilities, transport and crime prevention. Related to that would be expanding the Jomo Kenyatta International Airport to increase its passenger handling capacity from 2.5 million to 9 million. Finally, the plan will develop industrial and technology parks to spur manufacturing and technology uptake.

Another key element of the plan is to invest and build modern infrastructure and utilities for the metropolitan region. This will include investing in water supply and sanitation infrastructure and services, improving storm water drainage and flood mitigation, and storing excess rain water to address scarcity issues. Inadequate energy hampers economic growth; therefore, the plan will increase access to modern energy services and enhance energy security through investing in diverse energy sources such as hydro, thermal, and biomass (municipal solid waste). Improved solid waste management will strengthen efforts to collect, re-use and recycle waste streams and to employ only sanitary landfills. Lastly, to address the digital divide, the city will develop information and communication technology networks that support business, government, education and citizenry.

Optimizing mobility and accessibility through effective transportation is another important initiative of the plan. This will be accomplished through a number of steps including a land use plan and a transport master plan. Emphasis will be given to new road construction as well as improvement of the existing road network, and special attention will be given to radial routes to outlying areas. Strategies for urban mass transit will focus on investments in high occupancy buses and modernizing the existing commuter rail network. Rail transport changes will increase penetration to the city center and allow passengers to avoid road congestion. Traffic management will increase transport system functionality, largely through flow control measures, junction improvements, a traveler information system and modern traffic management centers. The central business district will encourage pedestrianism and discourage private vehicles by reducing parking and creating access charges. Freight delivery to the central business district will be restricted to off peak hours. The city will also adopt a "zero crash" programme designed to produce significant reductions in traffic fatalities.

Great strides will be made to enhance the quality of life in the city. The Nairobi Metro 2030 plan calls for a housing programme to eliminate slums that will fast track construction of new housing with secure land tenure. An environmental management strategy calls for measures to be taken to mitigate heavily polluted water courses and mismanaged dumping sites, which both have

negative impacts on human health. The main health issues in Nairobi are all linked to the environment and include HIV/AIDS, tuberculosis and diarrhea. A medical service mapping exercise will lead to a comprehensive access to medical services strategy. A coordinated strategy is being put in place to improve access to education, including enhancing the level of literacy. Measures to improve food safety and security will improve crop and livestock processing, improvements of markets (refrigeration), adoption of certification schemes, and improved packaging.

The 2030 plan seeks to create a new image and identity for the city through effective place branding and promotion. The branding will build on the strengths of Nairobi as the gateway to Africa and the world. It needs to ensure that the social amenities that go with the branding strategy cater to the needs and aspirations of all age groups and cultures. A heritage and culture strategy will add value to creative sector strategies for the arts, museums, sports, libraries, film and media, historical heritage and tourism. Finally the plan will implement an identity-building urban design and landscaping strategy. This strategy will seek to develop urban spaces that are walkable and distinctive, are linked to the natural environment, and are safe and secure environments which can support a variety of activities and uses.

To support this vision for 2030, Nairobi will strengthen its urban management systems. It will foster new public – private partnerships to enhance services and reduce costs. Public sector investments will be targeted at leveraging private sector participation in the planning and delivery of economic and social services. It will develop a comprehensive, metropolitan geographical information system to support effective and efficient provision of city services. It will build effective metropolitan emergency services for improved safety, including new programmes for policing, fire and emergency healthcare response. Currently the city lacks a comprehensive street addressing system. A multidisciplinary team will be tasked with mapping, introducing signage, and bestowing numbers and addresses for all property in the city. Finally, efforts will be made to set clear and rigorous targets for all result areas of the 2030 plan. This will include monitoring of a set of forty indicators that cover all the key building blocks of the plan.

Lessons learned

Mayors of rapidly growing cities in developing countries face greater challenges on multiple fronts than their counterparts in developed countries. Grinding poverty and the inability to provide adequate housing, energy, water and food force mayors to address development issues before quality of life issues. But that does not preclude them from envisioning a brighter future for their city. In fact, a vision of what a city wants to achieve may only energize its citizens to strive for that goal. Mayors of such cities, in truth, may not be able to afford the expensive infrastructure solutions that have been followed in cities like London, New York or Shanghai. They have to seek more innovative, creative and lower cost solutions. Yet large cities in

developing countries can receive significantly more support from national governments and international development cooperation agencies, as such cities are often recognized to be the engines of the national economy.

3. Better City, Better Life: Best Practices For Envisioning A Sustainable City

Strategy: Envisioning a Sustainable City
Best Practice 1: Organize public visioning sessions or collect inputs online through a dedicated website for that purpose.
Best Practice 2: Establish a vision for the city through an inclusive visioning process that includes citizens from all local communities (rich and poor), community organizations, businesses, non-governmental organizations, government representatives, academia and youth.
Best Practice 3: Backcast to identify the steps needed to be taken today and in the future to realize the city's vision.
Best Practice 4: Establish a peer review process to learn from other cities that are undertaking similar projects to achieve their visions.
Best Practice 5: Establish goals and metrics in order to assess progress in reaching the city's vision.
Best Practice 6: Employ integrated planning, strategies and management efforts across all city departments to make the most effective use of resources and to realize synergies through coordination.

4. Links for Further Information

http://en.expo2010.cn/ Shanghai World Expo official site

http://www.adb.org/Documents/Studies/Managing-Asian-Cities/part02-07.pdf

"Managing Asian Cities: Sustainable and Inclusive Urban Solutions, Asian Development Bank", 2008

http://www.clubofrome.at/archive/cities_to_last.pdf

"Green Growth and alternatives to GDP: Cities to Last", Mary Dengler, Carlos Rodriguez Cascal, Eds., Club of Rome, March, 2009

http://www.un.org/popin/wdtrends.htm

United Nations Population Trends site, UN Department of Economic and Social Affairs. Includes 2008 report "World population monitoring, focusing on population distribution, urbanization, internal migration and development"

http://www.mckinseyquarterly.com/Economic_Studies/Country_Reports/Comparing_urbanization_in_China_and_India_2641 *McKinsey Quarterly*, July 2010

http://www.iclei.org/ Local Governments for Sustainability (ICLEI)

http://www.cityofsydney.nsw.gov.au/2030/

http://www.cityofsydney.nsw.gov.au/2030/documents/2030Vision/2030VisionSnapshot.pdf City of Sydney, Australia. "Sustainable Sydney Vision 2030", Vision Snapshot, 2010.

Nairobi Metro 2030, Government of the Republic of Kenya, Ministry of Nairobi Metropolitan Development, 2008, http://www.nairobimetro.go.ke/index.php?option=com_docman&Itemid=78

CHAPTER 2 - DELIVERING EFFECTIVE URBAN MANAGEMENT

To Build Friendly and Livable Communities.

Cities should promote a harmonious and friendly social environment, and build civil, safe and livable urban neighborhoods through rational planning. They should provide high-quality public services in employment, healthcare, education, housing, social welfare and other areas. They should encourage public participation in urban planning and governance, take into consideration the practical and psychological needs of migrants to the cities, and eliminate social barriers and conflicts.

Shanghai Declaration on Better Cities, Better Life

1. ISSUES AND CHALLENGES[1]

Urban leaders understand that effective management is crucial to the successful implementation of an urban development plan. As mayor, one of your first steps might be to assess if the management systems currently in place are adequate for implementing, monitoring and evaluating the implementation of the plan and the provision of related public services.

Management challenges in metro areas abound. Cities struggle every day to meet daily operational needs while at the same time investing in the future – all with limited financial resources. Perhaps the main challenge currently facing local governments of large cities in developing nations is how to provide essential services–including housing, energy, water, sanitation, health and education--to meet the basic needs of an ever-growing population. In many developing countries such growing populations include a significant amount of people who are born in or migrate into poorly managed slum settlements. Inadequate public services related to health, education, housing and a lack of security of tenure are at the core of urban poverty and vulnerability.[2] The management of urban growth also requires adequate supply of land and appropriate plans for its use and deployment of infrastructure.

[1] This chapter was authored by Warren Karlenzig, with valuable input and contributions from Wu Zhiqiang and Mohan Peck

[2] "Managing Asian Cities: Sustainable and Inclusive Urban Solutions," Asian Development Bank, Manila, 2008, p. XIV: http://www.adb.org/Documents/Studies/Managing-Asian-Cities/part02-07.pdf

Capacities to make change happen are typically diffused between many different stakeholders. Therefore, integrated approaches, methods and skills needed to enable successful cooperation and collaboration are being increasingly used. Urban management policies and practices are always likely to impact strongly on social issues, so tools and approaches for promoting social inclusion are especially important. Promotion of public participation in decision-making is vitally important in urban management. Tools for urban assessment, visioning, scenario development and strategy planning can stimulate social and organisational learning and provide a process for enhancing stakeholders' understanding of how to prepare for and manage change, risk and uncertainty. Engaging grassroots and neighbourhood level participation in urban management, including in participatory budgeting, helps put new urban solutions into practice. This can only be successful if community leaders have access to information on the alternatives and options available.

A significant urban management challenge many mayors face is land tenure. In most African and Asian cities, for example, more than 50 per cent of urban populations live on land where title is disputed or unknown. Land registration and information systems require urgent improvement. Within and around some Asian cities only 10 to 20 per cent of land holdings are formally registered.[3]

As an urban leader you will have to plan to accommodate future urban growth, including providing the urban poor with serviced land to build and improve their own housing. In doing so, measures to secure property rights are indispensable. Such measures should ensure that women's property rights are equal to those of men, even if there are cultural hurdles to that. When considering their urban area "footprint," regional and local authorities should regulate and orient urban expansion in desired areas, while prohibiting settlement expansion or development in sensitive lands, such as watershed infiltration zones, seasonal wetlands, and forested areas. Mexico City has taken this approach with its "Plan Verde" (see case study this chapter). Through the use of such a strategic growth "footprint," government can minimize negative urban impacts and be proactive in preventing environmental degradation while reducing the environmental vulnerability of the poor.

[3] Ibid, p. X: http://www.adb.org/Documents/Studies/Managing-Asian-Cities/part02-07.pdf

As mayor, you may face the challenge that your city is growing faster than its infrastructure. This can result in uncontrolled urban sprawl that destroys established communities and increases costs of service provision.[4] Sprawl also puts local economies more at risk to the economic and expected supply constraints related to both operational energy use (gasoline, natural gas and electricity) and embodied energy (including in concrete, asphalt and steel for infrastructure development).[5]

Also, urban sustainability requires that you have an effective foundation of planning for urban land forms and land uses. Well designed land use codes and zoning mitigate both carbon emissions that contribute to global climate change as well as other pollutants from transportation that impact regional air quality. Transportation emissions per capita, for instance, can be almost four times higher in low-density urban areas than in high-density areas. Cities with high densities tend to have better-developed public transportation infrastructures and lower transportation emissions. Higher density cities restrict car use and limit parking spaces; they make non-polluting mobility such as cycling and walking easier, and they provide convenient access to public transportation. In short, you need to plan for effective transportation.[6]

Effective land use planning can counter a recent trend in large cities where industry-related pollutants are decreasing while transport-related pollutants are growing rapidly (Tokyo, Beijing, Shanghai, Jakarta and Manila).[7] Some reports state that in the People's Republic of China—deaths and illnesses of urban residents because of air pollution cost an estimated 5 per cent of annual GDP. The health-related cost of air pollution in Jakarta probably exceeds $1 billion per year.[8]

[4] Ibid, p. 5: http://www.adb.org/Documents/Studies/Managing-Asian-Cities/part02-07.pdf

[5] Scientific American magazine and some studies, such as the United Kingdom's "Industry Taskforce on Peak Oil and Energy Security" http://peakoiltaskforce.net/download-the-report/2010-peak-oil-report/ have predicted a peak global oil production by 2014-2015. See "How Much is Left: 2014, The Peak of Oil," Michael Moyer, Scientific American, September 2010, p. 75.

[6] "Reinventing the City: Three Prerequisites for Greening Urban Infrastructures," WWF International (in conjunction with Booz & Company), Gland, Switzerland, 2010, p. 5: http://www.slideshare.net/itsgowri/wwf-low-carboncities

[7] Ibid, p. 45: http://www.adb.org/Documents/Studies/Managing-Asian-Cities/part02-07.pdf

[8] Ibid, p. 47: http://www.adb.org/Documents/Studies/Managing-Asian-Cities/part02-07.pdf

One aim might be to provide multi-modal mobility options and easily accessible activities that enhance the quality of life. Land use planning should include zoning for mixed uses including light industrial (where appropriate), residential, commercial, educational, recreation and other uses. These should also be oriented toward public transit, cycling, walking and organized or city-sponsored automobile sharing services. "Transportation-oriented development" incorporating economic, social and environmental considerations in the design stage reduces greenhouse gases compared to automobile-dominated development. Transit-oriented design also enables citizens and businesses to reduce automobile ownership costs.

When making a sustainable urban land use plan, be sure that the built environment not only includes parks and open space but also accommodates and leverages natural systems that provide economically valuable ecosystem services. When properly leveraged, these natural systems can help to clean polluted water and air and prevent urban flooding through natural biological and hydrological processes.[9]

Urban management systems should include the ability to plan and model whole systems that optimize transportation and the built environment, resources including energy and water, and natural systems. This comprehensive approach will reduce resource use within cities, metro areas and regions, particularly "mega-regions." ("Mega-regions" are continuous densely populated regions spanning more than 100 kilometers with as many as 100 million inhabitants.[10]) Increasingly, as metro areas expand in developing countries, greater regional management and coordination will be necessary in order to prevent or mitigate unregulated land uses including slum settlements and automobile-dependent sprawl.

Though planning higher-density metro areas is overall an effective strategy for reducing carbon emissions (higher densities with transit oriented development reduces operational greenhouse gas production), this approach can have its disadvantages. When higher metro area densities are planned and developed improperly, for instance, urbanization may destroy or reduce the functionality of ecosystem services and inhibit resident access to parks and greenways. Dense

[9] "Ecosystem Services: A guide for decision makers," Janet Ranganathan and others, World Resources Institute, 2008: http://pdf.wri.org/ecosystem_services_guide_for_decisionmakers.pdf

[10] "UN Report: world's biggest cities merging into 'mega-regions'," John Vidal, *The Guardian*, 22 March, 2010: http://www.guardian.co.uk/world/2010/mar/22/un-cities-mega-regions

urban development may also increase surface temperatures through the urban "heat island" effect.

Effective management can integrate new sustainability ideas and approaches, knowledge management and communications in order to enhance management, decision-making and reviews. As an urban leader, you should try to assess how effective your management team performs. Performance indicators are a key tool for measuring effective management. Consider one example of a technological solution called City Cockpit. It is an integrated Management Information and Decision Support System that can assist city authorities in managing growth and changes within a city based upon key performance indicators related to areas such as traffic, environment, and finance.[11]

How cities fund new management processes until they are self-sustaining is an issue faced by all urban leaders. Researching and assessing potential financing mechanisms and tools should be part of the integrated management strategy. Public-private participation in sustainable infrastructure development, for instance, should be investigated during the strategic planning phase in functional areas including water supply, sewage treatment, solid waste management and public transit.[12] Mexico City, in developing its $1 billion Plan Verde (Green Plan), worked with international non-governmental organizations as well as with public and private foundations and international development banks in order to develop successful funding partnerships.[13]

You may also wish to explore land monetization and taxation policies, which are important considerations in successfully financing sustainable development. The strategy of aggressively monetizing land assets is likely to be most successful on the level of large cities. Revenue from land monetization should be distributed equally between metropolitan area and municipal governments; such funding can provide partial support for metro-area strategic planning

[11] "City of the Future", Siemens Corporation, p. 2. Accessed 20 August 2010: http://www.it-solutions.siemens.com/b2b/it/en/global/Documents/Publications/city-of-the-future_PDF_e.pdf

[12] "India's Urban Awakening: Building Inclusive Cities, Sustaining Economic Growth," McKinsey Global Institute, April 2010, p. 75: http://www.mckinsey.com/mgi/reports/freepass_pdfs/india_urbanization/MGI_india_urbanization_fullreport.pdf

[13] "Experience Green Living," Mexico City Plan Verde website. Accessed 20 August 2010: http://www.mexicocityexperience.com/green_living/

programmes.[14] Considering the importance of large cities on national economies, measures should be taken by national and state governments to provide local governments with greater control over tax policy: they must be able to set and define the tax rates.[15]

2. MENU OF OPTIONS: EFFECTIVE MANAGEMENT

2.1. SLUM UPGRADING

Urban slums comprise approximately one billion people, according to UN Habitat, and are expected to double by 2020.[16] In terms of urban planning and design, though, instead of being perceived only as locales of grinding poverty that need to be eradicated, slums are increasingly being upgraded. They are high density, pedestrian-friendly, mixed-use, made from recycled material, adaptive to changing conditions and can be socially inclusive with strong neighborhood social networks. What they need are provision of basic services, more public safety, and better integration into the local economy.

Some of the latest approaches to slum urban development work focus on improved stakeholder participation in planning improvements. The planning group should consist of representatives from the slum community, the local small-business community, service providers, financial institutions, local institutions, non-governmental organizations, community-based organizations, and other citizens. One of the most common approaches for slum upgrading has been the "in-situ" method of upgrading infrastructure including water, utilities, buildings and streets. Working with local leadership councils and implementing improvements on a localized scale helps cities

[14] Ibid, pp. 74-80: http://www.mckinsey.com/mgi/reports/freepass_pdfs/india_urbanization/MGI_india_urbanization_fullreport.pdf

[15] "Managing Asian Cities: Sustainable and Inclusive Urban Solutions," Asian Development Bank, Manila, 2008, p. XI: http://www.adb.org/Documents/Studies/Managing-Asian-Cities/part02-07.pdf

[16] "Course on 'Upgrading informal urban settlements' being developed," the World Bank, accessed 28 September 2010: http://wbi.worldbank.org/wbi/news/2009/10/16/course-upgrading-informal-urban-settlements-development

successfully upgrade the conditions of their slums without changing the essential layout and fabric of the community.[17]

The main reasons why rehabilitation and upgrading offer the most feasible solutions to the problems presented by slum and squatter settlements include:

- the burden on public funds can be considerably less than for public housing and relocation, if upgrading programmes are designed using principles of affordability by the residents and the mobilization of popular action;
- the provision of security of tenure and access to credit, and people's participation in terms of savings and labour can be mobilized and directed to upgrading activities;
- there are political and practical reasons against relocating total communities on the scale that is common in many cities;
- given the precarious nature of the informal sector activities (community dependency, location, etc.), relocation removes people from employment sources and reduces their capacity for economic survival; it is difficult to transplant informal sector activities to public housing and apartment blocks and expect them to survive;
- social and economic survival of slum and squatter communities depends to a large extent on community organization and neighbourhood relationships. Relocation and public housing destroys the social fabric of poor urban settlements.

2.2. IMPROVE LAND REGISTRATION SYSTEMS

Poor land registration systems can be a large damper on urban development in developing countries. Improving such systems would provide numerous benefits, among them security of ownership and land tenure rights, as well as more efficient land transfers, and the ability to use a land title as collateral for loans. Improved land use and management can directly provide better information on land ownership and rights for physical planning and can facilitate the

[17] "Vietnam urban upgrading programme," the World Bank, accessed 28 September 2010: http://info.worldbank.org/etools/urbanslums/Map.html

development of other planning tools such as information banks covering land use, land values, population etc. It can also provide a tool to restrict certain land uses with a negative environmental impact. The expenses for improving land registration systems can be quickly recovered by increased property tax revenues.

In reforming land registration systems, urban managers can face institutional, technical and economic challenges. Efforts can be hampered by shortage of skilled staff and lack of interdepartmental coordination. Technical problems may include the inefficiency and inflexibility of the existing system and the high standards required for land surveys. While the financial costs of improving land information systems are often not small, it has been shown in many countries that the costs for improving the registration system can be recovered within a very short time span with revenues from land transfers and/or property taxes. It should also be noted that registration of such a scarce and valuable commodity such as land may also be a politically sensitive matter.

2.3. LEVERAGING PRIVATE SECTOR PARTICIPATION

Public-private partnerships are a rapidly evolving means and model for both the financing of and the delivery of city services. Public-private partnerships are considered "creative alliances" formed between a government entity and private companies to achieve a common purpose. A wide range of interests have joined these partnerships—including non-governmental institutions, health care providers, educational institutions, non-profit associations, such as community-based organizations, and intermediary groups, such as business improvement districts. Partnerships have been most common in energy systems and infrastructure, waste management, wastewater treatment, and public transportation infrastructure planning and development.

In North America, these partnerships have completed real estate projects including mixed-use developments, urban renewal through land and property assembly, public facilities such as convention centers and airports, and public services such as affordable housing.[18] Projects in the

[18] "Ten Principles for Successful Public Private Partnerships," The Urban Land Institute, February 2005: http://www.uli.org/ResearchAndPublications/Reports/~/media/Documents/ResearchAndPublications/Reports/TenPrinciples/TP_Partnerships.ashx

nations of Asia and Latin America have focused on transportation (Bus Rapid Transit in Mexico City), wastewater (Guangzhou and Beijing), solid waste (Shenzhen, China) and telecommunications (India).[19] Successful public-private partnerships are predicated on factors that include proper preparation, securing coordinated leadership, creating a shared vision among stakeholders, gaining participation of the non-profit sector and civil society, understanding and communicating risks and rewards, negotiating a fair "win-win" deal, and establishing a decision-making process that stakeholders consider clear and rational.[20]

In some large cities at the level of functional city services, cities are moving to a model of greater corporate participation from the department level down to the level of service provision or even project management. Agencies or services such as transportation, water supply, and waste management have been cost-effectively managed through public-private partnerships. Cities utilizing these approaches are sometimes more able than public agencies to effectively and quickly tap into the private industry networks of expertise that are needed for complex departmental functions and capital-intensive projects.[21]

2.4. NEW MODELS FOR STRUCTURING, MANAGING AND MEASURING CITY PERFORMANCE

New models are emerging to structure, manage and measure critical strategic changes needed for sustainability planning. One model, for instance, makes use of two tools for describing, measuring and managing city sustainability: strategy maps and "balanced scorecards." This strategic approach has been widely used in the corporate sector in China, North America and Europe. For municipal government sustainability functions, the US city of Charlotte, North Carolina used the balanced scorecard approach to monitor sustainability-related initiatives using relevant metrics for greenhouse gas reduction, transportation and land use planning, wastewater

[19] "Cities and Green Growth: Issues Paper for the 3rd Annual Meeting of the OECD Urban Roundtable of Mayors and Ministers," 25 May 2010, OECD Conference Center, Paris, p.33

[20] "Ten Principles for Successful Public Private Partnerships," The Urban Land Institute, February 2005: http://www.uli.org/ResearchAndPublications/Reports/~/media/Documents/ResearchAndPublications/Reports/TenPrinciples/TP_Partnerships.ashx

[21] Ibid

management, and natural system conservation.[22] For instance, Charlotte developed a one-page graphically illustrated strategy map for the process, which provided the city's critical objectives, combined with desired goals, and enabling objectives. Charlotte used the balanced scorecard-type approach to parse the city's critical strategic objectives, such as "maintain water quality national permit compliance," into measures, ("per cent/number of incidents out of compliance"), targets ("achieve 100 per cent compliance by 2012") and, finally, actionable city and department initiatives.

2.5. NATURAL DISASTER RISK MANAGEMENT

Urban management systems should also incorporate comprehensive risk management strategies. Risk management is fast becoming a major priority for city governments because of regional climate change impacts, including drought, extreme heat events and flooding. A significant number of large cities are located in areas susceptible to flooding. The Intergovernmental Panel on Climate Change has estimated global sea level rises of 0.18 to 0.59 meters this century.[23] Large vulnerable cities in developing nations include Dhaka, Jakarta, Tianjin, and Manila. The increase of less predictable and potentially violent or dangerous weather events has the greatest implications for those residing in poor quality housing, which is frequently located in flood-prone or geologically unstable zones.[24]

Disaster risk management stresses the need for active participation of local actors in design, development, implementation and monitoring of activities related to phases of disaster cycles. Cities can better prepare for natural disasters through preparation and publicizing of hazard maps and evacuation routes, as well as through development of early warning systems (including cell phone text-based system for those who may not have other communication devices). Anticipation of likely natural disasters that may occur on a repeated basis, such as tropical cyclones and

[22] "Charlotte's Balanced Scorecard," Lisa Schumacher, City of Charlotte, North Carolina, United States, PowerPoint Presentation, 2007: charmeck.org/.../charlotte/.../City%20of%20Charlotte%20Balanced%20Scorecard.pdf

[23] "Coastal zones and sea level rises," United States Environmental Protection Agency website, accessed 27 August, 2010: http://www.epa.gov/climatechange/effects/coastal/index.html

[24] "Managing Asian Cities: Sustainable and Inclusive Urban Solutions, Asian Development Bank, Manila, 2008, p. 45: http://www.adb.org/Documents/Studies/Managing-Asian-Cities/part02-07.pdf

hurricanes, necessitate coordinated evacuation drills and the development of special shelters for citizens.

An early warning system, specified evacuation procedures and the construction of cyclone shelters in Dhaka and other parts of Bangladesh, for instance, have significantly reduced deaths from these seasonal tropical storms that include high winds, heavy rainfall and often inundate low-lying areas with tidal flooding. Cyclones and sea level rises are thought to be exacerbated by global climate change, thus Bangladesh's natural disaster risk management activities can also be classified as climate change adaptation, which can potentially make its cities eligible for international funding addressing climate change.[25]

2.6. PROACTIVE REGIONAL PLANNING FOR URBANIZATION

Proactive regional urban planning approaches have been carried out on a national level in China, where planning focused on the creation of new urban areas in specific coastal locations. The nation purposely shaped a pattern of dynamic urban concentration on its East Coast at the beginning of its modern economic development period for a number of economic and geographic reasons.[26] China's announcement in August 2010 indicates that it is now moving in a similar proactive direction for sustainability planning: the National Development and Reform Commission endorsed a low-carbon pilot programme for the eight cities of Baoding, Xiamen, Hangzhou, Guiyang, Nanchang, Chongqing, Shenzhen, and Tianjin as well as for low-carbon pilot programmes in five provinces. This undertaking demonstrates a significant sustainability-related approach in proactive regional planning for urbanization. Under the low-carbon cities programme, the eight municipalities and five provinces will plan for low-carbon industry

[25] "Investing in a safe future," Australian Government, June 2009, (accessed 28 September 2010): www.ausaid.gov.au/publications/pdf/disasterriskreduction.pdf

[26] "India's Urban Awakening: Building Inclusive Cities, Sustaining Economic Growth," McKinsey Global Institute, April 2010:
http://www.mckinsey.com/mgi/reports/freepass_pdfs/india_urbanization/MGI_india_urbanization_fullreport.pdf

technology investment while attempting to reduce citizen and municipal energy consumption on a regional basis.[27]

Greater London's Master Plan uses a top-down planning process with a multiple-decade time horizon. London's plan differs from other multi-decade planning initiatives in that it addresses the economy, transportation and housing at general levels that increase in complexity when moving down to the individual borough level, which is the smallest scale unit of administrative governance or the most local level of government in London. Micro-planning is applied in detail in all 32 of the metro area's boroughs. By this mechanism the city has addressed, for instance, land use planning issues 20 years in advance, such as congestion planning of peak morning traffic on a neighborhood basis.[28] The Greater London Authority and its boroughs share authority in planning.

[27] "China launches low-carbon pilot in select cities, provinces," Online People's Daily, 19 August 2010, accessed 15 September 2010: http://english.peopledaily.com.cn/90001/90778/90862/7110049.html

[28] "India's Urban Awakening: Building Inclusive Cities, Sustaining Economic Growth," McKinsey Global Institute, April 2010, p. 107:
http://www.mckinsey.com/mgi/reports/freepass_pdfs/india_urbanization/MGI_india_urbanization_fullreport.pdf

3. CASE STUDIES

3.1. NEW YORK CITY: ROLE OF INTEGRATED SUSTAINABILITY PLANNING AND MANAGEMENT

A view of New York City's Manhattan skyline at night.

In 2007 New York City and its mayor, Michael Bloomberg, released a plan to make the city, the largest in the United States, into a more sustainable city by 2030. Called PlaNYC, it sets goals for reductions in energy and water use, culminating in a planned 30 per cent reduction in

greenhouse gas emissions by 2030. The greenhouse gas emission reduction goal was later codified into law under the Climate Protection Act (Local Law 55).[29]

Besides reducing greenhouse gas emissions and water use, PlaNYC creates a rich assessment of quality of life in the city of more than eight million, sometimes illustrating issues by using stories about real people living in the city, such as a six-year-old boy named Sasha. Using breadth and depth of analysis written in direct, non-academic language for the average citizen, PlaNYC covers housing, open space/parks, brownfields, water quality, water supply network, transportation, energy, air quality, climate change, and city street greening.

The plan provides numerous detailed maps showing the location of city amenities in 2007 in the context of future conditions that the plan will be addressing. A map of "Current Playground Access and Proposed Schoolyard-to-Playground Sites," for instance, plots 290 under-utilized schoolyard sites throughout the city that could be converted to public playgrounds. Shaded areas indicate on a neighborhood-by-neighborhood basis where there is "adequate" existing playground access and where there is "inadequate" playground access, as well as non-residential open space.[30]

PlaNYC 2030 was based on input from town hall meetings and roundtables with thousands of citizens as well as business leaders, advocacy organizations, leading academic experts and practitioners from various sustainability disciplines. The city also set up a website by which to receive input for the plan before it was drafted.

New York City developed the plan to face the challenge of adding nearly one million more residents by 2030 with an increasingly antiquated infrastructure network (the city's subway system, for instance, dates back as far as 1904).[31] Mayor Bloomberg also predicted that the

[29] "PlaNYC 2030," New York City, United States, accessed 20 August 2010. Site includes 2007 Plan: http://www.nyc.gov/html/planyc2030/html/home/home.shtml and 2010 Plan Update: http://www.nyc.gov/html/planyc2030/downloads/pdf/planyc_progress_report_2010.pdf

[30] New York City PlaNYC 2030, Open Space, p. 32-33: http://www.nyc.gov/html/planyc2030/downloads/pdf/report_open_space.pdf

[31] http://en.wikipedia.org/wiki/New_York_City_Subway

coastal city would be facing an increasingly unpredictable and volatile environment, ostensibly from the impacts of climate change.[32]

In order to help develop and manage the plan, the city reorganized its departmental functions to reflect the growing importance of sustainability in urban issues. New York City was the first major US city to merge its sustainability and planning management functions in 2007,[33] a move that was followed by US green city trendsetter Portland, Oregon, a small city of about 600,000. New York City's Long Term Planning & Sustainability Office coordinates and oversees efforts to develop and implement a strategic vision for the City's future through coordination with city agencies and the Mayor's Advisory Board for Sustainability.

The city developed several major goals as part of PlaNYC 2030, including:

- Turning a landfill into the largest city park developed in more than a century
- Expanding a subway line to augment the nation's already highest rate of public transit use: use forecasts were made on all the city's subway lines through 2030 to determine congestion based on demographic and ridership trends
- Launching a public outreach effort to get citizen and community input on developing plans and projects, or what Mayor Bloomberg called "a citywide conversation"
- Developing an inventory of more than 1,300 neighborhood playgrounds to see where more are needed
- Developing power plant efficiency forecasts for next 25 years
- Creating and preserving affordable housing for 500,000 residents by 2013
- Phasing out pollution-causing trucks using heavy-diesel fuel in the city fleet
- Lowering global warming carbon emissions by 30 per cent by 2030
- Developing a new tunnel and filtration plant for water delivery to the city from its protected upstate fresh water sources

[32] New York City PlaNYC 2030: http://www.nyc.gov/html/ops/html/long_term/long_term.shtml

[33] New York City Office of Long Term Planning & Sustainability, New York City, United States, 20 accessed 20 August 2010: http://www.nyc.gov/html/ops/html/long_term/long_term.shtml)

The 2007 plan also set 127 individual milestones for which the city has actively tracked progress toward its original goals by issuing a 2010 progress report. The 2010 report indicated that: 72 of the 127 milestones were achieved or mostly achieved; 41 milestones were not yet achieved; 11 milestones were reconsidered; and 3 milestones were reported as "not available" in 2010.

By category, New York City's plan addresses eight major areas for which it conducted planning meetings for input that included the presentation of research and discussion of the larger goals and more detailed milestones. A summary of the goals and milestones the city achieved between 2007 and 2010 in seven categories is outlined below:

Land Use and Transportation Planning: The city completed 19 land use re-zonings that direct development to areas well-served by transit. The city added a Bus Rapid Transit line and more than 200 miles of bicycle lanes. New York developed pedestrian plazas with successful conversions of auto-dominated space to pedestrian and mini-park space in Times and Herald squares.

Air Quality: The city enacted a clean air law for public school buses, reducing emissions that children and residents are exposed to and lowering the retirement age of buses with old technology that produce more pollutants.

Water Quality and Supply: New York City acquired almost 29,000 acres of land to protect its water supply. All 14 of the city's wastewater treatment plants were able to meet national ambient water quality standards for pollutant removal by 2010.

Green Buildings: The city passed a green building plan that requires sweeping code changes for greater energy efficiency and implementation of renewables, including solar thermal hot water heating units.

Street Greening: After first doing an inventory on the number of trees in the city--five million trees were tallied--PlaNYC 2030 set out to increase that number by 20 per cent, or one million. The city reported planting more than 322,000 trees by the time of its 2010 plan update.

Energy/ Energy Efficiency (includes greenhouse gas emissions reductions): New York City completed 86 energy efficiency projects in its government buildings as part of an effort to reduce city greenhouse gas emissions 13 per cent by 2017.

Parks: PlaNYC 2030 utilized an effective metric for determining how easily residents can access their local parks: that is, how many city residents live within a 10-minute walk of a public park? Even with more than 29,000 acres of parks, New York City has less park land per resident than average US cities.[34] The plan stated the importance of improving access to parks in underserved neighborhoods where parks have been scarce. By strategically adding 300 acres of parks between 2007 and 2010, the city reported an 8 per cent increase in the number of residents that live within a 10-minute walk of a public park, with 84 per cent of city residents having such access in 2010, up from 76 per cent in 2007 when PlaNYC 2030 was released. The plan has a goal of having a public park within a 10-minute walk for nearly every resident of the city by 2030.

Another exemplary approach undertaken by PlaNYC for improving park access was to convert schoolyards to public playgrounds: between 2007 and 2010, 113 schoolyards were converted to public playgrounds.[35]

City Fleets: The city greened 25 per cent of its taxi fleet with the introduction of hybrid gasoline-electric vehicles.

Lessons Learned:

New York City's PlaNYC 2030 is credited by experts as one of the best examples to date of an integrated sustainability management plan because of its widespread citizen and expert input, its associated executive and legislative leadership, effective analysis and communications, metrics and transparent follow-through. Interestingly, one indicator of the plan's success besides tangible and widespread areas of progress has been the ability of the plan to adapt to changing times and conditions by reconsidering a limited number of milestones. The 2010 progress report declared that 11 milestones, or about nine per cent of 127 total plan milestones, were no longer relevant or feasible.[36] One of these reconsidered goals was making 43 high school fields available for

[34] See pp. 32-33: http://www.heartpark.org/RedondoBeachIsParkPoor.pdf

[35] PlaNYC Progress Report 2010," City of New York, United States, April 2010, p. 16: http://www.nyc.gov/html/planyc2030/downloads/pdf/planyc_progress_report_2010.pdf

[36] "PlaNYC 2030," New York City, United States, accessed 20 August 2010. Site includes 2007 Plan: http://www.nyc.gov/html/planyc2030/html/home/home.shtml and 2010 Plan Update: http://www.nyc.gov/html/planyc2030/downloads/pdf/planyc_progress_report_2010.pdf

competition athletics throughout the city. The economic crisis combined with a thorough analysis of expected costs from such a programme convinced city officials to reconsider the goal.[37] Demonstrating flexibility on particular milestones illustrates that changing conditions need not mire entire sustainability plans with a lack of progress but instead can actually strengthen the overall planning process.

3.2. SLUM UPGRADING IN PHNOM PENH, CAMBODIA[38]

Substandard housing and squalor typifies these slum dwellings in Phnom Penh.
Photo credit: Dr. Stephen C.F. Chan

Phnom Penh has experienced extensive development, but commercial and public interests have remained on a collision course with the specific needs of the urban poor. As a result, the poor have been left worse off and struggling to secure a place in the aggressive commercialization of land markets.

[37] "PlaNYC Progress Report 2010," City of New York, United States, April 2010, p. 22: http://www.nyc.gov/html/planyc2030/downloads/pdf/planyc_progress_report_2010.pdf

[38] UN Habitat, State of Asian Cities Report 2010/11, Ch. 4, Box 4.11

In 1998, the Squatter and Urban Poor Federation together with other non-governmental organizations and the Phnom Penh municipality established the Urban Poor Development Fund to provide shelter loans to a specific community to support their relocation from a forthcoming inner-city development project. Since then, the Fund has diversified in response to other community needs. The Fund has supported the development of a new City Development Strategy, the basic principle of which was the vital need for a vision of the city's development that was shared between various stakeholders.

The Urban Poor Development Fund provides low-interest loans for housing, improved settlements and income generation for the benefit of those urban poor communities that are actively involved in a community savings process. Loans are made only to communities, not to individuals, through their savings groups.

Besides providing a much-needed source of affordable credit, the Fund supports the poor in several ways:

- adding capital to community savings accounts to help community residents overcome financial constraints
- innovations in housing and settlement improvements, as well as negotiated tenure formats that demonstrate fresh solutions and test new kinds of institutional set-ups.

Following the establishment of the Fund, in 2004 UN Habitat and the City of Phnom Penh launched a partnership for Urban Poverty Reduction to strengthen the human dignity of the urban poor. Poor communities were supported in efforts to form community organizations that launched community consultations on local problems. The communities then initiated negotiations with city authorities and built working relationships between the communities and the Phnom Penh municipality. These negotiations led to the financing and execution of site improvements identified in the community.

The aims of the partnership were to strengthen the self-confidence, competence and dignity of the urban poor by reducing their poverty, vulnerability and social exclusion through:

- empowering communities to improve their access to affordable basic services and better living environments;
- optimizing the outcomes of the community-based infrastructure and basic services provision in slum and squatter settlements in Phnom Penh from lessons learned in the use of the Urban Poor Development Fund;
- promoting the direct involvement of poor communities in the design and implementation of improvement activities;
- assisting the municipality in achieving the target of "improving 100 slum-squatter settlements per annum," a commitment made by the Cambodia Prime Minister in May 2003.

A range of activities were undertaken to meet those aims. Community Action Plans were implemented in the areas of water and sanitation, drainage, solid waste disposal, access roads and walkways, health and income generation as proposed by communities. Housing was improved or upgraded either in the slums or at relocation sites. Municipal staff were trained in the implementation of pro-poor policies and on partnering with poor communities. Key to the success was the direct involvement of poor communities in the design and implementation of slum upgrading activities.

As a result of these activities, over 160 new community organizations formed. More than 350 improvements in community infrastructures and basic urban services were achieved, such as footbridges, concrete lanes, drainage and toilets – many built by the communities themselves. More than 31,000 families benefited from such improvements, which resulted in a greater sense of ownership by participating communities. More positive perceptions were created within the poor communities of themselves and of the local authorities by becoming a part of municipal decision-making. And human dignity was improved through better living conditions.

Lessons Learned:

Supportive approaches such as slum upgrading efforts are founded on the belief that slum and squatter settlements have an inherent potential for improvement. Supportive policies seek the inclusion of slum and squatter areas in the urban development process, as well as the social and

economic integration of the residents into the surrounding communities. Supportive policies should be designed to improve the conditions in slum and squatter settlements. For example, security of land tenure acts as a stimulus for residents to improve their own dwellings and provide for some of their needs as a community; therefore local governments should wherever possible legalize slum plots, either on an ownership or leasehold basis. The most successful upgrading approaches are those that combine efforts of local governments with those of the business community, finance institutions, community-based organizations and non-governmental organizations.

3.3. GHANA IMPROVED LAND REGISTRATION SYSTEM[39]

Since independence the citizens of Ghana dealt with a dysfunctional land administration system resulting from two overlapping systems: the inefficient state land bureaucracy and customary tenure. Long and expensive procedures taking up to 5 years and involving 6 different agencies discouraged many from utilizing state institutions to register land. Many instead dealt with land issues by means of unrecorded, traditional practices within clans or tribes. The turning point was the establishment of land administration reform by the Ministry of Lands, Forestry, and Mines. This reform was piloted in greater Accra and the city of Kumasi.

About 80 per cent of land in Ghana is held by the customary owners: tribes and their leaders, clans and families, and "tendamba" — traditional owners of land and groves, typically the first settlers in communities. The remainder belongs to the state.

During colonial times data on land ownership were not comprehensively recorded. According to custom, most transactions happened without documentation, and boundaries were not defined by surveyed maps but by such physical landmarks as hills, streams, and trees. Because landmarks are not a reliable way of delimiting land, litigation over ownership and boundaries was a constant problem.

[39] Peter Kuntu-Mensah, On the Implementation of Land Title Registration in Ghana, FIG Regional Conference, Accra, Ghana, 2006

Attempts at reform - Numerous attempts at correcting the situation were initiated and failed, including the 1962 Land Registry Act, which disallowed the registration of the oral transactions and made it compulsory to register all instruments affecting land. The deeds registration system however failed to ensure title security. Its flaws included inaccurate maps, multiple sales of the same parcel, use of unapproved development schemes, haphazard developments, conflicting land uses, and time consuming land litigation, among others.

Then in 1986, the government enacted the Land Title Registration Law, introducing title registration as the official system for recording property. The purpose of the new system was to promote title security by registering the title rather than just the transaction. Under title registration the registrar and the state guaranteed the title and its authenticity and there would no longer be any need to trace ownership back to the root title. The new law also promoted accurate parcel or cadastral maps to reduce fraud and multiple registrations of the same parcel.

But implementation of registration proved slow. By some accounts, less than 5 per cent of land in these districts had been registered 15 years later. A 1996 study reported an average turnaround time of 5 years to secure concurrence to a private land transaction. As a result, only 10 per cent of land buyers in the two pilot cities ever approached the Lands Commission for official certification, choosing instead to ignore the law.

The reasons for the failure were many. The reform was inadequately funded and resourced and suffered from personnel and logistical problems. There was also widespread duplication of efforts and lack of coordination among land administration agencies, notably the Title Registry and the Lands Commission.

Much of the confusion was due to lack of public outreach. The Land Title Registration Law was not publicized widely enough and the public remained largely unaware of the change in legislation. Public education was conducted mainly through the distribution of flyers and brochures, while 40 per cent of the population was illiterate.

The government realized that it was failing in its goal to secure land tenure in the country. Problems were particularly acute in the urban and peri-urban areas, where the growing population and rapid urbanization increased the social and economic demand for land. In those areas, tribal chiefs often sold communal land to commercial entities and small farmers were then

forced off their land. The resulting homelessness, poverty, and violence showed that land tenure security was a problem not just of economic development but of basic rights.

Effective land administration reform - It was at that point that the government Ministry of Lands, Forestry, and Mines introduced the National Land Policy in June 1999. The policy outlined the bottlenecks to efficient and effective land administration, stressing such problems as indeterminate boundaries, weak and fragmented land administration, and inadequate tenure security. The new government implemented the policy through the Land Administration Programme. The programme, supported by international donors, is to last 15–20 years and consists of 5-year phases. The first phase, known as the Land Administration Project, began in 2003.

The goal of the Land Administration Project is to create a sustainable and well functioning land administration system that is fair, efficient, cost effective, decentralized, and provides land tenure security. The launch of the project created public awareness of land management problems throughout the country. Special emphasis was given to education. Public figures became involved, including the president.

The Ministry of Lands, Forestry, and Mines then began exploring ways to resolve the disagreements and lack of coordination among the various land administration agencies. In May 2006, the Ministry issued a directive calling on all agencies of the government to observe the new law, and the Lands Commission was ordered to stop registering deeds belonging to family and individual owners in the compulsory registration districts. The results were impressive. Within 34 days anyone could complete a property transaction in one of the pilot districts.

The directive, which went into effect on 1 June 2006, dramatically increased the workload of the Land Title Registry. To keep up with the demand, the registry recruited new staff and began computerizing its databases in 2008. Information technology is helping the agency deal with the heavy workload brought on by the change and is further reducing the time required to search for a title.

The Ministry of Lands, Forestry, and Mines is working to sustain its progress within the framework of the Land Administration Programme and is working to expand the registry's

operations to the rest of the country. The Ministry has already established 6 land registries under the Land Administration project, one in each regional capital in addition to the two already in Accra and Kumasi.

Lessons learned:

First, the success of any land registration reform is contingent upon a well-designed public outreach campaign. Lack of such a programme can only lead to confused applicants and cumbersome transactions.

Second, lack of coordination and turf battles among existing government authorities can hamper efforts. Duplication and bottlenecks must be overcome, which often require negotiations.

Third, it is crucial to build the capacity to implement reforms. After publishing the Directive in May 2006, the Ministry of Lands, Forestry, and Mines had to recruit new staff and computerize databases in order to allow the registry to deal with the higher workload, thus smoothing the transition for Ghana's landowners.

3.4. MEXICO CITY'S PLAN VERDE

Mexico City has made enormous strides in reducing urban air pollution. Photo courtesy of UN Habitat.

Mexico City has improved its dubious standing of two decades ago, when it was the world's most polluted city. In an interview some years later, the city's mayor described that birds were literally dropping dead in mid-air from air pollution.[40] Its achievement is due to an ambitious and far-reaching plan impacting city management and citizen actions, called "Plan Verde" (Green Plan). In 1990, there were a total of 333 days in the nation's capital in which the ozone level rose above the Mexican national standard. By 2009, the number of days above the standard fell to 180. In

[40] "Marcelo Ebrard, the battle-hardened and reform-minded mayor of Mexico City," City Mayor Interviews, 10 June 2010, accessed 10 September 2010: http://www.citymayors.com/interviews/ebrard-interview.html

addition, the average hours per day that the ozone standard is above the norm has also fallen--from an average of 4.9 hours per day in 1990, to just 1.5 hours per day in 2009. In 2010 this large city of about 20 million citizens no longer ranked among the top 10 cities with the world's worst air quality.[41]

In 2006, Mexico City developed its 15-year Plan Verde to reduce carbon emissions by seven million metric tons between 2008 and 2012. Nearly 20 city agencies are working together to optimize the city's $1 billion-per-year investment in the plan, which represents about seven per cent of Mexico City's total yearly budget.[42] In addition to bettering air quality, the plan has other major goals. Plan Verde includes what it refers to as "seven pillars":

1. land conservation;
2. public spaces;
3. air pollution;
4. waste management and recycling;
5. water supply and sanitation;
6. climate action planning; and
7. transportation and mobility.

Plan Verde includes major financial investments in public transportation, recycling programmes, and in developing new green spaces. The city's efforts to control atmospheric pollutants include replacing aging taxis, microbuses and government fleets with lower emission vehicles, introducing a bike-sharing programme, and building a world-class bus rapid transit system. In addressing its regional air quality challenges, the city was able to significantly impact its global greenhouse gas emissions. Mexico City reported reduced greenhouse gas emissions by 2 per cent

[41] "Mexico City presents comprehensive plan to tackle environmental conditions," City Mayors, 1 May 2010, http://www.citymayors.com/environment/mexico-green-plan.html

[42] "Experience Green Living," Mexico City Plan Verde website. Accessed 20 August 2010: http://www.mexicocityexperience.com/green_living/

after the first year of the plan, or 750,000 metric tons. Plan Verde also includes a business and citizen education component.[43]

Waste Management - Mexico City is attempting to transform one of the world's largest waste management systems into a showcase for Latin America. The city is implementing an ambitious recycling programme that aims to increase the amount of trash recycled by 79 per cent. Management of solid waste under the plan promotes recycling in households, commercial and service businesses and industrial facilities. Plan Verde has also developed a permanent education campaign to encourage the separation of waste into organic and inorganic waste. Mexico City is building new state-of-the-art waste disposal facilities and modernizing all other waste selection plants so it can recycle, compost or burn for energy 85 per cent of Mexico City's trash by 2012.

Land and Eco-System Services Conservation - 59 per cent of the total area of the Federal District is designated as conservation land. In order to protect this highly valuable land, Mexico City is creating a specialized surveillance corps to enforce the laws and restrict settlements on conservation land. Mexico City has created a special police unit of 1,500 officers to enforce environmental regulations in the land conservation areas. The Federal District under the Plan Verde has a regional emphasis on land and ecosystem services conservation, including analyzing and protecting clean air, food, forests and water surrounding the urban area. Mexico City is restoring the nearby Magdalena River Basin and Eslava River Basin, planning on reversing their degradation by 100 per cent by 2012. The city also plans to protect 27 per cent of the conservation land through the establishment of a payment system for environmental services to the owners of regional forests who abide by the city's conservation requirements under Plan Verde.

Water Supply and Water Quality - The unique geographic characteristics of the Valley of Mexico City presents challenges to the city's water supply. Water is a vital commodity for Mexico City, as the Valley of Mexico is prone to periods of drought that may become more frequent with the impacts of climate change. In 2009, low-reservoirs due to drought caused the

[43] Plan Verde web site, Mexico City, Mexico. Accessed 20 August 2010. http://www.sma.df.gob.mx/planverde/ also see: http://www.mexicocityexperience.com/green_living/ "Earth Day and the World's Cities," Marcelo Ebrard, 17 April 2008: http://www.huffingtonpost.com/marcelo-ebrard/earth-day-and-the-worlds_b_541708.html

city to ration water to five million of its residents.[44] Mexico City is investing in treatment and recovery systems that will reduce water leaks and losses, such as modernizing the Mexico City Water System infrastructure. The water recovery strategies outlined in the Green Plan can result in water savings of up to four cubic meters per second. In addition to modernizing its water supply network by replacing 100 per cent of obsolete or damaged pipes by 2012, Mexico City is increasing the reuse and treatment of water by improving the drainage system and building water treatment facilities in key city locations. The city has also started a social awareness campaign to educate businesses and consumers of their role in reducing water consumption and improving water efficiency.

Habitability and Public Space - Mexico City is retrofitting its arid cityscape with rooftop gardens and green roofs. The city aims to install 500,000 square feet of garden roofs by 2012. It has a goal of increasing green public spaces, ensuring nine square meters of green space per resident, an increase of 3.6 square meters from 2008 levels. New green roofs, parks and gardens will not only transform the image of the city and improve the quality of life of its communities, but also filter pollution, cut energy use, and absorb noise. The new green public spaces will be strengthened with eco-system services such as treated water networks and rainwater collectors. Cultural amenities under Plan Verde include park benches, play structures and access ramps for children, seniors and disabled people along with improved public lighting.

Air Quality and Transportation - Mexico City is devoting significant resources to improving the air quality in its metropolitan area. To reduce the effects of population growth and an increased vehicle fleet, the city has plans to replace 100 per cent of official government vehicles with fuel-efficient and low-polluting units by 2012. The trend of clearer skies continues. In the first three months of 2010, there were 24 days when the ozone level was above the standard (just 26.7 per cent of total days), with the average hours per day above the level falling to just 0.8 hours.

To improve mobility choices, Mexico City is devoting significant resources to increasing safe and energy-efficient mass transportation in the city. The city is investing $2 billion to construct a 12th metro line by 2012 and is providing subsidies to replace taxis with newer, more energy

[44] "Back to the Source," National Geographic magazine, April 2010, p. 23.

efficient and cleaner vehicles. In addition to these projects, Mexico City has restricted private vehicle usage on certain days and in certain high-traffic zones as part of the "Hoy No Circula" programme that reduces both traffic and emissions. It has also introduced a bicycle mobility strategy that includes free bike rentals and the creation of 21 kilometers of new bicycle paths in 2009, with further expansion in future years. The city is building bicycle parking infrastructure at major Metro subway stations. These programmes are intended to help the city achieve its goal of increasing bicycle trips from one per cent to five per cent of total trips in the city by 2012. At the 2010 launch of its free bike rental programme, called Ecobici, the city installed 1,100 bikes at 85 stations around the city center.

Lessons Learned:

A serious challenge to Mexico City's economy and environment—consistently poor and even dangerous air quality-- prompted the city to initiate measures to overcome the crisis. By focusing on addressing poor air quality through multiple areas of city influence including land use and planning, transportation, waste management, and climate action planning, the city was also able to simultaneously produce effective programmes and progress in areas that were seemingly unrelated, such as water use and supply. Meanwhile, the city has kept its primary focus on air quality improvement by putting overall emphasis on measuring and publicly reporting air quality improvements. Mexico City has proven that an integrated sustainability plan is effective in tackling a serious "single" challenge by addressing multiple areas of influence. Through effective programme management, combined with public and media visibility it has also ensured progress on other related sustainability issues.

3.5. PARTICIPATORY CITY BUDGETING IN PORTO ALEGRE, BRAZIL[45]

A transition to participatory budgeting in the city of Porto Alegre in the 1990s was highly successful in improving urban management. City residents were empowered to decide on

[45] Andreas Novy and Bernhard Leubolt, *Participatory Budgeting in Porto Alegre: Social Innovation and the Dialectical Relationship of State and Civil Society,* Urban Studies, Vol. 42, No. 11, 2023– 2036, October 2005

virtually any use of municipal resources—from street paving, to cultural initiatives, to education, to sanitation services, to pay scales for municipal civil servants. Its positive impacts on city management included greater transparency, greater rationality in administrative procedures, strict control of finance, constant public monitoring of governmental performance, and an established routine of efficient allocation of public resources. These changes allowed the level of investments in the city to increase significantly, greatly improving the provision of basic services and indicators of social development.

City leaders of Porto Alegre faced the following problems in the 1990s:

- Nearly 98 per cent of revenues were needed to pay the municipal staff.
- Executive control and financial management were very weak.
- The tax system was not indexed to inflation, preventing the city from coping with the high inflation rates at that time.
- Under decentralization, the municipality had received many new responsibilities but lacked sufficient financing for them.

The above conditions jeopardized the administration's ability to fulfill its campaign promise of implementing policies to help poor citizens and left it uncertain of a proper course at the beginning of its tenure. The country had recently emerged from years of military/authoritarian rule and citizens and local government wanted to explore taking democratic governance to new levels.

In this context of administrative confusion and lack of resources, the administration sent government staff into community neighborhoods to conduct inexpensive public works and to cement personal contacts with citizens and leaders of community organizations. The municipality relied on this network of relationships to solicit public participation in the first meetings on participatory budgeting.

At the same time, the new administration made efforts to increase revenues. The administration submitted various proposals to the city council for new laws. One of these laws modified the property tax, a major source of municipal revenues, to make it progressive. Other modifications that the new laws introduced included indexation of taxes for waste collection and water. These

measures solved the revenue crisis, so the city could have resources for infrastructure improvements and enabled the introduction of participatory budgeting.

The Administration divided the city into communities and allowed existing community associations to represent their constituents. City officials decided that community associations themselves would decide how the city should be divided into representative areas. It also promised to include the newly formed City Council in local decision making processes.

In launching the preparations for participatory budgeting, two conditions should be mentioned. First, the decision to integrate community associations into the municipal decision making structure went smoothly because many of the new municipal leaders had been community leaders themselves. The people involved in the dialogue already knew each other and were familiar with local conditions. Second, the community associations sought and received full autonomy for the participatory budgeting process. The City Council and the Mayor could review and make suggestions, but had no authority over the participatory budgeting decisions. This was a landmark decision, and one that was in agreement with the new administration's political views.

Participatory Budget Process - On an annual basis, two main roundtable meetings coordinated by the municipality are preceded by several smaller meetings organized by the communities themselves. Thematic meetings are also held to attract groups like trade unions and professional organizations.

At the first roundtable meeting, photos of public works are presented to demonstrate the status of the previous year's investments. City officials can submit proposals for discussion, which can then be accepted by a simple majority vote. Direct, continuous relations between high-level government personnel and the community have a profound impact on educating officials about citizens' wishes and on educating citizens about government programmes.

At the second roundtable, participants choose the investment priorities for their regions, make a list of demands, and elect the Council representatives. The Council then considers various demands for services, and discusses criteria and priorities for budget allocations. It develops the budget proposal and submits it to the Mayor and the City Council for review. The City Council

then votes on the budget and sets the level of financial resources that will be available for the next year.

The main goal of the process is to prepare a detailed budget that balances demands and financial viability. The criteria, which aim to balance funding priorities among the sections, are:

- Lack of public services and/or infrastructure
- Total population in the particular section of the city
- Priorities of the community in relation to the city's priorities.

Council members from each community of the city choose and rank four of the seven standard priorities: basic sanitation; land and settlement regulation; transport; education; health services; street paving, including water and sewerage systems; and city organization. The priorities each community selects are graded from highest (4) to lowest (1). After the second roundtable meeting, all 16 regions' grades are added to determine the overall highest priorities for the following year. In one year, the communities decided that land and settlement regulation (including housing construction, land regulation, and resettlement of marginalized populations) would be the top priority. In other years, the top priority was street paving (which usually includes basic water and sanitation, because that infrastructure is under any paved street). Each community's priorities are then compared with other regions in order to have an equitable distribution of financial resources.

Results and Impacts - A key result of participatory budgeting is its effect on local participation and interest. As revenues recovered and the level of investments increased, citizen participation grew dramatically. Political gains were also recorded. Specific political results included: increased approval ratings, decrease in nepotism and unethical practices, and increase in democratic practices (including among low-income groups),

There was also a positive effect on municipal government of increased functional efficiency, improved staff morale, improved monitoring resulting in less waste and delays, reduced costs of public works, and greater transparency with respect to taxes paid and services rendered.

The increased investment funds that Porto Alegre made available for infrastructure through the participatory budgeting process resulted in improved basic services. The initial successes in

infrastructure improvements also facilitated the development of public-private cooperative efforts.

With a priority on basic services in the peripheral regions of the city, Porto Alegre's infrastructure noticeably improved within a period of ten short years. The sewerage system expanded dramatically growing from 46 per cent coverage to more than 85 per cent. Slums were upgraded and housing was built for the homeless. Significantly, the number of students enrolled in school doubled.

Lessons learned:

- Participatory budgeting processes can empower communities and lead to increased transparency and efficiency of government operations.
- Municipal governments must have the political will to share decision-making. In some cases, a government may agree to share its mandate with no preconditions; in other cases, the government may keep a portion of power under its own control.
- The success of participatory budgeting is contingent on the ability of the city to raise sufficient revenues for infrastructure improvement to improve basic services.
- Social participation in participatory budgeting processes is proportional to the government's commitment to the process, and its ability to maintain the schedule of public works.
- One long-term political objective of participatory budgeting is to transform the municipal government into a public institution in which special interest groups hold no sway. The new political behavior also affects community leaders, among whom authoritarian and unethical practices may have been pervasive.
- The participatory budgeting experience presupposes a minimum background of social organizational traditions in the city, especially in the poorer regions. If no such traditions exist, then participatory budgeting's development will be slow and difficult, and require a step-by-step approach.

3.6. DISASTER RISK MANAGEMENT, MUMBAI, INDIA[46]

The city of Mumbai rebuilds after a natural disaster. Photo courtesy of UN Habitat

On 26 July 2005, 99.4 cm (39.1 inches) of rain fell during a 24-hour period on Mumbai, bringing the city to a standstill. The unprecedented rainfall caused severe human and economic losses. Flash floods and landslides resulted in over 5,000 deaths in Maharashtra State and 445 casualties in Mumbai. An additional 194 died due to various water-borne illnesses related to the deluge.

Thousands of school children were stranded due to flooding and could not reach home for up to 24 hours. Adding to the chaos was the lack of public information. Radio stations and many television stations did not receive any weather warnings or alerts from government agencies. The rain water caused the sewage system to overflow and all water lines were contaminated. The government ordered all communities to add chlorine to their water tanks while they decontaminated the water supply. Thousands of animal carcasses floated in the flood waters,

[46] http://nidm.gov.in/idmc/Proceedings/Flood/B2-%207.pdf

raising concerns about the possibility of disease. Reports in the media warned of the threat of waterborne diseases, and hospitals and health centers geared up to distribute free medicines in case of any outbreaks.

Suburban train systems were completely disrupted. Road traffic was chaotic where the streets were still useful, but many major roads were completely flooded. The airport closed for two consecutive days. Electricity service was shut off to avoid electric shocks. Damaged infrastructure included 50,000 residential buildings, 40,000 commercial establishments, and 30,000 vehicles (cars, trucks, buses and trains)

Apart from the heavy rains, three factors contributed to the scale of the disaster: an antiquated storm-water drainage system, uncontrolled and unplanned development in the northern suburbs, and destruction of mangrove ecosystems. The drainage system was extremely inadequate in terms of potential flow rate and it was clogged in several places. Ninety-seven per cent of the outflows to the sea were not equipped with floodgates and as a result, there was no way to stop the seawater from rushing into the drainage system during high tide. Development in the northern suburbs of Mumbai is haphazard and buildings are constructed without proper planning. The drainage plans in those suburbs were developed in an ad hoc manner, not systematically. Mangrove ecosystems which exist in and around the city were being destroyed and replaced with construction. These ecosystems serve as a buffer between land and sea. It is estimated that Mumbai lost about 40 per cent of its mangroves between 1995 and 2005, some to builders and some to slums.

After the 2005 floods, the local Disaster Management Office designed a plan to reduce the impact of future extreme weather events. Most of the efforts related to flood control. Substantial public works were undertaken to de-silt the entire sewerage system. This included micro tunneling to ensure adequate discharge of monsoon water at several chronic spots, and cleaning of railway culverts. Flood-gates and sluice gates were installed and manned to operate during high tide and low tide. Twenty-six automatic weather stations with rain-gauges were installed to monitor the system. The Mithi River was dredged to widen and deepen its channel. Finally, 85 pumps were installed at chronic flooding locations; these are manned by operators with communication systems.

Significant efforts were made to control communicable diseases. To control water and food-borne diseases, the government launched a cleanliness drive through a communication campaign that included wall posters, slides of do's and don'ts, as well as messages through various major media channels. Hospitals have been included in planning efforts, so they can be quickly put on alert. Adequate stocks of medicines are maintained. Water sampling capacities have been built up. Food security teams are ready to take urgent steps.

A contingency plan has been drafted for a range of other city services. These include emergency transport system services, establishment of relief camps for displaced persons, and hygiene counseling.

Finally, enhanced monitoring and advanced warning systems are now in place that would alert the population about impending disasters. The new monitoring system will be linked to first responders so that the city services can respond in a nimble and flexible manner. A flood warning system has been put in place; six command centers have been established and will ensure better coordination of city services with local non-governmental organizations and community-based organizations.

4. BETTER CITY, BETTER LIFE: POLICIES OPTIONS FOR EFFECTIVE URBAN MANAGEMENT

Strategy 1: Develop planning for integrated sustainability management

POLICY OPTIONS	
option 1	Prepare a city or metro-area wide sustainability plan with participation from a broad representation of stakeholders, including citizens, civic groups, all levels of government (national, state and local), businesses, experts and academia.
option 2	Develop long range plans for sustainability and resilience, including land use and transportation planning, sustainable economic development, food and energy security, open space and natural habitat protection, and educational and

	cultural development.

Strategy 2: Develop a set of integrated policies targeting the urban poor to foster economic progress and social equity.

POLICY OPTIONS	
option 1	Work with utility companies, private sector and community-based organizations to advance the provision of basic services to under-served urban communities, particularly water supply, electricity, slum upgrading, sanitation and waste management.

Strategy 3: Shift toward dense, mixed-use urban development to ensure a low-carbon and resource-efficient city.

POLICY OPTIONS	
option 1	Develop plans and mechanisms to reduce urban sprawl. Design growth in transit-served mixed-use corridors while protecting valuable natural areas needed for eco-system services, such as wetlands, forests and other lands of high biodiversity and resource valuation.
option 2	Inventory current and forecast projected carbon emissions—including operational energy use for buildings and transportation, product use and waste. Develop metro-area wide and city climate action plans.

Strategy 4: Improve integrated city and metro sustainability management capabilities.

POLICY OPTIONS	
option 1	Facilitate aligned sustainability management mechanisms across departments,

	including waste, energy, water, streets, building and transportation management. Strengthen management systems for land management.
option 2	Utilize goals to measure and manage sustainability performance indicators for areas including waste, water, energy, health, transportation, local food, parks and open space, citizen engagement and other categories chosen by citizens and government. Deploy strategic tools such as scorecards, maps and dashboards to make results easy to understand and act upon.

Strategy 5: Create transparent and engaged sustainability programmes and communications

POLICY OPTIONS	
option 1	Publish, publicize and make available sustainability planning sessions and resulting plans, documents and milestones. Update plans and processes through meetings, online publications and announcements. Consider engaging stakeholders through a participatory budgeting process.
option 2	Utilize public events, campaigns, and tools, including social media, to inspire citizens and businesses to contribute ideas, observations and personal innovation both to city officials and directly to one another.

Strategy 6: Develop natural disaster risk assessment and management capabilities

POLICY OPTIONS	
option 1	Perform natural disaster risk assessment and put in place city plans to respond effectively to higher probability risks as they occur.

5. RELATED LINKS:

http://www.adb.org/Documents/Studies/Managing-Asian-Cities/part02-07.pdf
Managing Asian Cities: Sustainable and Inclusive Urban Solutions, Asian Development Bank, 2008

http://www.mckinsey.com/mgi/publications/india_urbanization/index.asp
Site for 2010 McKinsey Global Institute Report "India's Urban Awakening: building inclusive cities, sustaining economic growth"

http://www.mexicocityexperience.com/green_living/)

http://www.nyc.gov/html/planyc2030/html/home/home.shtml
New York City PlaNYC 2030

www.oecd.org/dataoecd/30/35/44232263.pdf
"Cities, Climate Change and Multi-Level Governance," J. Corfee-Morlot and others, the Organization for Economic Co-operation and Development (OECD), Paris, 2009

http://www.pwc.com/us/en/cities-of-opportunity
"Cities of Opportunity," (report), PricewaterhouseCoopers, New York, New York, United States, 2009

http://www.sma.df.gob.mx/planverde/
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http://pdf.wri.org/ecosystem_services_guide_for_decisionmakers.pdf
"Ecosystem Services: A guide for decision makers," Janet Ranganathan and others, World Resources Institute, Washington DC, 2008

http://www.proventionconsortium.org/

http://www.slideshare.net/itsgowri/wwf-low-carboncities
"Reinventing the City: Three Prerequisites for Greening Urban Infrastructures," WWF International (in conjunction with Booz & Company), Gland, Switzerland, 2010

http://www.telegraph.co.uk/news/worldnews/asia/china/8278315/China-to-create-largest-mega-city-in-the-world-with-42-million-people.html

http://www.undp.org/cpr/we_do/integrating_risk.shtml

http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTURBANDEVELOPMENT/EXTDISMGMT/0,,menuPK:341021~pagePK:149018~piPK:149093~theSitePK:341015,00.html

http://www.unisdr.org

CHAPTER 3 -- TRANSFORMING THE URBAN ECONOMY[1]

To Pursue Inclusive and Balanced Growth…

Cities should balance economic growth and social development; seek to achieve an optimal relationship between social equity and economic efficiency; strive to create an institutional environment of shared rights and interests, equal opportunity, and fair competition; and work to reduce inequities in income. They should enable all residents to share the fruits of urban development and fully realize their personal growth.

…And Balanced Urban-Rural Development

Cities should coordinate balanced development with rural regions through the provision of services and infrastructure. Cities should strive to reduce the urban-rural gap, take into consideration the interests of disadvantaged social groups, and encourage and aid the integration of rural populations into the city. More efforts should be taken to improve and optimize urban-rural linkages as well as regional networks. Cities should actively initiate urban-rural dialogue to achieve harmony in their interactions.

Shanghai Declaration on Better Cities, Better Life

1. ISSUES AND CHALLENGES

Cities represent the most powerful economic engines in the world. The transformation of cities to sustainable economic development will be critical to the 21st century global state of affairs.

As a Mayor, you have many options that you might exploit to transform a city's economy. Energy use, which has a commensurate impact on carbon emissions, presents a strong lever for addressing global climate change. Alternatively you may choose to focus on other sectors as urban needs for water, materials and infrastructure are increasing at exponential rates. City officials and traditional urban planners are struggling to sustainably grow their economies and

[1] This chapter was authored by Warren Karlenzig, with valuable input and contributions from Zhou Zhenhua and Mohan Peck.

manage the physical metro-area footprint while at the same time ensuring a livable urban environment. Investments in the built environment in developing economies will continue to be high in coming decades.

There are genuine opportunities for city leaders to reduce carbon emissions and pollution, enhance ecosystems, and minimise environmental risks. Compact, relatively densely populated cities with mixed-use urban form are more resource-efficient than any other settlement pattern with similar levels of economic output. Integrated design strategies and technologies are available to improve urban transport, the construction of buildings, and the development of urban energy, water, and waste systems in such a way that they reduce resource and energy consumption and avoid lock-in effects.

For urban managers, there is both a window of opportunity and a business case to cost-effectively drive down carbon emissions and production of pollutants in the rapidly growing urban centers of developing nations.[2] Cities are increasingly being targeted as a key source of scalable global economic solutions, particularly in sustainable development. Correspondingly, clean technologies (usually defined to include renewable energy, alternative fuels, advanced transportation, advanced materials, waste treatment and water conservation technologies) are expected to be some of the top emerging growth industries. The investment community recognizes the unprecedented opportunities in sustainable development: a 2009 survey on global venture capital trends, for instance, reported that 63 per cent of surveyed venture capitalists anticipated an increase in their investment in the clean-tech sector, the highest percentage among all sectors considered.[3]

Following proven successes for the urban investment model in Hong Kong, Bilbao, Barcelona, and Sydney, international banking and financing institutions are in the process of shifting focus from the national level to the city level.[4] Large cities such as Shanghai and Mumbai provide attractive centers for international investment as they emerge as centers of global financial services. In India, for example, cities are forecast to garner 85 per cent of the nation's total tax revenue (up from current level of 80 per cent), which will provide the primary source for financing economic development on a national scale. By 2030, 70 per cent of all new jobs in

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[2]"Reinventing the City: Three Prerequisites for Greening Urban Infrastructures," WWF International (in conjunction with Booz & Company), Gland, Switzerland, 2010: http://www.slideshare.net/itsgowri/wwf-low-carboncities

[3]"Cities and Green Growth: Issues Paper for the 3rd Annual Meeting of the Organisation for Economic Co-operation and Development (OECD) Urban Roundtable of Mayors and Ministers," 25 May, 2010, OECD Conference Center, Paris, p.23: http://www.oecd.org/site/0,3407,en_21571361_45068056_1_1_1_1_1,00.html

[4]"Urbanization and Urban Management Policy Framework and International Experience," Tim Campbell, Urban Advisor , the World Bank: http://info.worldbank.org/etools/docs/library/39815/M1S3CampbellTimEN.pdf

India will be created in cities, though cities are expected by that date to represent only 40 per cent of the nation's total population.[5]

1.1. TRANSITION TO A LOW-CARBON ECONOMY

In order to control carbon emissions and meet the economic, resource and public health challenges of urban growth, city managers will need to quickly begin shifting their spending from high-carbon intensity infrastructure to modern infrastructure that produces very low carbon emissions in production, transport and operations. This necessary transformation will require long-term and strategic action plans to guide capital investments toward infrastructure solutions offering attractive returns. These returns can take many forms including reduced operating costs, low-carbon, lower air and water pollution levels, and greater resource efficiency.[6] Cities and metropolitan regions are well positioned to develop policy and programmatic solutions that best meet specific geographic, climatic, economic, and cultural conditions. They are equally well placed to develop innovative policy solutions that can be scaled up into regional or national programmes, or to provide a "real world" laboratory for national pilot programmes on the urban level.[7]

The dramatic shift toward scalable sustainable urban development provides urban leaders with a means to cope with daunting urban challenges and risks. During what will be a profound period of transition from business-as-usual to low-carbon and increasingly sustainable urban economies, there will be a need to reach critical system synergies bridging traditional industry sectors (energy, transportation, communications, media, real estate development, building and infrastructure, food and agriculture). System-based sustainable development is a complex undertaking, yet it presents global economic opportunity on an unprecedented scope and scale.[8] Cities in developing nations will not only share in this economic evolution, in many sectors they will help lead the transformation.

An often-cited clean energy example from a developing nation is that of Suzlon Energy, an Indian company founded in 1995, which in 2009 was the world's sixth-largest wind turbine

[5]"India's Urban Awakening: Building Inclusive Cities, Sustaining Economic Growth," McKinsey Global Institute, April 2010, p.13-14: http://www.mckinsey.com/mgi/reports/freepass_pdfs/india_urbanization/MGI_india_urbanization_fullreport.pdf

[6]"Reinventing the City: Three Prerequisites for Greening Urban Infrastructures," WWF International (in conjunction with Booz & Company), Gland, Switzerland, 2010: http://www.slideshare.net/itsgowri/wwf-low-carboncities

[7]"Cities and Green Growth: Issues Paper for the 3rd Annual Meeting of the Organisation for Economic Co-operation and Development (OECD) Urban Roundtable of Mayors and Ministers,"25 May, 2010, OECD Conference Center, Paris, p.11

[8]Ibid, p.12

manufacturer.[9] Biofuels are also a clean technology area where the developing countries see themselves as having a global comparative advantage. Brazil in particular, which has been developing its bioethanol industry for the last 30 years, is pursuing a strategy to promote this industry worldwide. Malaysia, which has invested heavily in palm oil over the last decades, sees low-carbon biodiesel fuel as a new market for its palm oil.[10]

Mayors of cities need to combine multiple policy instruments and technologies in order to achieve the ambitious goal of higher urban growth at lower carbon intensity.[11]A dramatic shift at the urban level toward more integrated strategy, policymaking and operations is necessary. A good first step toward more sustainable city operations is sustained municipal investments in infrastructure that reduce energy, water and material use, and thus are less carbon-intensive. For example, distributed renewable energy systems don't necessarily require utility poles or excavated underground power transmission lines. Water systems that feature electronic sensors to detect the exact location of leaks spare streets from being torn up while preserving otherwise-wasted municipal water.

Such supply-side measures alone, however, will not be enough. Urban policy makers could pursue an integrated policy package that looks at three related phenomena: 1) how companies adjust to new sustainability-related business opportunities and adjustments in the price of energy; 2) how individual consumers or citizens change their preferences for products and services; and 3) how modern technologies are developed and effectively diffused in the marketplace.

We have seen that new economic and market development strategies are emerging rapidly as a direct result of urban population growth and innovation, particularly in green building, renewable energy, alternative fuels, information and communications technologies, and advanced material production. At the management level, information and communications technologies are being deployed to monitor and control the use of resources across cities in buildings, transit systems and infrastructure (see Chapter 8 - ICT for Smart and Connected Cities"). As a result, local authorities and business leaders are at the center of public-private collaboration that is shaping the urban economy. In some cities citizens have been involved in such planning efforts, while in others economic initiatives are being spearheaded by private sector advisors and key government leaders. The most thorough and proactive of these initiatives have included multiple stakeholders from many sectors.[12]

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[9]India was ranked sixth of manufacturers worldwide in 2009, having installed 6,000 cumulative Megawatts (MW): http://wapedia.mobi/en/List_of_wind_turbine_manufacturers#1.

[10]"Green Industry for a low-carbon future: A greener footprint for Industry," UN Industrial Development Organization (UNIDO), Vienna, 2010, p.7. http://www.unido.org/fileadmin/user_media/UNIDO_Header_Site/About/Green_Industry_Initiative.pdf

[11] .Carbon intensity is the ratio of greenhouse gas emissions produced relative to gross domestic product.

[12] Another example of citizen-government-private collaboration in planning of green urban economies includes "The Economy and Economic Development" (co-authors Scott Edmondson

1.2. GLOBALIZATION AND THE EMERGING URBAN ECONOMY

Globalization, with rapidly innovative business models, is transforming the competitive landscape of business by increasing types and velocities of transactions. A central feature of the new urban era is the movement of people, information and goods to urban areas accompanied by the growing flow of public and private capital.

People are gravitating to cities not only for economic opportunity, but also for better education and the non-stop flow of ideas, information and culture. Complexity and velocity are the fabric of "always-open" global innovation networks that center on urban clusters. Urban regions gather together a critical mass of people with highly specialized and advanced skills who know how to engage in particular productive activities. [13]

To attract resources and sustain the momentum of development, cities can enhance their growth potential by cultivating a number of vibrant leading industrial subsectors. The growth of these leading sectors can be increased by the formation of clusters of networked firms that compete, cooperate, attract skilled labor, generate capital and induce technological spillovers. Collaboration between manufacturers and service providers can lead to greater specialization, which provides advantages to both groups, in particular job creation. Finally, competitive clusters must be capable of upgrading, of diversifying and of incubating new industries.

Such industrial clusters tend to form around urban centers that have strong development orientation and leadership. Cities can be attractors for R&D, worker training, software, product design and branding, and organizational capabilities. Major research firms and multi-national corporations can also act as cluster hubs. To thrive, industrial clusters require anchors. The size and wealth of the urban market can be a powerful anchor. So too can a research university that provides high quality skilled labor, information networks, access to the knowledge economy, patenting, and technological innovation. Social infrastructure that speaks to the livability of a city can also help anchor these clusters. How a city goes about developing these anchors determines its overall competitiveness in the global economy.

Global competitiveness may soon be defined in part by carbon emission rates. Low-carbon economies will gain a decisive edge over economies that remain relatively heavy per-capita carbon emitters. This competitive advantage will be gained not only because of environmental and quality of life factors but also because of the potential merger of international trade rules and

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and Warren Karlenzig) section of city-adopted *Sustainability Plan* for San Francisco, California, United States, 1997http://www.sustainable-city.org/

[13]"Teamwork: Why Metropolitan Economic Strategy is the Key to Generating Sustainability Prosperity and Quality of Life for the World," Marc A. Weiss, Global Urban Development Magazine, Volume 1, Issue 1, May 2005. http://www.globalurban.org/Issue1PIMag05/Weiss article.htm

carbon emissions regulations. In some cities, regional air pollution from high-carbon urban industry, utilities and transportation has already impacted economic competitiveness by necessitating reduced airport traffic and idling ground transportation fleets.[14]

Globally, carbon emission allowances likely will decrease over time under the pressure of international commitments.[15] Because of these economic and policy drivers, new low-carbon technologies that reduce greenhouse gases represent a major area of global economic growth. By 2020, the global market for environmental products and services is expected to double to US $2.74 trillion from its 2010 annual value of US $1.37 trillion. Energy markets will account for half of this increase. Trade in 40 key climate-friendly technologies almost doubled (from US$67 billion to US$119 billion) between 2002 and 2008.[16] Renewable energy in China alone in 2009 contributed $17 billion in revenue and one million jobs.[17]

In summary, demographic trends, as well as economic data and forecasts, suggest that the trend towards low-carbon cities has the potential to shape the 21st century as much or more than earlier advances in transportation, communications, energy, construction and industrialization.

2. Menu of Options: Urban Economic Development

2.1. Financing of Modern Economy and Clean Technology

New approaches to financing modern economic development, particularly clean energy technologies, are emerging on the scale of cities, regions and nations worldwide. One example has been the construction of Masdar City, Abu Dhabi (see case study in Chapter 6 – Green Buildings for a Resource Efficient Future). Masdar has created a "financial ecosystem" strategy for its clean technology incubation, establishing a clean technology venture fund of USD $245 million with a consortium of banks, businesses and technology companies. The venture fund targets investments in sustainable technologies being developed at the Masdar City site including thin film solar energy, waste-to-energy and water purification systems. A similar new fund of USD $500-750 million started in early 2010 with additional partners.[18]

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[14]"To avoid Olympic smog, Beijing limits traffic," Chicago Sun Times," 20 July, 2008: http://www.suntimes.com/sports/olympics/china2008/1065390,olymptraffic072008.article

[15]"China and a Sustainable Future: Towards a Low-Carbon Economy and Society," UNDP/ Renmin University China, 2010: http://www.undp.org.cn/pubs/nhdr/nhdr2010e.pdf

[16]"Environment and Energy," Australian Trade Office: http://www.austrade.gov.au/Home/Environment-and-Energy/default.aspx

[17]"China and a Sustainable Future: Towards a Low-Carbon Economy and Society," China Human Development Report 2009/ 2010, UNDP/ Renmin University China: http://www.undp.org.cn/pubs/nhdr/nhdr2010e.pdf

[18]"Masdar Venture Capital: Making finance accessible to clean technology companies," Alexander O' Cinneide, Masdar Investment Fund, accessed 6 September 2010:

The World Bank Group established Climate Investment Funds in 2008, which includes a Clean Technology Fund and a Strategic Climate Fund in support of numerous urban programmes under a Pilot Programme on Climate Resilience. Through the Pilot Programme, Egypt, for example, is seeking finance under a clean tech investment plan to scale up a number of initiatives including: i) development of wind energy farms; ii) addressing Cairo's urban transport needs by replacing old public buses and private taxis with a new fleet of compressed natural gas vehicles; iii) completing two new lines of its underground metro; and iv) preparing for new Bus Rapid Transit and Light Rail Transit systems.[19]

In China national, regional, and local governments are offering clean energy companies generous subsidies to establish operations in their localities, including free or below-market priced land, low-cost financing, tax incentives, and money for research and development. In just over three years this approach has helped transform Baoding, China as a polluting automobile and textile production city into the fastest-growing hub of wind and solar energy equipment manufacturing in China (see case study on Baoding this chapter).[20]

Preparing for long-term sustainability through public-private financing.
The Republic of Korea, decided it wanted to become a leader in the emerging technology of broadband connectivity. The nation embarked upon an ambitious public-private financing campaign that resulted in 95 per cent household broadband penetration, which was the world's leading rate in 2009. Using this technology base as a competitive differentiator, South Korea has set well defined economic and technology goals for the development of a national smart grid (which utilizes broadband communications), including the strategy of becoming a world leader in exporting smart grid technology products and services. This strategy is based on public-private partnerships in both research and construction that include government financial incentives.[21,22] (See case study this chapter: "South Korea's Smart Grid Roadmap 2030")

http://www.slideshare.net/mindrom/masdar-venture-capital-making-finance-accessible-to-clean-technology-companiesby-alexander-ocinneide

[19]"Catalyzing Low Carbon Development? The Clean Technology Fund," Smita Nakhooda, World Resources Institute, May 2009, (accessed 6 September 2010) p. 4-5

[20] "Rising Tigers," The Breakthrough Institute, Oakland, California United States, 2009, p.12-13:http://thebreakthrough.org/blog/Rising_Tigers.pdf

[21] "Cities and Green Buildings: In the transition to a green economy," Moustapha Kamal Gueye, UNEP Brief, 2008: http://www.unep.ch/etb/ebulletin/pdf/Cities and building brief.pdf

[22]"The Smart Money's on Korea's Smart Grid Tech," The Next Silicon Valley, 22 July, 2010. http://www.thenextsiliconvalley.com/technews/793/The-smart-moneys-on-Koreas-smart-grid-tech

2.2. TARGETED PUBLIC FINANCIAL POLICIES

In some countries, national level financial policy measures are providing support for clean energy technology adoption through a variety of targeted public policies, including technology-specific production incentives, government procurement offers and sustained and long-term lines of credit in the form of low-cost financing and credit guarantees. One example of credit guarantees is the tax credits provided by the United States under the American Resource and Recovery Act, where solar energy system implementations for homes and businesses receive a 30 per cent tax credit, with an unlimited ceiling on credits.[23] Low cost financing can include low-interest loans, such as China's 2-3 per cent loans for renewable energy system installation. Government procurement offers may be technology based, district based, or both, such as city districts in China supporting low-carbon technology implementation where the government offers 50 per cent financing for solar photo-voltaic street lighting renovation.[24]

An example of a clean technology investment policy tied to a national carbon emission reduction policy goal is the Clean Technology Fund Investment Plan for Indonesia. It leverages co-financing of USD$400 million to support Indonesia's goals of providing 17 per cent of its total energy use from renewable energy and improving energy efficiency by 30 per cent from business-as-usual by 2025. Specifically, the Investment Plan proposes Fund co-financing for two programmatic areas: scaling up large-scale geothermal power, and acceleration of initiatives to promote energy efficiency and renewable energy (particularly biomass). The Fund plans to mobilize financing of up to USD$2.7 billion from multilateral financiers, state-owned enterprises, and the private sector. If additional resources are available, a second phase of the Investment Plan is expected to include investment in low-carbon transport and other renewable energies.[25]

2.3. ATTRACTION AND RETENTION OF A SKILLED WORKFORCE

The emergence of the urban economy rests upon the ability to attract and retain a skilled, knowledgeable workforce. This specialized labor pool requires access to the high-quality education and training that is complementary to the development of new industries. Because new industries are evolving quickly in the areas of construction and related professional services, for instance, quality education and training are necessary not only for those entering these job markets, but also for seasoned employees that need to update training for certifications. Local

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[23] "Federal Tax Credits for Consumer Energy Efficiency," United States Energy Star programme site accessed 6 September 2010: http://www.energystar.gov/index.cfm?c=tax_credits.tx_index

[24] "On Clean Energy, China Skirts Rules," Keith Bradsher, *The New York Times*, 8 September 2010, accessed 10 September 2010: http://www.nytimes.com/2010/09/09/business/global/09trade.html?emc=eta1

[25] "Clean Technology Investment fund for Indonesia," Climate Investment Funds, 12 April 2010, Accessed 6 September 2010: http://docs.google.com/viewer?a=v&q=cache:dgwT8b1vb-EJ:www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/CTF_Indonesia_investment_plan_041210.pdf+regulatory+and+pricing+policies+%22clean+technology%22&hl=en&gl=us&pid=bl&srcid=ADGEEShuQ4JpnrB-oAR1VAiB62pT

universities, colleges and crafts training institutes are similarly important as resources for younger students, mid-career employees changing careers, and disadvantaged workers interested in learning professions and crafts in the green economy, particularly renewable energy system installation and energy efficiency auditing and improvements for buildings.

In manufacturing, workers from dislocated or obsolete industries can sometimes take advantage of targeted training programmes to adapt their skills to emerging industry opportunities. A case in point is Toledo, Ohio (United States), which lost many of its local jobs in the glass manufacturing industry during the 1990s and early 2000s. Local and state officials worked with private industry and local universities to develop job training for the solar photo-voltaic industry that would leverage legacy production worker knowledge and equipment from closed-down glass manufacturing facilities. The glass manufacturing industry was retooled to become one of the leading centers of solar photo-voltaic research, development and assembly in the United States.[26,27]

2.4. MANAGING RURAL–URBAN NETWORKS, INCLUDING MIGRATION

City leaders must effectively prepare for and adapt to rural-urban migration, particularly in countries experiencing high levels of these migrations, like China, India, Brazil, Bangladesh, Nigeria and the Democratic Republic of Congo**.** Successful global cities are those that are more capable of leveraging resources, including employees, from their regional network, including rural areas. Large cities in particular need to focus on improving their capacity to serve their region while effectively managing growth and efficiently allocating resources.

Because urban poverty is a persistent feature in many developing countries, policy-makers must ask how rural-urban migrants can be assimilated in an equitable way. There is a need to assess quality of life in low-income neighborhoods in which rural migrants are more likely to settle, and to reduce inequalities between migrants and existing city residents.

In order to better control rapid migration, city leaders should adopt regional planning when building infrastructure and providing basic services. If rural areas acquire similar infrastructure and services, then rural-urban migration rates slow. Nevertheless, cities will continue to expand, therefore effective industrial and transportation planning in cities and their surrounding areas are important elements in anticipation of growing populations.[28] In order to avoid urban sprawl, which has negative environmental impacts on metro areas and also is a land use that typically

[26]"Switching to Green Job Training," *Community College Times*, 7 September, 2010, accessed 10 September 2010: http://www.communitycollegetimes.com/Article.cfm?ArticleId=2916

[27]"Emerald Cities: Urban Sustainability and Economic Development," Joan Fitzgerald, Oxford University Press, New York, 2010, pp. 55-59. Also see, "Cities on the Front Line," Joan Fitzgerald, The *American Prospect*, 13 April 2009: http://www.prospect.org/cs/articles?article=cities_on_the_front_lines.

[28]"Economic transformation and urban-rural relations," Shanghai World Expo, Shanghai, China 9-10 September 2010: http://www.mae.ro/pdf/Expo-2010/2010.03_Ev5_Economic_Transformation_and_Urban rural_relations.pdf

limits mobility options for inhabitants, cities should plan for high density housing that is conveniently located with equitable access to transportation, utilities and city services. Services, for instance, might include introductory training on urban amenities including public transportation, public libraries, and education and child care, as well as networking opportunities for new migrants. Cities could provide legal support services for migrants requiring contracts for new employment and housing opportunities.[29]

2.5. INDUSTRY CLUSTERING

The development of industry clusters has resulted from a combination of many regional factors: relevant pools of indigenous knowledge and skills; the regional location of engaged educational and training institutions; access to venture investment capital and affiliated talent networks; along with supportive government policy and funding. Many industry clusters (Boston, United States; Freiburg, Germany; and San Francisco-Silicon Valley, United States) have benefited from all of these factors.

The emergence of new industry clusters in places largely lacking the significant presence of venture capital firms or personnel—Baoding, China (see case study this chapter) and Toledo, Ohio,[30] for instance—demonstrates that early stage industry clusters have been able to attract significant enough investment from government and private sources to successfully establish themselves. As global market competition for industries increases, there will be multiple success models for such industries, ranging from models that are largely self-organized, to those pre-planned and directed by either local, regional or national government policy.

Strategic foresight exercises can assist local governments to map out a long term cluster development strategy and to provide the stable financing for R&D that research intensive industries frequently require. For cities, the incentive policies to attract industry need to be supplemented by others that secure the city finances and ensure that related services and housing meet expectations of the industrial talent pool. But providing services and infrastructure are not enough. Cities must also market themselves aggressively by organizing events and seeking out business investors, both domestic and international. Such marketing is a reliable way of infusing capital and ideas into existing clusters and growing new clusters.

2.6. NEW URBAN LOW-CARBON INITIATIVES

An increasing number of low-carbon city initiatives are being sponsored by cities and foundations[31] such as the C40 Initiative, non-governmental organizations like ICLEI,[32] countries such as China,[33] international organizations such as the World Bank and International Energy

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[29] "Rural-to-urban migration and the sustainability of urban growth," Bingqin Li, accessed 28 September 2010: sticerd.lse.ac.uk/case/events/barcelona/Bingqin_Li.pdf

[30] "Cities on the Front Line," Joan Fitzgerald, *The American Prospect*, 13 April 2009: http://www.prospect.org/cs/articles?article=cities_on_the_front_lines

[31] http://www.sdtfoundation.org/index.php

[32] http://www.wwfchina.org/english/sub_loca.php?loca=1&sub=96

[33] http://english.peopledaily.com.cn/90001/90776/90882/6981549.html

Agency,[34] as well as academic and city alliances, such as that between The Global Carbon Project and Nagoya University in Japan.[35]

China announced in 2010 a low-carbon cities pilot programme for eight cities, Baoding, Xiamen, Hangzhou, Guiyang, Nanchang, Chongqing, Shenzhen, and Tianjin. Under the low-carbon cities programme, the eight municipalities, ranging from a population of one to eight million, will plan for low-carbon industry technology investment while attempting to reduce industry and citizen energy consumption. The low-carbon pilot programme is also being implemented in five provinces, including Liaoning, Shaanxi, Yunnan, Hubei and Guangdong. Guangdong is the only province that also includes a low-carbon pilot city, which is Shenzhen.

The low-carbon initiative issued by China's National Development and Reform Commission in 2010 was directing the targeted provinces and cities to build data systems inventorying their greenhouse gas emissions in order to draw up low-carbon development planning and to create supporting state and city development policies. The low-carbon pilot programmes will also promote low-carbon lifestyles and consumption for citizens. Successes from pilot areas are intended to be modeled for other areas of the nation. Pilot areas will attempt to combine characteristics of local industry with low-carbon development strategy, accelerating low-carbon technology innovation to upgrade traditional industries. Pilot areas are directed to follow closely the latest global advances in low-carbon technologies and promote joint research and development with foreign countries.[36]

An important low-carbon urban initiative that is gaining traction globally is the adoption of feed-in tariffs to support the market development of renewable energy technologies for distributed electricity generation. By their nature, feed-in tariff regimes put a legal obligation on utilities and energy companies to purchase electricity from renewable energy producers at a favourable price per unit, and this price is usually guaranteed over a certain time period, say 20 years. The guaranteed access to the grid, favourable rate and the tariff term guarantee, mean that feed-in tariffs create security for investment by producers, manufacturers, investors and suppliers. They make the cost of clean energy competitive with conventional forms of energy, which do not internalize the costs of pollution and are also heavily subsidized.

[34] http://www.globalcarbonproject.org/global/pdf/GCP_Nagoya_NIES_Agenda_web.pdf

[35] http://www.gcp-urcm.org/A20090217/HomePage.

[36] "China launches low-carbon pilot in select cities, provinces," Online People's Daily, 19 August 2010, accessed 15 September 2010: http://english.peopledaily.com.cn/90001/90778/90862/7110049.html

3. CASE STUDIES

3.1. BAODING, CHINA -- CREATING A MODERN ECONOMY BASED ON CLEAN ENERGY

The deployment of solar photoelectric panels for electricity production.

A city of one million about 100 miles southwest of Beijing, Baoding has ascended rapidly as a working urban model of China's transition to a clean energy economy.[37]Within four years Baoding's economic growth rate surpassed that of all other cities in the heavily industrialized Hebei province - its strong performance has been linked to a 40 per cent growth rate in companies producing low-carbon technologies. These companies include almost 200 producers of wind, photo-voltaic and thermal solar, biomass, and energy efficiency technologies. As of 2010, approximately 20,000 Baoding jobs have been created in clean energy, including 7,000 jobs at Yingli Solar, one of the nation's largest photo-voltaic producers, with more than $1 billion in fiscal 2009 revenues. Baoding's combined companies in 2008 sold 500 megawatts (MW) of solar products and 5089 MW of wind power products.[38]

The municipality's recent economic performance likely helped convince national leadership in selecting Baoding in August 2010 as one of eight cities and five provinces in China slated to become nationally sponsored low-carbon pilot projects. Under the low-carbon cities programme, the eight municipalities will engage in strategic planning for low-carbon industry technology investment while attempting to reduce citizen energy consumption by addressing lifestyle

[37]"China is leading the race to make renewable energy," Keith Bradsher, *New York Times*, 30 January, 2010.http://www.nytimes.com/2010/01/31/business/energy-environment/31renew.html
[38]"China to Develop Low Carbon Cities," *People's Daily*, 12 October, 2009 http://english.peopledaily.com.cn/90001/90776/90882/6781237.html

issues.[39]This innovative programme demonstrates an emerging platform linking China's clean energy manufacturing industry with policy support, research institutions, and other social systems.

Baoding's apparent success as both a center of production and deployment of clean energy technologies has its origins in numerous strategic and collaborative actions taken at the local and national level, and the international level.

In 2008 Baoding joined with international environmental non-governmental organization Worldwide Fund for Nature (WWF), based in Gland, Switzerland, to design a "low-carbon city" initiative intended to spur research and growth in clean energy and energy efficiency technologies. The effort was undertaken in conjunction with China's National Development and Reform Commission.[40]

Baoding's clean energy industry growth, however, was initially reportedly the result of its Mayor's interest in developing a new economy after lakes in the area experienced fish-die offs that were attributed to water pollution from local industry. The city had traditionally been an industrial center for textile production and, more recently, automobiles when the Mayor, Yu Qin, helped close hundreds of local polluting factories.

After the national government in 1992 established the Baoding Industry High-Tech Development Zone,[41] Mayor Yu Qin began researching clean energy technologies through visits to nations with early-stage renewable industries in Europe. Baoding decided it would also emulate the industrial cluster model of California's Silicon Valley, but instead of semi-conductors and software, the city began to create what it calls "Power Valley." "Polluting first and paying later is very expensive. So we chose renewable energy to replace traditional industry," said Mayor Yu Qin in a Christian Science Monitor article.[42] Baoding area companies and the city were able to secure bank loans with interest rates as low as two per cent—the result of a government policy of steering loans toward renewable energy investments.[43]

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[39]"China launches low-carbon pilot in select cities, provinces," Online People's Daily, 19 August 2010, accessed 15 September 2010: http://english.peopledaily.com.cn/90001/90778/90862/7110049.html

[40]"The Greening of the Monster," Rebecca Macfie, New Zealand Listener, 10-16 July , 2010 Vol. 224 No 3661 http://www.listener.co.nz/issue/3661/features/15754/the_greening_of_the_monster.html

[41]Baoding Industry High-Tech Development Zone website: http://www.bdgxq.cn/english/gqgk_eng.asp

[42] "The World's first Carbon Positive City will be in…China? The Mayor of Baoding Is on a Crusade to Make It a Hub of Renewable Energy", Peter Ford, *Christian Science Monitor*, *16* August 2009. http://www.csmonitor.com/Innovation/Energy/2009/0810/how-baoding-china-becomes-world-s-first-carbon-positive-city

[43]"China is leading the race to make renewable energy," Keith Bradsher, *New York Times*, January 30, 2010. http://www.nytimes.com/2010/01/31/business/energy-environment/31renew.html

Exports are important in bolstering the city's local economy: one company makes turbine blades for wind farms in Texas, while another company supplies solar panels to Portugal for what is currently one of the largest solar power stations in the world. By one account, the city may be among the world's first to go "carbon positive."[44]This would mean that the carbon emissions saved annually worldwide through the use of equipment made in Baoding would outweigh the city's own greenhouse gas emissions.

Baoding's Jinjiang International Hotel generates a maximum of 300 kilowatts (kW) of electricity. A plaque at the building's entrance informs visitors that it would take 104 tons of coal, emitting 270 tons of CO2, to produce the equivalent amount of power for a year. Another PV-clad building, which serves as a business center, produces up to 500kW, and a third building at the site will bring the total capacity of the complex to 1500kW.[45]

Both the hotel/visitor's center and the city of Baoding are a testament to the timely potential of green technologies and to China's future as a leading force in the modern economy.

Lessons Learned

Baoding represents one of China's brightest hopes in terms of both renewable energy manufacturing and deployment. It is clear that the city of one million is benefiting from renewable energy exports in terms of boosting its local economy; the city has also devised innovative approaches for developing programmes that incentivize large-scale deployment of energy efficiency and renewable energy technologies. Next, as part of a new national low-carbon pilot city programme (led by the National Development Reform Commission), Baoding will likely need to quantify if there is a linkage between its emerging urban low-carbon industrial base and its local low-carbon building and infrastructure construction and operations programmes. Cities attracting clean energy investments will need to consider if the overall merits of developing clean energy and energy efficiency technologies include demonstrating such technologies for local visitors, and deploying them effectively on a large enough scale to reduce local-carbon emissions.

[44]"Reinventing the City: Three Prerequisites for Greening Urban Infrastructures" WWF International (in conjunction with Booz & Company), Gland, Switzerland, 2010: http://www.slideshare.net/itsgowri/wwf-low-carboncities

[45]"The Greening of the Monster," Rebecca Macfie, New Zealand Listener, 10-16 July, 2010 Vol. 224 No 3661
http://www.listener.co.nz/issue/3661/features/15754/the_greening_of_the_monster.html

3.2. BILBAO, SPAIN: LOW-CARBON REDEVELOPMENT[46]

The Guggenheim Museum in the redeveloped new urban heart of Bilbao.

Photo courtesy of Wikipedia.com

[46] Ploger, Jorg, "Bilbao City Report", Centre for Analysis of Social Exclusion, CASEreport 43, 2007

Historically, the City of Bilbao, Spain was dominated by heavy industries, such as steel, shipyards, and machine engineering. By the 1970s the aging industrial sector was in a steep decline and was particularly hard hit by the energy crisis in the middle of that decade. Between 1975 and 1995, 60,000 manufacturing jobs – almost half of the industrial workforce – were lost in the metropolitan area. The proportion of manufacturing jobs dropped from 46 to 27 per cent. Some large industrial companies that had dominated the local economy for a long time, such as the Altos Hornos steelworks in Barakaldo or the Euskalduna shipyard in Bilbao, were modernized and continued production but with only a fraction of their original workforce. Other companies collapsed completely. Workers and unions engaged in years of workplace actions and occasional outbursts of violent labour conflict.

Metropolitan Bilbao suffered from serious environmental degradation as a result of its industrial past. Air, water and soil were seriously polluted. Industrial waste and household sewage drained into the river without being treated until the late 1980s. The main harbor or Nervión was ecologically dead. Closing of industrial plants left a total of 340 hectares of obsolete industrial wastelands in metropolitan Bilbao. Many of the sites were covered with derelict industrial buildings and the soil was deeply contaminated. In Barakaldo, more than one third of the total land was brownfield sites with vacant structures and disused infrastructure.

This recognition and the urgency of the immediate situation in Bilbao provoked debates about the best strategy and actions to initiate recovery. The interaction of all levels of government led to consensus on the need for action and drove the emergence of a strong redevelopment strategy. The ‘Strategic Plan for the Revitalisation of Metropolitan Bilbao’ was adopted in 1991. *Bilbao Metrópoli-30* was founded in 1991 to act as a facilitator for the regeneration process and to promote the objectives set by the strategic plan.

In its founding documents *Bilbao Metrópoli-30* identified four fields of action:

1. formation of a knowledge-based high-tech sector;
2. inner-city urban renewal, especially revitalization of the Old Quarter;
3. environmental improvements, namely reducing river pollution and restoring industrial brown fields; and
4. strengthening cultural identity through culture-led urban regeneration.

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To implement the strategic plan, another development agency, the Bilbao Ría 2000, was created in 1992, with the authority to regenerate specific ‘opportunity areas’ in Bilbao. Its main aim is to manage the large-scale revitalisation of abandoned land formerly occupied by old industries or by obsolete transport infrastructure.

Bilbao Ría 2000 is a not-for-profit publicly sponsored partnership that operates like a private sector company. The agency is based on a complex model involving all levels of government. This integrated model was necessary because decision-making is located at different administrative levels, i.e., urban planning by local government, fiscal power by provincial government, and land ownership often by central government authorities. Shareholders include a land management company (SEPES), the Port Authority, two railway companies (FEVE & RENFE), the Basque government, the Provincial government, the City of Bilbao, and the City of Barakaldo. Taking control of the vacant land was essential for redevelopment. Land owned by some of the shareholders was brought into the company's portfolio.

While start-up funding came from central and regional governments and the European Union, Bilbao Ría 2000 is now self-financing in its activities. This is done through the revaluation of land as a result of the rezoning of its land-use designation and the subsequent sale to developers. Profits must be re-invested in the public company and in urban regeneration activities. The financial autonomy of its operations is considered highly significant for the success of Bilbao Ría. Owing to its mandate, its access to land, and its financial autonomy, it has become the major planning and urban regeneration entity in Bilbao.

By investing a total of €560 million between 1997 and 2006, Bilbao Ria was able to successfully regenerate the following designated 'opportunity areas':

• **Abandodoibarra**: This was formerly brownfield land occupied by harbour and railway infrastructure on the riverfront in central locations. This area was redeveloped to create the attractive new urban heart of Bilbao.

• **Zorrozaure**: This was a peninsula occupied by mixed, mostly lower-value, harbour, industrial and residential buildings and activities. The project restructured land use here and connected it to the planned future extension of Abandoibarra.

• **Ametzola/Eskurtze**: This area south of central Bilbao was dominated by dense residential developments. The project removed much of the old physical infrastructure that divided this area, such as deep railway cuttings.

• **Miribilla and Morro**: These abandoned mining areas on the hilly slopes south east of central Bilbao were reclaimed and became the site of new housing construction.

The private sector was initially very cautious about investing in 'opportunity areas' of Bilbao. Public-sector investment was necessary to create confidence in the sites and in Bilbao as a whole. To assure the business community, the provincial government planned to relocate to a business tower in a zone to be redeveloped.

The most well-known redevelopment site in Abandoibarra is the landmark Guggenheim Museum designed by the architect Frank Gehry. The museum opened in 1997 attracting over a million visitors in its first year and immediately became a major tourist attraction. The cost of €144 million for this risky but prestigious investment was covered entirely with public sector funding, shared by the provincial and regional governments. Other major developments on the Abandoibarra site are the €72 million Euskalduna Conference Centre on the former shipyard and a modern shopping mall, the latter being the first significant private sector investment.

Environmental restoration was essential to the redevelopment effort. On many of the derelict sites formerly occupied by industrial uses and now earmarked for redevelopment, the contaminated soil had to be removed. But perhaps the single-most important project in terms of environmental clean-up was the construction of the new water sanitation system. This project, carried out by the province's water utility, Consorcio de Aguas, helped restore the river, which had been very heavily polluted from industrial uses and untreated household sewage. The total investment cost of €1 billion was shared by different levels of government.

To further the economic transformation, a major strategic element was the development of a Technology Park. The Technology Park for the Bilbao metropolitan area was built close to the airport in Zamudio. Today, 6,000 people are employed in 350 businesses at that complex.

In comparison with the major physical investments, the social consequences of the urban crisis received considerably less attention. But the most striking social intervention was the creation of a new city agency, Lan Ekintza, which was set up in 1998 to link fragile parts of the labour force with job opportunities. Lan Ekintza translates into 'action for employment'. Its objective is to find solutions for job and skill mismatches resulting from labour market restructuring. Its main services include: assistance in job searches; assistance with business startups; vocational training; and skills development. Lan Ekintza also offers special services to immigrants in order to foster their integration into the labour-market. Special efforts are concentrated on the disadvantaged area of Bilbao La Vieja where many social problems are concentrated. On an average annual basis, the agency places some 2,000 people in jobs and assists in the startup of approximately 100 new businesses.

Outcomes

Bilbao's recovery from industrial decline has by now become one of the most well-known success stories in Europe. It is a good example of a city actively engaging in globalization strategies and getting transformed in the process. The integrated approach to redevelopment was very ambitious. The aim was to change the city's image from a declining industrial city to a modern post-industrial one. Physically, Bilbao is now a transformed city.

In terms of economic restructuring, there has been a marked shift in employment from the industrial towards the service sector. In 2005, the proportion of the workforce employed in manufacturing was 22 per cent, less than half of its share in 1975 (46 per cent). The share of

those employed in the service sector has on the other hand increased from slightly less than half to over two thirds of the workforce.

Notwithstanding the steep decline of its old industries, Bilbao still has a significant industrial base, higher than in many other cities. Hence, the strong focus on marketing Bilbao as a post-industrial city only partly reflects the reality. Although the share of manufacturing employment is shrinking, the actual number of employees in this sector in Greater Bilbao has increased slightly. Metropolitan Bilbao has experienced a massive increase of overall employment from 267,000 to 380,000 jobs between 1995 and 2005.

Despite its initial problems and public-sector dominance, the Abandoibarra regeneration with its landmark Guggenheim Museum is widely seen as a success story and Abandoibarra is now attracting significant private sector investment. While the provincial government decided not to occupy the proposed office tower, the large energy company Iberdrola has decided to build its new headquarters on the site. Today, the high-profile projects of Bilbao Ria can be found all over the city and several more are currently in the planning process.

Lessons learned

The financial model of land value enhancement through changing the land-use of old industrial sites has been very successful in financing urban regeneration in Bilbao. The financially self-supporting approach enables the agency to finance its own redevelopment strategies. The model of Bilbao Ría 2000 demonstrates that action can be taken even in the context of strained public budgets. Due to the requirement that financial gains have to be reinvested, this allowed some un-profitable projects to be financed in other parts of the city, e.g. in the deprived inner-city neighbourhood of Bilbao La Vieja.

The creation of the regeneration agency Bilbao Ría 2000 was key to the physical transformation of the city. The agency was given the resources and the power to implement an ambitious programme. The delegation of planning and implementation powers to a body outside of the City Council, the entrepreneurial approach of Bilbao Ría and the focus on physical regeneration all combined to yield a successful result. But key to the success was bringing together all levels of government in the project. This carefully constructed but functioning balance between different political interests has been very important.

One criticism is that the city residents have not been sufficiently involved in the redevelopment process. The whole implementation plan was very top down with little public participation. Some suggest that the design of some of the new public spaces appeals more to affluent groups and fails to create amenities for all of the society.

3.3. SOUTH KOREA'S SMART GRID ROADMAP 2030

The Republic of Korea, commonly known as South Korea, launched a national "Low-Carbon, Green Growth" programme[47] to reduce its fast-growing global climate change emissions and to also cut imports of imported fossil fuels. The country was in part reacting to international studies ranking it the world's fastest increasing carbon emitter and the world's fifth-largest oil importer.[48] The "Low-Carbon Green Growth" programme consists of numerous initiatives to structurally change the economy while creating a new export growth engine. The programme impacts numerous national sectors including construction, transportation, the domestic consumer market, energy and energy transmission.

As part of the Low-Carbon Green Growth programme, South Korea's national government introduced a "Smart Grid Roadmap 2030," to plan for next-generation networks integrating information technology into the power grid. The Smart Grid Roadmap 2030 programme is expected to have significant economic impacts on the cities of South Korea, particularly Seoul, the nation's capital and largest city, which had approximately 10 million inhabitants in 2010. The global market for smart grid technologies and services is forecast to grow from $70 billion in 2009 to $171 billion in 2014.[49]

Moreover, a number of companies from South Korea have been involved in a 2010 deal to outfit old commercial skyscrapers in the U.S. city Chicago with new smart grid technologies, demonstrating the feasibility of the national strategy to become a global leader in green tech exports.[50]

South Korea's Smart Grid Roadmap 2030 has laid out the goal of completing a smart grid test bed by 2012. As of 2010 an immense research test bed was under construction on the nation's island of Jeju, south of mainland South Korea.[51] The roadmap has set a national goal of completing a functional smart grid across the nation's metro areas by 2020.

The government of South Korea estimates that public-private investments of seven trillion Korean Won (about US$6 billion) for technology development (68 per cent private, 32 per cent public) and 20.5 trillion Won (about US$17.5 billion) for infrastructure construction (97.5 per cent private, 2.5 per cent public) would be needed through 2030. These investments would yield an estimated 50,000 domestic jobs annually (1 million jobs by 2030), while reducing energy imports, greenhouse gas emissions (an estimated 230 million tons) as well as the need to build new power plants.

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[47] http://www.adb.org/documents/events/2009/Climate-Change-Energy-Workshop/KOR.pdf

[48] http://www.businessgreen.com/business-green/news/2256676/korea-moves-ahead-smartgrid

[49] Gigaom, Katie Fehrenbacher, 26 May, 2009: http://earth2tech.com/2009/05/26/smart-grid-to-grow-21-per cent-a-year-to-17b-in-5-years/

[50] "The Smart Money's on Korea's Smart Grid Tech," The Next Silicon Valley, 22 July, 2010. http://www.thenextsiliconvalley.com/technews/793/The-smart-moneys-on-Koreas-smart-grid-tech

[51] http://www.iti.illinois.edu/news/press-releases/iti-collaborate-korea-smart-grid-security

South Korea's Smart Grid Roadmap 2030 is divided into five sections:

- **Smart power grid**: would require building a monitoring and control system of the national power grid, and also building a grid failure prediction and automatic recovery system
- **Smart consumer**: residential smart power meters would be distributed nationwide, with a corresponding automated energy management system
- **Smart transportation**: the plan calls for developing a nationwide charging infrastructure with an information and communications technology-based electric vehicle operating system
- **Smart renewables**: creation of a large-scale renewable energy generation complex and large capacity energy storage devices
- **Smart electricity service**: development of a dynamic power pricing system, which would enable a consumer electricity trading system

Smart power grids are being developed between supply and consumption sources as well as to accommodate smart transportation systems and smart renewables. Smart grids are expected to pave the way for numerous new business models and businesses. Emerging business models are based on technologies wrapped in a variety of information and functional services, from remote monitoring and control of residential or office appliances, to electricity trading services for both businesses and consumers.

According to one online industry publication, South Korea is at a global advantage in developing its smart grid technology goals, as the country of 48 million depends on just one energy utility, making planning and implementation easier. Another advantage South Korea has is its broadband network. After the Asian financial crisis of 1998, South Korea embarked on a plan to become a worldwide leader in broadband. The nation succeeded; in 2009, 95 per cent of households reported broadband access, the highest rate of residential penetration in the world.[52]

"[With Smart Grid Road Map 2030] South Korea is saying, 'this is what smart grid is and we've got the existing knowledge base to be technology leaders here'," said David Leeds, a smart grid analyst with GTM Research in Greentechmedia. "South Korea imports essentially all of its energy, so there is a necessity there that may drive Korea to develop next-generation smart grid technologies ahead of the pack."[53]

Lessons Learned

[52] http://www.physorg.com/news164595432.html

[53] "South Korea Guns for the Finish Line," Katherine Sneed, Michael Kanellos, Greentechgrid, 16 March, 2010 http://www.greentechmedia.com/articles/read/south-korea-guns-for-smart-grid-finish-line/

South Korea's national programme "Smart Grid Roadmap 2030" emerged from the nation's overall "Low-Carbon Green Growth" strategy, demonstrating a technology-focused approach in support of the national goal of reducing carbon while increasing clean technology industry exports. Smart Grid Roadmap 2030 provides tangible goals for job creation as well as mobilization of private financing that will be needed in research and development, construction and technology deployment. Within South Korea's Smart Grid Roadmap 2030, five sectoral elements (transportation, consumers, renewables, electricity, power grid) are nested within. Precise milestones for each of these sectoral areas are broken into three phases: Phase 1 (2010-2012), Phase 2 (2013-2020), and Phase 3 (2020-2030). This framework provides cities a clear and compelling model for how each sector will be impacted: for instance in the "Consumer" sector for Phase 1, "Real time price information" will be provided.

3.4. San Jose, California's Green Vision

The city of San Jose, California is at the center of Silicon Valley.

San Jose, United States is a city of one million located in California's Silicon Valley. This is a renowned location where investors, manufacturers, suppliers and technology innovators have established dense networks of relationships that can provide cost and innovation advantages for

the region.[54] From Google, Apple and Hewlett Packard to Facebook and Twitter, the Silicon Valley has witnessed the creation of start-up companies that constitute the underpinnings of the global economy and modern culture. San Jose has been more recently trying to leverage this hotbed of innovation with a "Clean Tech Strategy" that sets goals for economic growth and job creation in clean technology jobs in clean energy, and resource efficiency.

As part of a larger "Green Vision," the city's Clean Tech Strategy has set a goal by 2022 of creating 25,000 clean tech jobs from its current total of about 4,000 jobs in the clean tech sector. This strategy intends to leverage the region's easy access to venture funding, highly skilled engineers and entrepreneurs, world-class research institutions, supportive government policies, and technology incubators like San Jose's Environmental Business Cluster.[55]

The San Jose clean technology strategy uses traditional business retention and attraction approaches combined with sophisticated networking of technology and governmental partnerships that are:

- Providing incentives and services at every stage of growth to encourage both established clean technology companies and start-up firms to stay and grow in San José;
- Incubating next-generation technologies through partnerships with local universities and the US Department of Energy's National Renewable Energy Laboratory-backed Environmental Business Cluster;
- Providing city demonstration opportunities for innovative clean technology products;
- Creating opportunities for local residents to receive training for employment in clean technology industries;
- Advocating for legislative changes that will support the clean technology industry's growth.

The San Jose-based Environmental Business Cluster is a clean technology incubator that provides commercialization support and facilities for emerging clean energy and environmental technology companies. Founded in 1994 by the city of San Jose in conjunction with San Jose State University's Research Foundation, its services include expert coaching and strategic counsel, focused educational and networking programmes, targeted access to investors, strategic partners and industry networks, office space, equipment, conference rooms and training facilities.[56]

[54]"Rising Tigers," The Breakthrough Institute, Oakland, California, United States, 2009, p.9 http://thebreakthrough.org/blog/Rising_Tigers.pdf

[55]"San Jose's Green Vision," City of San Jose, United States website, accessed 20 August, 2010. http://www.sanjoseca.gov/greenvision/CleanTech.asp

[56]San Jose Environmental Business Cluster website, accessed 20 August, 2010: http://www.environmentalcluster.org/

As one of the largest environmental and clean technology incubators in the United States, the Environmental Business Cluster has assisted more than 150 companies since its founding in areas such as water purification, advanced transportation, wind and solar energy, waste heat recovery, sustainability, social networking, power management and testing, and alternative fuels. The Environmental Business Cluster supported 22 companies as of August 2010. One company that recently emerged from the incubator designs concentrating solar photovoltaic technologies; it raised $30 million in financing and was named as a "2008 Company of the Year" by Business Week.

Since 2003, the Environmental Business Cluster has also been working with the California Energy Commission and the U.S. Department of Energy's National Renewable Energy Laboratory to provide commercialization services to selected applied research grant recipients.[57]

The city of San Jose and the Environmental Business Cluster developed an Electronic Transportation Development Center, where emerging and established technology companies collaborate on the design, development, prototype fabrication, and technology licensing for clean energy technologies. The city is establishing pilot programmes for new technologies such as electric school buses, refuse trucks and fueling stations, while incorporating designs and electronics from the Silicon Valley region to make the vehicles cleaner, safer, and more secure.[58]

San Jose's Green Vision is attempting to "use our buildings, lands and processes" to accelerate the growth of local clean technology economic development, according to the city's Clean Technology Regional Policy Manager, Scott Green. He said across from San Jose City Hall is an electric vehicle charging station that was assembled at two locations in the city. Green stressed that continuing San Jose's clean technology industry economic development process will require ongoing policy engagement at all levels of government, capital investment, fair and stable rules of the road and collaboration and coordination across multiple disciplines. Importantly, it can also count on research partnerships with universities both near the Silicon Valley, such as Stanford University, and beyond it, such as the University of California at Davis. Another collaborative approach the city has taken, Green said, is to play matchmaker with local clean technology companies in developing contracts with large corporations in the city on energy saving retrofitting. Such an effort has saved San Jose corporations like EBay, Adobe Systems and Brocade more than $1 million in energy costs, while providing energy retrofitting revenues and jobs for city-based clean technology start-ups.[59]

Lessons Learned

San Jose's Green Vision programme provides goals and milestones so the U.S. city of one million can leverage the Silicon Valley's leading base of technology and business model innovation in the creation of clean technology economic development. In addition to partnering with a nationally supported technology innovation center, the Environmental Business Cluster,

[57]Ibid
[58]"New home, bank for San Jose green car developer Synergy," Mary Duan, *San Jose Business Journal*, 10 Jan., 2010: http://sanjose.bizjournals.com/sanjose/stories/2010/01/11/story8.html
[59]Conversation with Scott Green, Clean Technology Policy Manager, San Jose: 9 August, 2010.

San Jose tracks the number of local clean technology sector jobs and has set longer-term job creation goals for the city's clean technology sector. San Jose has attempted to utilize a number of operational tactics for supporting clean technology industries by making its buildings, land and operations open to pilot project collaboration, as well as matching smaller clean technology and energy efficiency companies with contract opportunities provided by the city's many large corporations.

3.5. FEED-IN TARIFFS SUPPORT RENEWABLE ENERGY IN GERMAN CITIES

Feed-in Tariff s (FITs) support the market development of renewable energy technologies, especially electricity generation. They put a legal obligation on utilities and energy companies to purchase electricity from renewable energy producers at a favourable price per unit, and this price is usually guaranteed over a certain time period, say 20 years. Tariff rates are usually determined for each renewable technology in order to take into account their differing generation costs, and to ensure profitability. The guaranteed access to the grid, favourable rate and the tariff term guarantee, mean that FITs create security for investment by producers, manufacturers, investors and suppliers. FITs make the cost of clean energy competitive with conventional forms of energy, which do not internalize the costs of pollution and are also heavily subsidized. The Feed-In Tariff (FIT) has proven to be one of the most effective policy instruments in overcoming the cost barriers to introducing renewable energy and making it economically viable.

The German FIT has been a great success and is generally regarded as the best example of an effective FIT law. While Germany's energy use has remained relatively stable, renewables have accounted for an ever greater portion of the electricity consumed, helping to limit Germany's greenhouse gas emissions. It has been estimated that as of 2010 the FIT law itself had directly saved more than 33 million tonnes of carbon dioxide from being released into the atmosphere.

In 2008, renewables accounted for about 16 per cent of total electricity consumption in Germany – up from 10.2 per cent in 2005. From 2000 to 2008 the volume of electricity produced from renewable sources supported by the FIT law increased from about 13.6 terawatt hours (1TWh = 1,000,000 kWh) to over 70 TWh.[60]

The solar sector in Germany has grown considerably thanks to the Feed-in Laws. Germany is the largest solar heating producer in the world with a 47 per cent share of the global market. As of 2007 there were over 40 companies in Germany that produce solar system components. The industry employs more than 20,000 people and generated €1.7 billion in revenue per year. The renewables industry as a whole in Germany earned €21.6 billion in 2006, up from €16.4 billion in 2005, and employed about 214,000 people – more than the nuclear and the coal industries

[60] IEA Statistics

combined. It is expected that by 2020 the renewable energy industry will employ between 400-500 thousand people.

Key elements of FIT legislation[61]

Some key elements that legislators must consider when introducing a FIT law are:

• *Impose a priority purchase obligation.*
Grid operators must be obliged to connect renewable energy producers to the grid, whether the producers are utilities, businesses or private households, and they must transmit the electricity they produce. This should be a priority obligation so that electricity from renewable energy sources is purchased ahead of electricity from other sources. The consequence of this obligation may well be that conventional power generation plants must reduce their production.

• *Determine which technologies and plants will be covered by the law.*
A FIT law needs to state clearly what renewable energy technologies and plants are covered by it.

• *Determine a fair tariff rate.*
The tariff rate for electricity generated from renewable sources must be set at a level that guarantees profitability and reflects the costs associated with electricity production from that source. Getting the tariff rate right is one of the most important and most difficult tasks. If it's too high, windfall profits for producers will follow. If it's too low, there will be little or no investment. For this reason it is important to include a mechanism for adjusting the tariff.

• *Guarantee the tariff rate over a specific period of time.*
The price-per-unit rate should be guaranteed for a specific period of time after qualifying producers have connected to the grid. This ensures the profitability of production, and the security of investment for producers, manufacturers, investors and suppliers. The duration can be set differently for each eligible technology. A time limit should be fixed in order to reduce the overall costs of the FIT system. Restricting payment to a certain number of years also speeds up the innovation cycle by replacing old technology with new and more efficient equipment. Experience has shown that tariffs should be guaranteed for a reasonably long period of time, otherwise, investment security may be hampered. The German FIT law guarantees the rate for a period of 20 years, which has proven effective.

• *Determine an effective way of financing the FIT law.*
There are two main options for financing the feed-in tariffs. The costs could be covered by a cost sharing mechanism for all electricity end-users, or it could also be done through a fund. Most countries with FIT laws, including Germany, have financed it through a cost sharing mechanism. Such a mechanism equally distributes the costs onto the electricity bills of all consumers. This usually ensures that the cost per consumer is very low – in Germany it comes to approximately €1.50 per month per household. The major political advantage of this financing method is that

[61] A copy of the German FIT legislation (Renewable Energy Sources Act) in English is available at: http://www.solarpaces.org/Library/Legislation/docs/EEG%20English.pdf

it is separate from the national budget, and therefore less vulnerable to changing political moods.

• *Reduce the tariff rate each year.*
Reducing the annual per kWh tariff rate for plants qualifying for connectivity to the grid under the FIT law encourages innovation and cost cutting. In Germany, for example, the 2005 tariff rates per kWh for PV plants connected to the grid were reduced by 6.5 per cent in 2006. This annual digression of tariff rates has spurred on innovation and encouraged very rapid growth in the renewable energy sector.

Lessons Learned
Some of the benefits of a well-designed feed-in tariff law are:
• *A reduction in CO2 emissions*. Well designed FIT laws can greatly increase the market share of renewable energy, thereby replacing fossil fuel based power with clean electricity generated from renewable sources.
• *The creation of jobs*. The growth of the renewable energy industry will create jobs for thousands of workers. In Germany, for example, as of 2007, the renewable energy industry in Germany employed about 249,000 people – almost 60 per cent of whom were employed as a direct result of the German FIT law.
• *A more secure domestic energy supply*. By expanding the market share of renewable energy produced domestically, countries will rely less on imported fossil fuels.
• *An increased drive for technological innovation*. Good FIT rates for renewable technologies increase the drive for innovation, and encourage investment in technologies such as wind and solar energy that have huge potential.
• *The creation of fair market conditions for renewable technologies.* Renewable technologies have been unable, in the past, to compete with conventional energy sources that do not internalize environmental costs and are frequently heavily subsidized. FIT laws help to level the playing field, and enable renewables to compete.

4. BETTER CITY, BETTER LIFE: POLICY OPTIONS FOR SUSTAINABLE ECONOMIC DEVELOPMENT

Strategy1: Bridge traditional industry sectors in order to create sustainable economic development at the regional, city and project level.	
Policy Option 1	Utilize new financing instruments and economic support for low-carbon assessment and development for industry, land use and planning, transportation, energy generation and use, buildings, forests, agriculture and infrastructure.

Policy Option 2	Facilitate a transition to low-carbon economy by adopting feed-in tariff legislation to catalyze investment in renewable energy for electric power generation in the industrial, commercial, residential and government sectors of the local economy.
Strategy 2: Develop goals and programmes for green economic growth in both traditional and emerging industry sectors.	
Policy Option 3	Assess current industry base/ service sector and prioritize best opportunities for green economic transformation based on regional differentiators, including physical assets, location, tourism and workforce characterization.
Policy Option 4	Investigate emerging economic opportunities, assess regional/local competitive advantages, and opportunities for economic growth and third-party financial support.
Strategy 3: Improve integrated city and metro sustainable economic development capabilities	
Policy Option 5	Facilitate aligned sustainability fiscal management across departments, including waste, energy, water, streets, building and transportation management through budgetary and financing mechanisms.
Policy Option 6	Utilize goals to measure and manage sustainable economic development performance indicators for areas including waste, water, energy, transportation, green building, sustainable materials and tourism industries. Deploy strategic tools such as scorecards, maps and dashboards to make results easy to understand and act upon.
Strategy 4: Create sustainable economic development growth mechanisms including subsidies, enterprise zones, land use, land purchases, public-private partnerships and business facilitation	
Policy Option 7	Develop metro area green economic growth policies and levers for sustainable enterprise zones, local green industry subsidies, tax incentives, land purchase and land use facilitation.
Policy Option 8	Systematically create new business opportunities for local new economy start-ups by introducing them to the city's existing base of corporations and industries

	requiring such products or services.
Policy Option 9	Utilize existing city government utilities, infrastructure, facilities, fleets and resources for implementation or testing of green products and services in order to increase regional or local green economic opportunities.
Policy Option 10	Leverage both public and private economic development financing for new infrastructure, energy, transportation and water projects, including international support and partnerships.

5. RELATED LINKS FOR FURTHER INFORMATION:

United Nations Environment Programme: Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication. (2011) www.unep.org/greeneconomy

http://www.weforum.org/documents/gov/Environment/TF%20Low%20Carbon%20Prosperity%20Recommendations.pdf
"Task Force on Low-Carbon Prosperity: Recommendations," World Economic Forum, 2009

http://www.oecd.org/document/42/0,3343,en_21571361_45068056_45068202_1_1_1_1,00.html
Organization for Economic Co-operation and Development site, including report, "Cities and Green Growth: Issues Paper for the 3rd Annual Meeting of the OECD Urban Roundtable of Mayors and Ministers", 25 May, 2010, OECD Conference Center, Paris.

http://www.globalurban.org/Issue1PIMag05/Weiss article.htm
"Teamwork: Why metropolitan economic strategy is the key to generating sustainable prosperity and quality of life for the world," Marc A. Weiss, Global Urban Development Magazine, Global Urban Economic Development Institute, Issue 1, volume 1, May 2005

http://www.slideshare.net/itsgowri/wwf-low-carboncities
"Reinventing the City: Three Prerequisites for Greening Urban Infrastructures", WWF International (in conjunction with Booz & Company), Gland, Switzerland, 2010

http://www.pwc.com/us/en/cities-of-opportunity

"Cities of Opportunity," Price Waterhouse, 2010. Analyzes 21 global centers of economic activity, by financial, economic, environmental factors

http://www.greengrowth.org/rethink.asp
United Nations Economic and Social Council for Asia and the Pacific (ESCAP) site

http://www.greengrowth.org/capacity_building/Download/GG_capacity_development/Green_Growth_Capacity_Development_Brochure-resized.pdf
United Nations Economic and Social Council for Asia and the Pacific (ESCAP) report on rethinking growth

http://www.nyc.gov/html/om/pdf/2009/pr465-09_plan.pdf
Site for New York City PlaNYC 2030

http://www.nycedc.com/SupportingYourBusiness/Industries/Green/Pages/Green.aspx
Site for New York City Green Economy Plan

http://www.routledge.com/books/details/9780415953610/
Description of book on squatter settlements and economic innovation, "Shadow Cities: A billion squatters, a new urban world" Robert Neuwirth, 2006 Routledge

"Catalyzing Low-Carbon Development? The Clean Technology Fund," Smita Nakhooda, World Resources Institute, May 2009, (accessed 6 September 2010)

CHAPTER 4 - SUSTAINABLE URBAN TRANSPORT

Cities should respect nature, consider the urban ecological environment as an asset, integrate environmental issues into urban planning and administration, and accelerate the transition to sustainable development. They should promote the use of renewable energy sources and build low-carbon eco-cities. They should strongly advocate for conservation of resources and promote environment-friendly manufacturing. Cities and their citizens should join together to create sustainable lifestyles and an ecological civilization in which people and environment co-exist in harmony.

Shanghai Declaration on Better Cities, Better Life

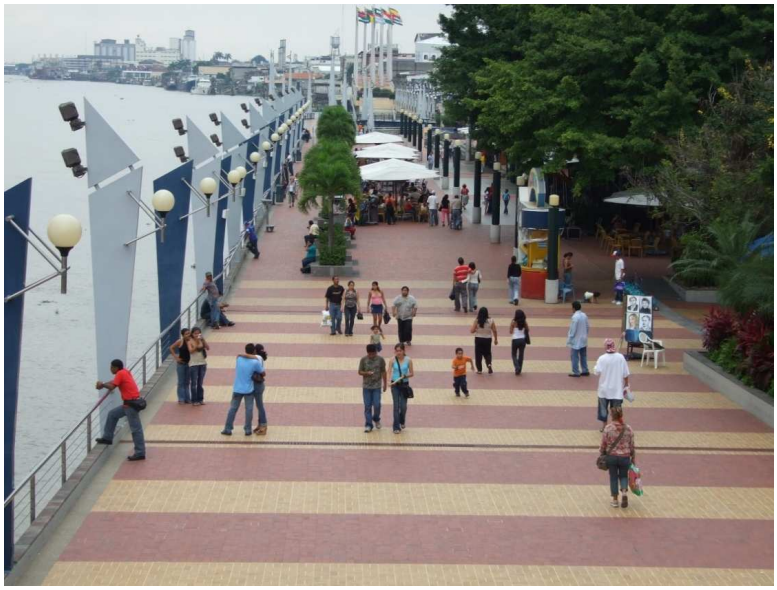
INTRODUCTION[1]

As a Mayor, one of your greatest challenges is to plan and invest wisely in infrastructure for sustainable urban transport. Transport plays a crucial role in urban development by providing access for people to education, markets, employment, recreation, health care and other key services. Especially in cities of the developing world, enhanced mobility for the poor and vulnerable groups is one of the most important preconditions for achieving Millennium Development Goals. Those cities with transport modes in an integrated system are more likely to evolve and prosper as centers for trade, commerce, industry, education, tourism and services. It is common that cities ranking at the top of surveys measuring urban quality of life have high quality urban transport systems that prioritize public transport and non motorized modes.

The existing reality, however, is that urban transportation systems in most developing cities are far from ideal. The most visible and frequently mentioned transport problem of a city is its traffic congestion, and it is well known that high levels of congestion create significant impact on local and national GDP. Accessible and affordable public transport service and safe infrastructure for non-motorized transport such as cycling and walking are lacking in most developing country cities. The number of private vehicles has been increasing continuously and dominates the roads. As a result, the transportation sector is heavily responsible for public health issues in cities such as air pollution (acidification, smog), noise, greenhouse gas emissions, and road accidents. While transport enables the economy to grow, if not well-managed, it can also retard growth and the efficient delivery of essential social services. The lack of comprehensive planning of transport systems, without due consideration to social, economic, environmental and cultural

[1] This chapter was authored by Carlos Felipe Pardo, with valuable input and contributions from Yang Jiemian, Yu Hongyuan and Choudhury Rudra Mohanty.

elements of the city, can result in physical breaks in the fabric of communities and reinforce social exclusion. The impact on quality of life and the environment cannot be underestimated.



Caption: Guayaquil restored its waterfront as part of a large redevelopment plan which also included a Bus Rapid Transit System and a housing improvement project. Previously an area of high crime rate, the riverfront is a place where citizens can enjoy public space and have an additional opportunity for daily leisure. (photo Carlos Felipe Pardo)

In order to return urban places to people and to create more livable cities, decision makers in these cities urgently need to change the direction of urban transport development toward a more sustainable future. Establishing a sustainable urban transport system requires a comprehensive and integrated approach to policymaking and decision-making, with the aim of developing affordable, economically viable, people-oriented and environment-friendly transport systems.

Political will has become a key ingredient to improving urban transport policies in cities. The knowledge of what is happening and how to improve a situation is already there, and tools to address problems are well known by many practitioners. When a city mayor or another decision maker takes these tools and applies them in their city knowingly and appropriately, positive outcomes and benefits for city inhabitants can result.

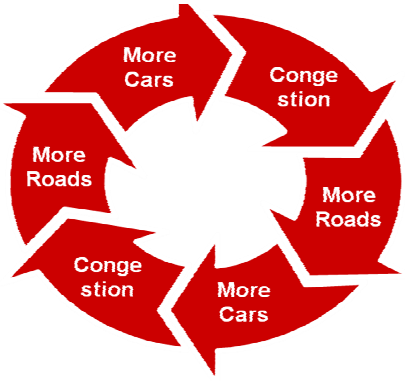
1.ISSUES AND CHALLENGES

1.1 UNCONTROLLED MOTORIZATION

“Adding highway lanes to deal with traffic congestion is like loosening your belt to cure obesity. – Lewis Mumford, The Roaring Traffic’s Boom.

With rapid urbanization and economic growth, motorization has been accelerating in cities in developing countries. For example, in the Asian region, the number of motor vehicles per one thousand people has more than tripled in the past 30 years. Owning a private car or a motorized two-wheeler is a major aspiration for people in these cities, in particular, where public transport service is often inadequate and unsafe.

Figure 4-1. Vicious Circle of Car-Oriented Transport Development



Source: Buis, 2009b

Unfortunately, city managers in developing countries are following the same car-oriented transport development patterns made by many cities in developed countries in the past. Ironically, many cities in developed countries are now trying to recover from a car-dominated development era by halting the building of more infrastructures for private vehicles and re-allocating road space for public transport and non-motorized transport. This approach has been called in some cases a "road diet" or "complete streets" (the first is one where space for cars is explicitly reduced, the second emphasizes the need for streets where all road users are catered to).[2]

One considerable problem that is seen the world over is that there is a feeling, mainly prompted by traditional road engineering, which can be summarised in the phrase "build your way out of congestion". It essentially reduces the problem of congestion to a lack of sufficient road space and a need for better traffic flow, disregarding other more complex problems of travel demand management, negative externalities (side-effects) of such policies and overall liveability in an urban setting. This approach has luckily started to lose strength, but some cities still erroneously promote this vision as the solution to congestion and transport problems.

In the developing world, however, the trend is still largely in favor of the expansion of infrastructure for private motor vehicles. Policies for more and more road construction have clearly failed to cope with ever increasing demand from rapid motorization, resulting in a vicious circle as depicted in Figure 4-1.[3] This cycle shows how the increase of infrastructure to alleviate travel demand will have apparently positive consequences in the short term, but some months later there will be a much greater congestion than before, thus increasing the problem rather than solving it.

[2] McCann, B., Rynne, S., Editors (2010). Complete Streets: Best Policy and Implementation Practices. American Planning Association Planning Advisory Service Report Number 559.

[3] Buis, J. (2009b) *A new Paradigm for Urban Transport Planning: Cycling Inclusive Planning* at the Pre-event Training Workshop on Non-Motorized Transport in Urban Areas, 4th Regional EST Forum in Asia, 23 February 2009, Seoul, Republic of Korea

1.2 URBAN AIR POLLUTION

"Because we don't think about future generations, they will never forget us."

- Henrik Tikkanen, author and artist, 1924-1984

Table 4-1. Air Pollution in Selected Cities

	PM_{10} ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
WHO Air Quality Guidelines:	**20**	**20**	**40**
Beijing	89	90	122
Delhi	150	24	41
Tokyo	40	18	68
Seoul	41	44	60
Mexico City	51	74	130
Bangkok	79	11	23
London	21	25	77
New York	21	26	79
Paris	11	14	57
Shanghai	73	53	73
Santiago	61	29	81
Sao Paulo	40	43	83

Data Source: World Bank, 2009[4]

Another major problem for city managers is urban air pollution, which is a widespread environmental hazard. As shown in Table 4-1, even though the level of different air pollutants in cities of developing cities are generally higher than those of developed ones, still very few cities overall stay below the recommended levels by the World Health Organization (WHO). In most cities in the world, the road transport sector is the largest contributor of these urban air pollutants, as well as to high levels of carbon monoxide and hydrocarbons, among other substances. These high levels contribute to various respiratory and cardiovascular illnesses. Various epidemiological studies have clearly linked transport-related contaminants to asthma, bronchitis, heart attacks, and strokes.

The groups most vulnerable to urban air pollution include infants, the elderly, and those suffering from chronic respiratory conditions. For example, from 1999 to 2009, 25.6 per cent of the children in Bangalore, India, suffered from asthma.[5] WHO estimates that nearly 2 million premature deaths in the world are caused by air pollution, where road transport is one of the major contributors to these premature deaths due to its effects on outdoor air pollution.[6] Urban air pollution also has a huge economic cost. For example in

[4] World Bank (2009). *World Development Indicators 2009*. World Bank, Washington, D.C.

[5] Majumdar, S. (2010). *More and more kids falling prey to asthma in Bangalore*. DNA. (Available at http://www.dnaindia.com/bangalore/report_more-and-more-kids-falling-prey-to-asthma-in-bangalore_1342244)

[6] World Health Organization (WHO) (2008). *Air quality and health*. WHO online article. (Available at http://www.who.int/mediacentre/factsheets/fs313/en/index.html)

2000, approximately 15,100 cases of chronic bronchitis and 7,200 cases of premature deaths in Shanghai were due to fine particulates (PM_{10}), and resulted in a cost of US$ 880 million.[7] Since exposure to air pollutants is generally beyond the control of individuals, local authorities need to take action to tackle the serious health problems with appropriate measures including policies to reduce private vehicle use, to encourage more public transport and non-motorized transport options, and to promote cleaner fuels. Air quality monitoring systems with a sufficient number of sampling stations also need to be established.

1.3 ROAD SAFETY

"The road system needs to keep us moving. But it must also be designed to protect us at every turn."

- *www.visionzeroinitiative.se*

Urban managers have to take road safety seriously as it is a universal problem. The importance of focussing on road safety has reached such a degree that 2011-2020 has been defined as "the Decade of Action for Road Safety" by the World Health Organization .[8]

Some recent facts include the following:[9]

- Over 90 per cent of the deaths on the roads occur in low-income and middle-income countries, which have only 48 per cent of the world's registered vehicles
- Pedestrians, cyclists, and riders of motorized two-wheelers and their passengers (who are collectively known as "vulnerable road users") account for around 46 per cent of global road traffic deaths. This proportion is greater in low-income countries than in high-income countries.
- Less than one-third of countries have taken necessary measures - for example low-speed zones - to reduce speed in urban areas
- More than 1.3 million people die annually on the road in the world and another 20~50 million people are injured

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[7] United Nations Environment Programme (UNEP) (2007). *The fourth Global Environment Outlook: environment for development (GEO-4).* UNEP, Malta (Available at http://www.unep.org/geo/geo4/report/GEO-4_Report_Full_en.pdf)

[8] World Health Organization and FIA Foundation (2010). Decade of Action for Road Safety 2011-2020. http://www.decadeofaction.org/

[9] WHO (2011b). 10 Facts on Global Road Safety. http://www.who.int/features/factfiles/roadsafety/en/index.html

In fact, road traffic injuries are the leading cause of death for people aged 15-29 years; killing more young people than HIV/AIDS. In addition, almost half of those killed in traffic accidents are pedestrians, cyclists, passengers in public transport and motorcyclists.[10] . This share is even larger in developing country cities where simply walking or cycling can be a serious risk due to lack of road safety infrastructure for pedestrians and cyclists. Generally, many of the road safety measures are not focused on these vulnerable groups but rather on drivers.

1.4 MOBILITY OF THE URBAN POOR

Caption: Women are a specific group which has different transport needs in their daily activities. This road in Pune (India) does not provide suitable infrastructure for this walking woman. (photo Carlos Felipe Pardo)

"Poverty must be seen as the deprivation of basic capabilities rather than merely as lowness of income" - Amartya Sen, 1999

Urban transport needs of all social groups are seldom met, especially in cities of developing countries. This may be due to a lack of understanding of such needs, a lack of data on the transport trends of different population groups or simple lack of knowledge about the importance of understanding all these needs and acting upon them.

A more comprehensive approach towards the travel patterns of different groups in society reveals the following:

- There are many more trips being taken by individuals with higher income than by those of lower income, mostly because low-income groups do not have the capacity (in time or money) to travel more. This weighs heavily on their capacity to access jobs, education, health and all other services that a city can provide, reducing their participation in society as a whole.[11]

[10] World Health Organization (WHO) (2009). Global Status Report on Road Safety. WHO, Geneva.

[11] Thynell, M. (2009). GTZ SUTP Technical document No.2: Social Change and Urban Transport. Eschborn: GTZ.

- There is much less accessibility for lower-income groups (and vulnerable groups in general) due to high/inequitable transport fares, lack of public transport provision to areas where low-income populations live, and lack of safe and high quality infrastructure for these users (including sidewalks, which are often neglected in favour of roads). [12]
- Transport patterns of citizens vary widely, with low-income women travelling in trip chains (various short trips chained to one another) rather than pendular trips (one trip in the morning and one in the afternoon), and a great use of non-motorized transport modes (walking, cycling).
- Negative impacts from unsustainable transport systems affect the poor disproportionately.[13]

This situation poses a threat to social development and general equity in cities. For instance, non-motorized transit is often an 'orphan' in transport systems and is frequently overlooked and considered as a peripheral issue rather than a core requirement. In most cases, for example, cycling is not well integrated with public transportation, which leads to loss of potential passengers. Also, partly as a result of this circumstance, the majority of victims in traffic accidents are pedestrians and cyclists, many of whom belong to lower income groups.

1.5 MOBILITY NEEDS OF DISABLED AND SENIOR CITIZENS

The disabled and the senior citizens are important disadvantaged social groups with special mobility needs which ought to be addressed more effectively.[14] The special needs should be anticipated in the planning and construction of new transport infrastructure. Barrier-free facilities can significantly enhance the mobility for these social groups.

In recent years, a growing number of cities have issued municipal regulations on barrier-free facility construction, requiring all new construction projects, including public and residential buildings, roads, bridges, pedestrian overpasses and underpasses, metro and rail stations, as well as tourist sites, to be barrier-free, thus enabling the safe and

[12] World Bank (2002). Cities on the Move: A World Bank Urban Transport Strategy Review. Washington.

[13] Badami, M. G., Tiwari G., and Mohan, D. (2004) *Access & Mobility for the Urban Poor in India* presented at the Forum on Urban Infrastructure and Public Service Delivery for the Urban Poor, 24-25 June 2004, New Delhi, India. (Available at http://www.wilsoncenter.org/topics/docs/badami.doc)

[14] In 2006, the United Nations General Assembly adopted Resolution 61/106 establishing the Convention on the Rights of Persons with Disabilities.

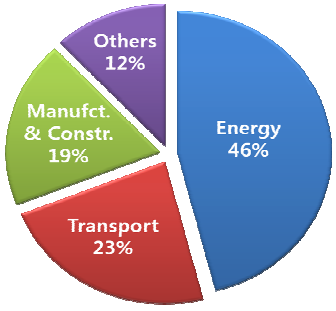
convenient mobility of the disabled, seniors, injured and other disadvantaged social groups. [15]

Barrier-free bus stations and buses, sidewalks for the blind, ramps, elevators, lifting platforms and wheelchair waiting positions are essential elements which can enable barrier-free mobility.

1.6 Energy Security & Greenhouse Gas (GHG) Emissions

"Urban transport represents one of the fastest growing sources of greenhouse gas emissions that contribute to global climate change" - UNCRD, 2009

Figure 4-2. Global CO2 Emissions by Sectors



Source: UNEP, 2010

Transport is the second largest sector contributing to global carbon dioxide (CO_2) emissions from fossil fuel combustion as shown in Figure 4-2.[16] Of the 23 per cent of global CO2 emissions from the transport sector, road transport accounts for 73 per cent, followed by international shipping and international aviation. However, the transport sector is not receiving enough attention in global climate change mitigation efforts, despite the fact that, according to UNFCCC (2011) it is the sector where emissions have increased the most (by 14 per cent from 1990-2008) and, in a business-as-usual scenario, are expected to grow by 25.8 per cent by 2020 compared to 1990 levels.[17]

Cities must understand that action upon climate change must be done collectively and seeking global goals of mitigation, while acting locally. The co-benefits of such an approach would also be significant and must be always understood as part of a package of urban transport improvements.

To date, the number of transport-related projects funded by the Clean Development Mechanism is few. However, a new possible source of funding is Nationally Appropriate Mitigation Actions or NAMAs. This is an instrument developed by the UN Framework

[15] To prepare itself for hosting the 29th Olympic Games (8-24 August 2008) and the 13th Paraolympic Games (6-17 September 2008) Beijing Municipality implemented a series of measures to enhance barrier-free facilities around the city. The Organizing Committee compiled a Guide to Barrier-free Services which was published in four languages and distributed to the public free of charge.

[16] United Nations Environment Programme (UNEP) (2010). *2009 Annual Report - Seizing the Green Economy*. UNEP, Nairobi

[17] UNFCCC (2011a). Compilation and synthesis of fifth national communications. Subsidiary Body for Implementation, Thirty-fourth session, Bonn, 6–16 June 2011.

Convention on Climate Change (UNFCCC) to generate more projects which can mitigate climate change and can improve knowledge on emissions in cities and countries throughout the world. This opportunity has been identified as a possible "game changer" in climate change mitigation, especially for the transport sector since previous methodologies such as CDM have proven difficult to adjust to the nature of transport projects. While specific procedures and rules for NAMAs are now being developed, it is important to identify them as a potential source of financing for sustainable urban transport measures.

The table below identifies some of the key financing instruments used in climate change mitigation and how they can be used to develop sustainable urban transport. Please note that since NAMAs have not yet been fully developed as an instrument, they are not included in the table below.

Table 4.2 Financing instruments for climate change mitigation applicable to transport projects

Source of climate finance	Nature of support			Type of intervention supported				Modes supported			
	Grants	Loans	Technical	Infra-structure	Technology	Operations	Capacity building	Road	Rail	Urban public transport	Non motorised transport
Clean Development Mechanism	✓		✓	✓	✓				✓	✓	✓
UNDP Millennium Development Goals (MDG) Carbon Facility			✓				✓	✓	✓	✓	✓
Hayotama Initiative	✓	✓	✓	unclear				unclear			
Global Environment Facility	✓		✓	✓	✓	✓	✓		✓	✓	✓
Clean Technology Fund	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
International Climate Initiative	✓			✓	✓		✓			✓	✓

Source: Harald Diaz, 2011[18]

2. Policy Options for Urban Transport

A sustainable urban transport system requires strengthening various features of the system including mobility, accessibility, affordability, social equity, efficiency, safety, security, convenience, low carbon, comfort, and people- and environment-friendliness. In order to achieve all these elements, various challenges need to be addressed in an integrated manner. These challenges include improving human health through the

[18] Diaz-Bone, Harald, 2011, Use of Climate Finance (CDM, GEF, NAMA) in the Transport Sector, presentation at Forum on Sustainable Transport for Latin America, Bogotá, Colombia, 22 - 24 June 2011

reduction of urban air pollution, tackling climate change, reducing the number of deaths and injuries from road accidents, controlling excessive motorization, improving public transport services, encouraging more walking and cycling, and recognizing the specific needs of urban poor, women, the elderly, people with disabilities, youth, and children. It is critically important to understand that urban transport (or mobility) is not an isolated issue and is related to many other aspects of urban life in general. It is useful to note this integrated approach as an introduction to the more specific measures that are presented below.

There are various ways to describe an implementation method for sustainable urban transport in a city. While this document will present a specific framework, it is important to see other approaches to understand how to act upon the challenges posed above. In general, sustainable transport emphasizes the use of public transport, bicycles and walking and discourages the use of individual motorized modes of transport (cars and motorcycles). It also promotes the improvement of institutions, urban development plans, sound policies, appropriate technologies and the development of promotional schemes that persuade users into using sustainable urban transport modes.

2.1 PUSH – AND PULL APPROACH

One way to view the problem is to analyze it from the standpoint of "where" people should be in transport (where we should "push" them) and from which modes we should "pull" them. This is commonly called the "push and pull" approach.[19] It emphasizes that urban transport measures must persuade users into using public transport and non-motorized transport, while developing strategies to "push them out" of automobiles and similar transport modes. To achieve the "pull" component, one must provide good quality of service in public transport, develop infrastructure for public transport and non motorized transport and in general develop policies that improve conditions for the use of these modes. To arrive at a situation where people are "pushed from cars", policies must be in place to discourage their use by eliminating fuel subsidies, creating charges to automobile ownership and use, and in general creating policies that increase the cost of using these modes while using the revenue from those charges to enhance sustainable urban transport modes. This approach is generally used by transport economists as it follows a rationale of "price-driven-behavior".

2.2 PUBLIC TRANSPORT, NON-MOTORIZED TRANSPORT, TRANSPORT DEMAND MANAGEMENT, AND TRANSIT ORIENTED DEVELOPMENT

A second approach to describing how to implement sustainable urban transport is by applying the four measures listed above.

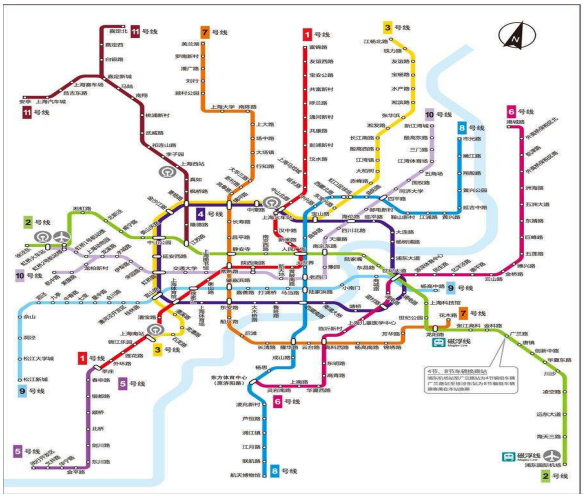
Public Transport: This measure implies the development of high quality public transport systems, which includes mass transit systems. A specific public transport mode

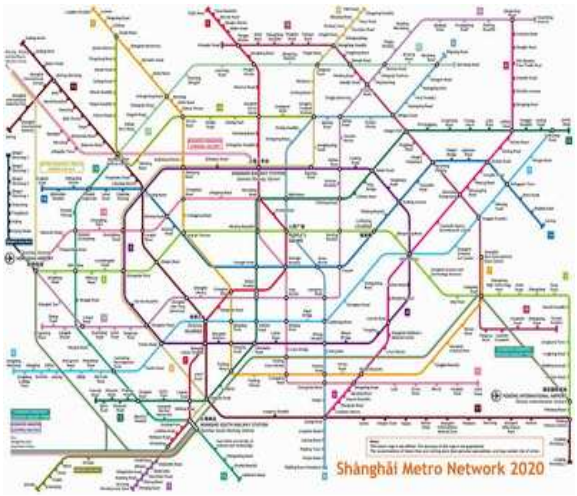
[19] Müller, P., Schleicher-Jester, F., Schmidt, M.-P. & Topp, H.H. (1992): Konzepte flächenhafter Verkehrsberuhigung in 16 Städten", Grüne Reihe des Fachgebiets Verkehrswesen der Universität Kaiserslautern No. 24

called Bus Rapid Transit (BRT) has been generally favoured in recent years due to its moderate cost of implementation, relatively short implementation time, high quality of service, and capacity to move large numbers of passengers once it is implemented.

Caption: Bogotá's TransMilenio Bus Rapid Transit system is a good example of how public transport can be improved with moderate costs and in a relatively short time span (photo Carlos Felipe Pardo)

Subway and light-rail systems are other means of rapid, cost-effective and environmentally benign urban passenger transport. For example, 116 cities, located mostly in the industrialized countries, operate their own metro systems, which are used by an estimated 155 million passengers each day. In addition, there are about 400 light-rail systems worldwide, while over 200 new systems are being planned. Many megacities in developing countries are also investing in the construction, modernization and expansion of urban light-rail systems.





Caption: Shanghai Metro System 2011 and Planned Expansion for 2020[20]

Metro and urban light-rail systems are costly to construct and to maintain but can provide significant long-term economic, social and environmental benefits. Various studies analyzing investment in urban public transport infrastructure and services have shown that in the long term the sum of public benefits by far exceed the investment costs.

Urban public transport systems are more attractive for commuters and more economically viable for operators if they offer the option to travel from any point in the city to any other point. This can be achieved through the expansion of network as well as through intermodal connections.

Non-Motorized Transport: Also called "Active Transport", it essentially refers to walking and cycling (and all other modes that have wheels but no engine such as pedicabs and freight tricycles), as well as related infrastructure, policies and education.[21] These modes have been greatly promoted recently due to their great benefits for reducing transport emissions and for improved human health.

Caption: Non-motorized transport is a key mode of transport which can be promoted at a relatively low cost and with considerable benefits. One modality in which it has been promoted is by means of bicycle sharing systems such as Paris's Velib system with 21 thousand bicycles available to citizens throughout the city. (photo Carlos Felipe Pardo)

Travel Demand Management: Also termed "Transport Demand Management", it refers to all measures that try to reduce the demand for travel/transport, and re-evaluate the actual need for providing more road infrastructure to cater for such demand (Broaddus,

[20] For detailed information on the Shanghai Rail Transit Network, please see: http://baike.baidu.com/view/70683.htm

[21] Godefrooij, T.; Pardo, C.F.; Sagaris, L. (eds) (2009). Cycling Inclusive policy Development: a handbook. Eschborn.

Litman & Menon, 2009). It specifically focuses on implementing fuel policies, road charging and parking pricing, and other related measures which are similar to those described in the section above under the "push" definition.

Transit Oriented Development: This refers to an approach to urban design where policies promote urban development of higher density along mass transit corridors (Cervero, 1998). The rationale for this approach is that significant energy efficiency and transport efficiency can be realised through urban designs where mass transit provides rapid access to the main nodes of urban activity (home, work, education, recreation, health services).

Caption: Transit Oriented Development implies that public transit corridors are planned in conjunction with land policies to complement each other. Such is the case of Bogotá's Bus Rapid Transit System. (photo Carlos Felipe Pardo)

2.3 AVOID, SHIFT, IMPROVE

Avoid: This first strategy seeks to avoid unnecessary travel and reduce trip distances. It implies measures where land use and transport planning are properly integrated and mixed use development is promoted, and where there is a greater role of information and communications technologies (ICT) to reduce the number of trips being taken by a person. This measure can effectively increase accessibility and reduce trip distances and times by properly integrating land use and transport and by developing areas so that home, work and shopping locations are near each other (mixed use development). This is accomplished through urban development master plans. Additionally, this approach can avoid many trips due to the ease with which ICT can replace many activities that previously required travel.

The "Avoid" strategy is described first since, if its policies are applied in a comprehensive way, it can have a great impact on urban transport and provide great social, economic and environmental benefits.

Shift: This strategy seeks to shift passengers towards more sustainable transport modes. It means that citizens who are using automobiles or motorcycles should be encouraged to

start using more public and non-motorized transport. It uses all travel demand management measures in its toolbox, as well as a better development of inter-city passenger and goods transport. It also seeks to persuade existing public and non-motorized transport users to continue using them, applauding their contribution to sustainability.

The shift approach can be the second most potent means of delivering sustainable urban transport if implemented properly. If one can implement Avoid and Shift strategies in one city, most of the hard work has been done, though more can be still improved.

Improve: The third strategy focuses on policies that aim to improve transport practices and technologies. It is a more technological approach to improving urban transport problems. Its measures include improving fuel quality and vehicle fuel efficiency standards, developing vehicle emission standards, implementing vehicle inspection and maintenance (I&M) policies, and transitioning to "intelligent transportation systems" that take advantage of information and communication technologies to improve transport management. It also emphasizes the need to improve freight transport technologies and logistics.

Though this measure is not generally seen as the most crucial to achieve substantial benefits in the short and long term for urban transport, it is an important complement to the Avoid and Shift measures, and can achieve incremental benefits for society, the environment and the economy.

Although the Avoid, Switch, Improve approach is generally described as having the three components described above, the Bangkok 2020 Declaration also states that there should be a fourth strategy which emphasizes a "people first" approach. This would provide a more humane angle to delivering sustainable urban transport policies by improving safety in urban transport systems, delivering health benefits and reducing negative impacts in air quality and noise, and mitigating global climate change. It would also provide an improved scenario for energy security, while also improving access to information and raising public measures in urban populations. The case study in section 4.3 below provides a detailed description of these strategies and policy options.

2.4 POLICY OPTIONS AND MEASURES FOR ROAD SAFETY

Solving the problem of road safety calls for finding solutions in four main areas:

- *Engineering*: Redevelopment of road designs, emphasizing protection of vulnerable road users as well as transport sensitive groups and physically enforcing speed limits through traffic calming and other measures. City planners should consider providing quality pedestrian facilities such as spatial, safe, refuge islands and medians, and non-interrupted walkways and at-grade crossings that are necessary for many people, but particularly children, women, the elderly, and people with disabilities.

- *Emergency Response*: Improvement of the response time and quality of emergency vehicles and institutions – this relates to the term "pre-hospital care" of WHO;[22]
- *Education*: Development of strategies to improve road users' understanding of the risks related to, for example, driving improperly;
- *Enforcement*: Improvement of the enforcement of speed limits and other safety-related measures that have a direct effect on accident rates.
  In related terms, the Global Plan for the Decade of Action for Road Safety 2011-2020[23] has defined 5 "pillars as key activities to improve road safety worldwide. These are: road safety management, safer roads and mobility, safer vehicles, safer road users, and post-crash response.

One very good example of an ambitious approach to road safety is Sweden's Vision Zero initiative, which is described in greater length in the case studies section that follows. They have aimed to reduce their road accidents to Zero, established clear guidelines, and have made good progress towards this goal.

2.5 POLICY OPTIONS FOR MOBILITY OF THE URBAN POOR AND OTHER DISADVANTAGED SOCIAL GROUPS

Urban transport is often provided in an inequitable manner in which the transport needs of low-income and/or vulnerable user groups are left behind or neglected. Fortunately there are a wide range of policy options and initiatives in place in some cities which have led to enhanced mobility for the urban poor and generated greater equity between citizen groups. Some examples of these are the following:

- Women-only carriages in trains or buses. These have been implemented in some cities in India, as well as Rio de Janeiro and Mexico City (among others). They provide increased passenger comfort for women. Though sometimes these initiatives have been debated, they have undoubtedly improved conditions for passengers.
- Multi-trip or time-based fares. In Hong Kong and many other cities where an integrated fare structure has been established, many population groups have found it easier and less expensive to travel when their trips are not pendular (several short trips, going back and forth) but are trip-chains (various small trips linked together to run specific errands).
- Cross-subsidies to increase affordability. In some cases, such as Bogotá's BRT system, public transport fares have been established in such a way that the fare for low-income groups is subsidised by that of high-income groups. The specific strategy in Bogotá has been to have one flat fare for all trips; thus longer trips of

[22] World Health Organization and FIA Foundation (2010). Decade of Action for Road Safety 2011-2020. http://www.decadeofaction.org/

[23] WHO (2011a). Global Plan for the Decade of Action for Road Safety 2011-2020. Geneva.

low income populations that tend to live on the periphery of cities are subsidised by shorter trips of higher income individuals who tend to live in city centers.

- Universal access. Many cities in the world have implemented infrastructure that has taken into account the needs of disabled citizens -- aids for visually impaired, audible signals, accessible ramps, stations and vehicles, etc). This has not only increased access to these population groups, but in some cases has actually created the opportunity for them to travel which was not readily available before.

2.6 NETWORKS AND ORGANIZATIONS PROMOTING SUSTAINABLE URBAN TRANSPORT

Promotion of sustainable transport has become a major issue in cities around the world. Several partnerships have been established to create synergy and leverage resources among different institutions and organizations. For example, the Partnership for Clean Fuels and Vehicles (PCFV), with well over 100 partners has been successfully working on phasing out lead from fuels, establishing standards for low-sulphur fuels and promoting clean vehicle technology. The United Nations Environment Programme (UNEP) acts as the Clearing House for the PCFV and also works in the area of fuel economy (Global Fuel Economy Initiative), public transport and investments in non-motorized transport (Share the Road Initiative) (www.unep.org/transport). The Partnership on Sustainable Low Carbon Transport (SLoCaT), www.sutp.org/slocat/) is another example. With over 30 members, it aims to provide options and advice for the establishment of sustainable transport systems. Other initiatives have been established in developing cities, such as the Sustran network (which has chapters in Asia and Latin America and acts primarily as a discussion group of practitioners), the Cities for Mobility network (initially a European Union project and from 2007 a network led by the city of Stuttgart), and in general various electronic debate forums. Other initiatives such as the Sustainable Urban Transport Project from the German Cooperation Agency (GIZ) have concentrated in developing documents and other material to support implementation of sustainable urban transport.

There are also regional efforts to address the issues of unsustainable transport. For instance, the United Nations Centre for Regional Development has implemented the Asian Environmentally Sustainable Transport (EST) Initiative since 2004. In support of the EST, 44 Asian city Mayors have signed the Kyoto Declaration on the promotion of EST at the city level. Recently, at the 5th Regional EST Forum in Asia, held in Bangkok, Thailand, on 23-25 August 2010, twenty-two participating countries agreed on the “Bangkok 2020 Declaration” in order to demonstrate their commitment to realizing a decade (2010-2020) for action on achieving safe, secure, reliable, affordable, efficient, people-centred and environment-friendly transport in rapidly urbanizing Asia.

Due to its success in Asia, the EST initiative began being replicated in Latin America from 2011 by the Inter-American Development Bank (IDB) and other regional partners, where a similar framework was established and began its activities.

Finally, various non-profit institutions have been crucial to the promotion and implementation of sustainable urban transport. These include the New York-based Institute for Transportation and Development Policy (ITDP), the World Resources Institute’s Embarq network, and the above-mentioned Sustainable Urban Transport Project.

3.CASE STUDIES

3.1 GUANGZHOU'S HIGH CAPACITY BUS RAPID TRANSIT SYSTEM

Caption: Guangzhou, one of the world's cities with highest density, has implemented a high capacity Bus Rapid Transit system which rivals many metros in efficiency. (photo Carlos Felipe Pardo)

This case study describes the experience of Guangzhou (China) and its Bus Rapid Transit (BRT) system. Its recent implementation was able to take advantage of experiences in other cities in the developing world, often improving on some well-known features of BRTs. It is useful as a case study since it provides an example of a mass transit system that has followed the main guidelines of planning, design and implementation of a high quality and high capacity bus-based system. It is also useful in that it can be replicated in many cities within an adequate time span and at a moderate cost.

Context

Guangzhou is one of the densest cities in the world, with 12.7 million inhabitants and a density of 1,708 people per square kilometre. As such, it had a great need for an efficient transport system. Although it had a metro system, most of its public transport passengers travelled by bus. Before the implementation of its Bus Rapid Transit system, congestion at specific locations of the city, such as Gangding, was intolerable and generated very negative impacts on the city's economy. As one of its main advisors stated, "the most vexing question posed by this unprecedented urban development is how to avoid gridlock".[24]

Policy options and measures

[24] Fjellstrom, K (2010). "Year of the Transit Tiger in Guangzhou" in Sustainable Transport magazine, Winter. Institute of Transportation and Development policy. pp. 10-15

The city of Guangzhou embarked upon the very complex task to redevelop its main avenues with a Bus Rapid Transit (BRT) system with support from international organizations. This was also complemented by the development of a greenway project and a bike sharing system. A Bus Rapid Transit system generally is comprised of dedicated bus lanes and stations where passengers can prepay the bus fare. These innovations speed the buses by setting them apart from any traffic congestion and ensuring quick entry and exit of passengers. The Guangzhou BRT has 980 buses along 23 kilometres of dedicated trunk lines, and is moving 800,000 passengers per day. Hand in hand with this, the city implemented a bicycle sharing system in June 2010, which has 5 thousand bicycles at 113 stations, mostly built adjacent to BRT stations, as the programme was developed initially as a complement to the BRT. There are plans to increase the programme to 15 thousand bicycles in the near future, and this is being complemented by the development of infrastructure for bicycles and more than 5 thousand bicycle parking positions at BRT stations.

Outcome

Bus Rapid Transit is a concept of bus-based transport which has revolutionized the common understanding of how to plan and operate mass transit, especially since buses were previously regarded as vehicles that could not operate above certain passenger limits. However, the example of Guangzhou is one which has shown that passenger flows can be greatly enhanced in these systems. This had also been demonstrated previously with TransMilenio in Bogotá (Colombia) and even more than 3 decades ago in the BRT systems of Curitiba (Brazil) and Quito (Ecuador).

The Guangzhou BRT has the following impacts in operations:

- Peak passenger flows of 26,900 passengers per hour per direction, which is generally regarded as a “metro-level” capacity.
- Daily ridership of around 800,000 passenger-trips per day on the system.
- Integration of the BRT with bicycle parking, bicycle sharing and the city’s metro system. Integration is one of the key elements of a successful transport system, since users can use more than one mode and have greater access to different places in the city with greater ease.
- This is the first BRT system in China with more than one BRT operator. Three corporate groups consisting of seven different bus companies all operate along BRT routes. Having more than one operator is generally positive since there is competition for the best service and users receive high quality service at a lower cost.
- The BRT has produced 30 per cent higher bus speeds, resulting in an average time saving of 6.63 minutes per BRT trip, or more than 30 million passenger-hours saved each year. Also, the percentage of riders satisfied with public transport rose from 29 per cent in December 2009 (when there was no BRT) to 65 per cent by the following year.[25]

[25] Fjellstrom, K (2010). "Year of the Transit Tiger in Guangzhou" in Sustainable Transport magazine, Winter. Institute of Transportation and Development policy. pp. 10-15

Though it is still too early to evaluate quantitatively in a comprehensive fashion, this system has improved access to places in the city and it is safe to say that Guangzhou's economy, environment and society have greatly benefited from these interventions.

Engagement of urban stakeholders
The Guangzhou BRT and its related projects had a very strong commitment from the local government, which from 2005 gave a clear directive to implement these projects and prioritize them. During project development, there was international support, namely from the Institute of Transportation and Development Policy, which established a permanent office to participate in planning during the entire project development phase and beyond. Planning for the Guangzhou BRT started in 2005, when a conceptual plan was developed over two years. Following the conceptual plan and stakeholder discussions, there was a full year of detailed engineering design during 2008, and construction was begun in 2009.

Lessons learned
The Guangzhou BRT provides important lessons for other cities, notably:

- Proper planning of a mass transit system may take time, but it bears fruit in terms of better performance of the system, quality of service and overall improvement of urban transport in a city. Guangzhou has shown how dedicated planning has produced a successful and high quality mass transit system at a moderate cost, which also includes integration with other modes of transport.
- Bus systems have the potential to provide high quality service and great performance, rivalling the capacity of rail-based systems at a fraction of the cost. Though this had already been shown by the Latin American examples of Curitiba and Bogotá's TransMilenio BRT systems, this Asian example provides similar results in a completely different political, economic and cultural context.
- The integration between this bus-based system and the rail-based metro has proven to be an indispensable feature of the BRT and the mass transit network of the city, not only for its complementarity but for the overall improvement of public transport service in the city. BRTs and mass transit systems in general must be planned with an entire system in mind, including those existing modes and others that may be planned in future.

3.2 A TALE OF TWO BICYCLE CITIES: BOGOTÁ AND COPENHAGEN

> *"At the core of the new model… all citizens will move exclusively using public transport, bicycles, or walking… it would get all citizens together as equals regardless of income or social standing. And most importantly, it would allow cities to become a place primarily for people, a change from the last 80 years a time during which cities were built much more for motor vehicles' mobility than for children's happiness."*

Enrique Peñalosa, former Mayor of Bogotá, Colombia.

This case study describes the development of bicycle-oriented policies in two cities: Bogotá, Colombia and Copenhagen, Denmark. Both cities have a considerable history of bicycle use, while being in developing and developed countries, respectively. Though there are issues in common with both cities, there are also other issues which have unfolded differently due to their different contexts. The story of Bogotá is one of recreational bicycle use that was transformed into transport-related use for all citizens. It still needs to work on specific issues to arrive at a "critical mass" in bicycle use comparable to the levels of some European cities.

On the other hand, Copenhagen can be seen as a city with a long history of cycling that improved its policies and infrastructure over decades to arrive at an incredibly high level of use. Riding a bicycle is not seen as something unusual or specific to a subgroup of citizens but something that all citizens do and is just as normal as riding a bus or a car.

Context

Caption: Bogotá built almost 300 kms of bikeways in less than 3 years, and continues to expand and promote them through innovative policies. Photo by Carlos Felipe Pardo.

Bogotá is a city with approximately 8 million inhabitants and has had considerable growth in population and physical size in the past 50 years,[26] while preserving a relatively high density of 4,684 inhabitants per square kilometre. Until 1998, little had been done with regards to non-motorized and public transport. Though an urgent need for improvement in the transport sector had been identified, specific policies had yet to be chosen and implemented.

For many, the latter part of the 1990s is seen as the turning point in transport policies of Bogotá. In terms of bicycle use, it must be noted that Bogotá had a considerable history of recreational bicycle use since 1974 with its Sunday Ciclovía, an initiative

[26]Martin, G., & Ceballos, M. (2004). Bogotá: anatomía de una transformación. Bogotá: E ditorial Pontificia Universidad Javeriana.

which closes major avenues of the city and allows only bicycles, pedestrians and any non-motorized mode to ride along them. This 121-km network served as one of the policies that would inadvertently increase bicycle use as a transport mode when proper policies were implemented after 1998.

Caption: Taking children to school on a cargo bicycle is very common in Copenhagen, as are many other daily activities in this city which has promoted bicycle use for more than 40 years. Photo by Carlos Felipe Pardo

The city of Copenhagen is, as many other European cities, one where population is not so large (1.2 million) and density is adequate at 2,632 inhabitants per square meter. Bicycles have always been a part of Copenhagen life since the 19th century, and the second world war increased substantially this level of bicycle use. It was only in the post-war era until 1960 that cars dominated urban policies and were given precedence over other modes of transport.[27] The turning point in its transportation policy came with the oil crisis of the early 1970s, and the growing traffic congestion. The plan to address these issues not only redirected the transport policy but also their urban redevelopment plans. It must also be emphasized that cities like Copenhagen a high GDP per capita choose bicycles not just for economical reasons but also for their great efficiency and various co-benefits.

Both cities faced considerable challenges around the time that their policies and projects shifted to develop a more bicycle-oriented approach. In the case of Bogotá, the challenge was to cope with increasing transport demand and congestion, the need for an improved overall transport system and the provision of cheap, reliable modes of transport for the entire population. This challenge was seen as an opportunity by Enrique Peñalosa, who was mayor of the city from 1998 to 2000. He took the enormous political risk to reduce the investment related to private automobiles and redirect the entire transport policy to one where people would be at the center and infrastructure would be developed for them,

[27] City of Copenhagen (2009). City of Cyclists: Copenhagen bicycle life.

while space would be taken away from cars and given to pedestrians, cyclists and public transport users.
In the case of Copenhagen, the challenges were very similar to those faced by many European cities in the decade of the 1970s. The difficulty of providing affordable transport to all which would be dependent on oil was insurmountable and the only way out was to redirect their transport policy to one where bicycles would have a predominant role. This was also linked to the need for a comprehensive urban development plan, which would need to take the needs of all citizens into account while providing suitable transport to everyone.

Policy options and measures
The example of Bogotá and the development of policy options that improved conditions for cyclists was linked to the overall transport plan that Mayor Peñalosa envisioned during his term. His view was that citizens come first, and, because of that, he felt that road space and other public space should be redistributed. This entailed the following:

- Sidewalks were widened in order to develop new space for pedestrians and fully segregated two-way cycletracks. This meant that space was taken away from cars -- either full traffic lanes and/or parking spaces were eliminated in order to make space for pedestrians and cyclists;
- A public transport network was designed, and its first phase was built during his mandate. This turned into the well-known TransMilenio Bus Rapid Transit system, which now carries almost 2 million passengers per day. It was integrated with cycletracks and every trunk line of the BRT system has an adjacent cycletrack by law.
- A full citywide cycletrack network was designed and its first 200 kms was built during his mandate. This created a network of high level bicycle infrastructure where users felt safe riding from home to work or study, and where travel times were reduced for cyclists. As of 2011, this network is 357 kms in length and still expanding. There was great emphasis on segregating these cycletracks from roadways as the cultural attitudes in the city were such that road users often did not respect cyclists if they were only in a painted cyclelane.
- This was also complemented by a set of strategies promoting bicycle use in the city as a mode of transport, complementary to the already-existing culture of recreational and sports cycling in the city.

In the case of Copenhagen, their policy was also citywide and its scope was overarching for all transport. This entailed:

- The creation of an urban development plan referred to as the “five finger plan”, in which development followed along five main rail lines that started from the city center. The spaces in between those lines of urban development became green spaces. This urban plan was able to increase the size of the city without risking urban sprawl.
- A cycletrack network (part of the National Bicycle Route network) which, as of 2010, consisted of 350 kms of segregated cycletracks and many more kilometres

of non-segregated cyclelanes.[28] This resulted in 1.2 million kms ridden on bicycles every day and in 37 per cent of daily transport trips in the city being done by bicycle.

Since 2000, a stronger policy was developed, where more ambitious goals were set. These now include a goal of 50 per cent of trips done by bicycle and 50 per cent less bicycle-related injuries on the streets by 2015. Specific measures developed in the most recent years include:

- An initiative to develop "Green Waves" of cyclists based on traffic light phases, where these are synchronized to cyclists' speed and movements rather than that of cars (it is set for 20 km/h speeds, which is achieved easily on a bicycle). This has increased comfort for cyclists and improved overall conditions. There is also a 6-second "green advance" for cyclists at stop lights, while cars must wait for their green light after cyclists have passed.
- The development of Green Cyclists Routes, which are essentially a high level network of cycle routes which have little or no contact with other traffic, making trips in the city more agile and safer.
- The redevelopment of infrastructure to improve safety for cyclists, reducing risks especially in crossings where conflicts with other road users may arise.[29]

Outcome

In Bogotá, the development of bicycle-related policies has had significant impacts on the transport situation of the city, complementary to what was achieved by other measures such as the BRT system and overall public space transformation. Specifically, the mode share of bicycles before the development of a cycletrack network was measured at 0.58 per cent of all trips in the city in 1996.[30] After all these developments, the use of bicycles rose to 5 per cent by 2010 (Bogotá Cómo Vamos, 2010), which represented an almost ten-fold improvement of bicycle use for Bogotá. Unfortunately, there is still a lag in data collection for Bogotá, but preliminary studies have shown that more women are using bicycles than before and that people feel safer on the streets when riding a bicycle.

In Copenhagen, the policy reorientations in the 1970s resulted in significant bicycle ridership gains, such that bicycles now account for 37 per cent of trips in the city. Studies show that while bicycle use has increased, traffic accidents have been reduced (City of Copenhagen (2002) – this is referred to as the "safety in numbers effect". Copenhagen is also known for its cultural/fashion approach to cycling, where initiatives such as "Cycle Chic" have been created and bicycle users seem to feel part of this Chic culture of

[28] City of Copenhagen (2009). City of Cyclists: Copenhagen bicycle life.

[29] City of Copenhagen (2002). Cycle Policy 2002-2012 ,City of Copenhagen.

[30] JICA. (1996). Estudio del plan Maestro del transporte urbano de Santa Fé de Bogotá en la República de Colombia: informe final (informe principal). Bogotá: Chodai Co Lt d,

cycling, which is now spreading all over the world. Copenhagen also has its frequent "Bicycle Account" where they do a follow-up on the goals that have been set from year 2000 to improve the situation of cyclists in their city (City of Copenhagen, 2008; 2010).

Engagement of urban stakeholders

The transformation of Bogotá could be described as one which was implemented "top-down", where the decision makers defined the policies and moved forward to implement them. Since the policies were properly researched and had as their main goal to improve quality of life for citizens as a whole, it produced positive effects in the short, medium and long term.

However, one must also note that after some years, there was a strong emergence of local groups related to cycling which enabled an appropriation of bicycle culture and promotion from the citizens' side. This complemented the "top-down" approach with several "bottom-up" initiatives which have been given these policies a more long-term outlook. The strongest of these groups are Ciclopaseo de los Miércoles and Mejor en Bici, both striving to find ways to promote bicycle use in the city. With their work, cycletracks have been improved and policies have been redirected towards a more comprehensive approach to cycling as a mode of transport.

In the case of Copenhagen, ideas such as "Cycle Chic" and "Copenhagenize" have resulted in an interaction between political levels and citizen initiatives. These initiatives promote urban cycling in the city of Copenhagen as a "chic" mode of transport, while promoting this vision beyond the city limits, such that various cities have now developed their own versions of the "Copenhagen Cycle Chic" and follow this approach to promote cycling.

Lessons learned

The following lessons can be drawn from these two examples:

- Cycling can be a suitable mode of transport, regardless of a city's economic conditions, level of development and previous history.
- Promoting cycling by means of infrastructure, policies and education results in higher levels of use and greater road safety for all users.
- There are many risks associated with promoting cycling, both at political and cultural levels, but these can be overcome.
- Policies related to cycling policy must not be isolated from general transport and urban planning policy, and must form a coherent whole. The Bogotá and Copenhagen examples are useful because their cycling policies were part of a broader set of policies which created positive feedback to the other transport systems.
- Stakeholders must be engaged for the development of these policies, and citizens can act as powerful agents of change in a properly developed policy. Engaging stakeholders from the outset of projects can produce greater outcomes.

3.3 GOTEBORG'S ROAD SAFETY VISION ZERO

Caption: Goteborg has implemented a set of measures which have improved road safety substantially, and has a clear vision of reducing traffic accidents to zero in the near future. (photo City of Goteborg)

One of the greatest examples of how road safety can be improved is with the bold approach and high goals of the Swedish "Vision Zero" initiative. It has become a world example of how to reduce road accidents with specific measures that can produce significant results.

Context

Goteborg, Sweden is a city with around 500,000 inhabitants (900,000 in its metropolitan region) and with an area of 450 km^2. It is an industrial city built in the beginning of the 17th century. In terms of road safety, it had a very bad record of traffic accidents.[31] As was the case in many European cities in the 1970s, motorization had grown and urban transport policies at the time often did not give priority to non-motorized or public transport.

However, in the 1970s there was a halt in this trend. In the view of the city's decision makers, road safety was "one of the most important prerequisites for an attractive city".[32] Their plans also included the idea of promoting public transport, cycling and walking. This generated demands for changes in the design and improvement of public spaces to enhance the use of those transport modes. The inclusion of safety was a crucial component of such a policy. One specific issue which heightened the

[31] City of Goteborg (2010). Year 2020: more people move around in the city - but fewer are injured in traffic.

[32] Ibid.

need to discuss and address road safety directly was the modification of traffic to the right-side of the road in 1967. The change to right-side traffic was quickly followed by the establishment of suitable speed-limits, and legislation for the obligatory use of seat-belts and helmets.

Policy options and measures

City leaders in Goteborg developed two main policies to improve road safety. The first policy was called traffic-calming. Implemented in 1978, it comprised specific infrastructure changes designed to reduce speeds of motorized vehicles and give priority to non-motorized transport. This approach gave physical signals to drivers which forced them to reduce their speed and to give right of way to other transport modes. By 2004, the municipality had implemented nearly 3000 countermeasures.[33] The traffic calming measures were also included in the "Goteborg agreement" which established how state funds would be allocated to transport.[34]

The approach of traffic calming has been used in other cities in the world with good success, since speed is one of the key issues that must be addressed when improving road safety, and developing physical strategies to reduce speeds is the most effective way of doing it. There are other approaches that go beyond traffic calming such as that of "shared space" or "naked streets", where streets have no significant signals for road users, which has the result of increasing car drivers' awareness of the road setup and its users. This has proven effective in many places, and has been termed "post-traffic calming" by some.

The second set of measures developed by Goteborg with the aim of increasing road safety was the initiative called "Vision Zero". In summary, this initiative aims at having zero fatalities due to road accidents; it is a very ambitious goal but has produced highly positive impacts. This initiative had such impact that in 1997 the Swedish parliament suggested it should be the basis for all traffic-safety related work in Sweden.

The Vision Zero approach has four main components, namely infrastructure (planning and building roads and related infrastructure to improve road safety), vehicle technology (improving driver, passenger and pedestrian safety), services and education (ranging from driver education to planning services), and control and

[33] City of Goteborg (2006). Calm, safe and secure in Goteborg: positive effects of traffic-calming countermeasures. Goteborg.

[34] Ibid.

surveillance (systems for monitoring traffic and weather).[35] The approach includes the following guidelines:[36]

- Focus on fatalities and serious injuries
- Integrate the failings of human beings in design
- Share responsibility between system and design
- Stimulate industry to improve safety design

- Saving lives is cheap.

Outcome

The measures implemented by Goteborg in improving road safety have had positive impacts on its main target: reducing deaths and injuries on the road. The Swedish National Road and Transport Research Institute stated that three quarters of the significant reduction of deaths and injuries on roads were attributed to the effects of the implemented Traffic-calming measures.[37]

The Traffic and Public Transport Authority aimed to reduce the number of killed and seriously injured by 60 per cent by 2005, and this number was achieved for pedestrians and cyclists. Their reports state that the total reduction by year 2003, based on the statistics for years 1985-89, was approximately 2460 people, which represents a reduction of 47 per cent.[38]

Engagement of urban stakeholders

As has been described, the initiatives of traffic calming and Vision Zero have been mainly led by the city government but with wide support from citizens. While citizen support has grown over time, some measures in 1978 (such as a speed bump in Kapplandsgatan) created some initial public outcry; but this was overcome when the results from the measures were seen. Initially traffic planners were somewhat against the measures when they were proposed, but once they saw the very positive effects, they quickly adopted the traffic calming techniques to improve road safety in their streets.[39]

[35] Traffic Safety by Sweden (2011a). Vision Zero Initiative: Solutions. in http://www.visionzeroinitiative.se/en/solutions/

[36] Traffic Safety by Sweden (2011b). Vision Zero Initiative: Long presentation. in http://www.visionzeroinitiative.se/PublicDownloads/Presentations/Long per cent20presentation per cent20(1.6MB).pdf

[37] City of Goteborg (2006). Calm, safe and secure in Goteborg: positive effects of traffic-calming countermeasures. Goteborg.

[38] Ibid.

[39] City of Goteborg (2006). Calm, safe and secure in Goteborg: positive effects of traffic-calming countermeasures. Goteborg.

An additional activity which increased public support and generated greater positive impact of the measures was the definition of target groups for special road safety measures, the development of a common agenda between the Traffic Authority, police, emergency services and public transport companies. According to the city government, stakeholder discussions were responsible for influencing the choice, design and placement of those measures".[40]
Finally, it should also be mentioned that property owners in commercial areas took special interest in the decisions related to traffic calming measures, which were implemented to enhance road safety in shopping areas and parking lots.[41]

Lessons learned
One key lesson from these experiences was that the city of Goteborg found that these measures were difficult to implement at the beginning, both for technical reasons and for reasons of public acceptance. But results showed they were well worth the trouble and the impacts of the strategies that were implemented were very positive.
Adopting speed limits was a decision that implied a significant amount of work but was something specific that could be tackled with simple but bold measures. From this experience, it can be seen that reducing traffic speeds can have a very high impact on road safety in city streets.
A co-benefit of these measures was that citizens felt the areas where these strategies were implemented had improved not only in terms of road safety, but also in terms of liveability since the areas seem livelier and more pleasant to spend time in, as measured by surveys in various areas of the city.[42]

[40] Ibid.
[41] Ibid.
[42] Ibid.

3.4 SINGAPORE'S APPROACH TO REDUCING TRAFFIC CONGESTION

Caption: Singapore's Electronic Road Pricing system is highly dynamic and changes according to actual demand in a corridor. This is one of the various measures implemented by the city to manage congestion. Photo by Carlos Felipe Pardo.

Context

In terms of transport, Singapore is unique among other South Asian cities in that it has a high motorization rate but does not have a high level of motorized two wheelers as well as a very high use of bicycles. In the 1970s in its space-constrained area and with a rapidly growing economy, Singapore was on the brink of major traffic congestion and potential gridlock. It was also concerned with its air quality problems and needed a solid approach to remedy the situation. As in many other countries in the world, the oil embargo at the beginning of the 1970s showed the risks of an oil-dependent transport system and urgent action was needed.

Policy options and measures

In 1975, Singapore embarked upon an aggressive approach towards improving transport conditions for all its citizens. It involved two projects. One project provided a large network of public transport which placed a mass transit stop no more than 500 meters from any place in the city. This called for significant, investment in public transport. The second project was to manage travel demand by means of various measures that addressed everything from car ownership to use of roads. It implied a considerable restriction on automobiles in terms of property and use, but also generated much needed revenue which was needed to fund public transport.

Singapore's well-known policy of travel demand management began in 1975 when it implemented a manually-operated scheme where cars would have to pay to access the city center during the morning peak hours. The cost of using those roads was based on the actual demand of the area, which would regulate the demand based on price.

This scheme successfully managed traffic congestion, and was known as the Area Licensing Scheme (ALS). It was implemented from 1975 until 1998 when the Electronic Road Pricing (ERP) Scheme took its place. ERP was an improvement because in-vehicle units provided information to entrances and discounted the cost of using roads, and it was now possible to charge for road use depending on the time of day and the estimated demand of a road. That is, a certain road could have a cost of 2S dollars to enter at 6am, but it would cost 3S Dollars to cross at 7am, all of this being automatically defined and published to users. This made managing demand something more complex but at the same time more efficient.

In addition to the well-known congestion charging scheme, Singapore also implemented other measures related to vehicle ownership. Since 1990 it has implemented a "Vehicle Quota System" policy, where people interested in buying new vehicles must enter a bidding system to bid for the price of the right to purchase a vehicle. As a result of the quota system and taxes, the cost of a vehicle can amount to 3 times the price of its normal market value, which not only discourages automobile purchasing, but also generates revenue to cover costs related to automobile travel such as road construction maintenance and improvement of road safety conditions.

Outcomes

The main outcomes of these initiatives to improve urban transport are the following:

- Public transport remains the main mode of choice for all citizens, while having an affordable cost and being fully integrated.
- Congestion in the city roads has kept constant at 50 per cent of gridlock levels, despite the growth of the motorization rate. For instance, the average speed on expressways is 45-65 km/h; that of other road arteries is 20-30 km/h [43]
- Considerable revenue has been earned by the ALS and ERP schemes. US$ 75 million was earned in 2008 alone from the ERP scheme.[44]

The Singapore example can be seen as a success after more than 30 years of implementation. It has been replicated successfully in London (through its congestion charging scheme) and Stockholm, while other smaller cities (Oslo, Trondheim) have also implemented schemes with similar results.[45]

Engagement of urban stakeholders

Developing schemes that restrict the use of the automobile in a city are seldom popular, especially before results in terms of reduced traffic congestion become apparent. Implementing a scheme like the ALS-ERP and its related measures has had its share of

[43] International Technology Scanning Programme (2010). Reducing Congestion and Funding Transportation Using Road Pricing in Europe and Singapore. Washington: US Department of Transportation.

[44] Ibid.

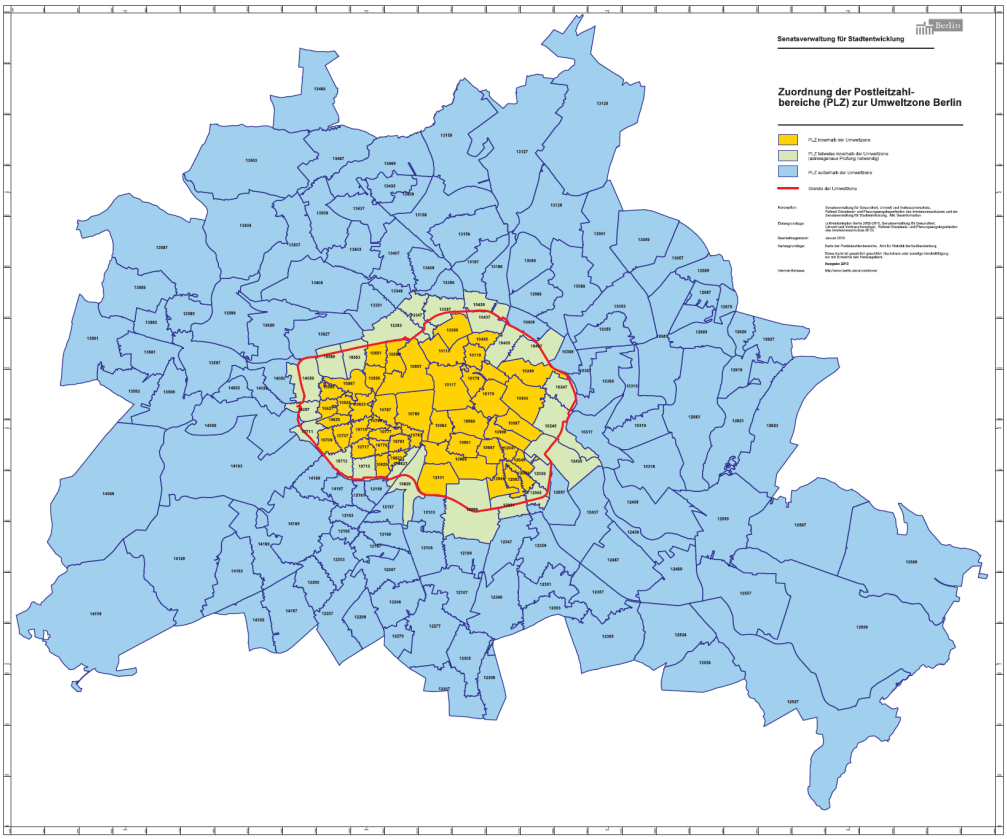
[45] Broaddus, A. Litman, T & Menon, G. (2009). Transportation Demand Management. Eschborn: GTZ.

debate among the population in Singapore, but it is now well accepted by the population and it is well understood that this measure is responsible for the free-flowing traffic in the streets.

Lessons learned

The example of Singapore has shown that, despite being a very unpopular measure, congestion charging is feasible to implement and retains its strength and effectiveness through the years.

3.5 BERLIN'S LOW EMISSION ZONE



Caption: Berlin's Low Emission Zone (area indicated in red) and postcodes. Source: City of Berlin.

Context

Due to the increased awareness of the importance of tackling pollution and mitigating GHG emissions due to its impact on climate change, many cities in Europe have chosen to develop unique strategies for the transport sector. One of these is the implementation of Low Emission Zones (LEZ). Berlin is an example of a progressive and effective implementation of such a measure.

Like many other cities, Berlin was concerned about the need to reduce emissions in the city core, and therefore designed their LEZ to be the inner city within the urban railway ring. This area is 88 km2, and one third of the city's inhabitants live within the ring.

The LEZ was evaluated as part of various measures to reduce congestion and pollution in the city. In 2005, a study[46] recommended that:

- The scheme should include all vehicles (heavy duty, passenger, petrol and Diesel;
- The key area for implementation of the LEZ should be the inner city ("S-Bahn Ring") due to population density and exposure to pollutants;
- There should be a transition period but it should be short;

Policy options and measures

Starting from 2008, access to the Berlin LEZ area was restricted. As defined by the city, the LEZ is an area where only those vehicles are allowed to drive that meet certain exhaust emission standards.

To achieve this, different stickers were developed according to the "class" to which vehicles belonged. Four emission classes were defined, the first of which does not have a sticker, and classes 2, 3 and 4 were defined as shown in the table below.

Table 4.3 Vehicle stickers that restrict access to urban low emission zones in Germany

Emissions class	**1**	**2**	**3**	**4**
Sticker	No Sticker			
Requirement for diesel vehicles	Euro 1 or worse	Euro2 or Euro1 particulate filter	Euro3 or Euro2 particulate filter	Euro4 or Euro3 particulate filter
(ban for Diesel vehicles older than…)		1992	1996	2000
Requirement for petrol vehicles	Without a catalytic converter			Euro1 with catalytic converter or better

Adapted from Lutz (2009) and http://www.lowemissionzones.eu/countries-mainmenu-147/germany-mainmenu-61/berlin

The stickers are based on a national regulation and are issued by the vehicle registration office, technical certification organizations and authorized repair workshops at a cost of between 5 and 15 Euro. Drivers must place these in their windshield. If visitors from outside of Berlin drive into the city, they must purchase a sticker for the duration of their

[46] Lutz, M. (2009) *The Low Emission Zone in Berlin – Results of a first Impact Assessment.* Presented at the Workshop on "NOx: Time for Compliance", Birmingham, Nov 2009.

trip and abide by the rules of the LEZ. If a citizen from Berlin drives into another city in Germany with LEZ, the stickers remain valid since they are part of a nationwide LEZ scheme.

The LEZ has had two stages. From the 1st of January 2008, vehicles (both heavy duty and passenger cars) had to meet the requirements of Pollutant Class 2 (red sticker). In that phase, only cars with no sticker (i.e. Euro 1 or worse requirement in Diesel or petrol vehicles without catalytic converters) were not allowed into the LEZ

Starting from January 1st 2010, the LEZ became more stringent, allowing only those vehicles with a green sticker (i.e. Euro 4 or Euro 3 with particulate filter for Diesel, or Euro 1 with catalytic converter or better) are allowed into the LEZ. All other vehicles (yellow, red or no sticker) are not allowed into the zone.

The penalty for not following the law is 40 Euros and costs one point in the national traffic penalty register. The measure is valid 24 hours a day, 365 days a year, and enforcement is by police. Vehicles must not only meet the expected emission standard but must also display the sticker. Failure to have a sticker results in a fine. There are, however, some specific exemptions from the LEZ but these are few and related to very specific cases. The zone is identified on the street by signs such as the one shown below.

Caption: Sign indicating the entrance to the Berlin LEZ, where only class 4 vehicles can enter (lowest emission standards). Source: City of Berlin.

Outcomes

The scheme has been successful and has produced beneficial impacts on pollution and congestion. Some of these impacts for phase 1 (before 2010) are presented in the list below:[47]

[47] Lutz, M. (2009) *The Low Emission Zone in Berlin – Results of a first Impact Assessment.* Presented at the Workshop on "NOx: Time for Compliance", Birmingham, Nov 2009.

- Net reduction of 24 per cent of exhaust particulate emissions and 14 per cent lower NOx emissions from Berlin's motor traffic
- impact on annual PM10 (fine particulates) pollution is about a 3 per cent reduction
- SO2-concentrations have fallen to 5 per cent of the levels 20 years ago
- A decrease of traffic by 4 per cent inside the zone and 6 per cent in the surrounding areas
- 70 per cent of high polluting passenger cars and more than 50 per cent of old commercial vehicles have disappeared from the city center
- Reduction of 73 per cent of "no sticker" (class 1) passenger cars and 53 per cent of commercial vehicles when comparing 2006-2008.

Engagement of urban stakeholders

The LEZ in Berlin was a product mainly of the EU's promotion of measures to reduce air pollution and mitigate climate change, the German national government's establishment of emission classes, and the decision of the Berlin local government to be one of the first German cities (along with Hanover and Cologne) to implement such a scheme.

Lessons learned

The experience of Berlin's LEZ provides useful lessons for those motivated to develop similar measures in their cities. Some of the more relevant lessons are the following:

- An LEZ must be properly planned and progressively implemented in order to be successful. If restrictions are too stringent or inflexible at first, they may result in poor levels of acceptance and negative responses from citizens.
- An LEZ can have specific and immediate benefits in terms of air pollution and GHG emissions, and it can also produce other benefits related to traffic congestion and health.
- Support from higher levels of government can be crucial to the implementation of such a scheme.
- These measures have various components (establishment of emission classes, issuance of stickers, enforcement, specification of the LEZ area, etc) which must all be properly designed from the beginning of its implementation.
- Users may be willing to take part in the LEZ but may also need support from the government in retrofitting their vehicles or acquiring new ones. Measures to tackle this must also be studied, such as subsidies to those users.

4.BETTER CITY, BETTER LIFE - POLICY OPTIONS FOR SUSTAINABLE URBAN TRANSPORT

As sustainable transport requires a comprehensive multi-sectoral approach, some of the main strategies and possible policy options that city authorities might consider are outlined below. They were derived from the recommendations of the Bangkok 2020

Declaration agreed upon at the Fifth Regional EST Forum, 23-25 August 2010, Bangkok, Thailand.:

Strategy 1: ***Avoid*** *unnecessary travel and reduce trip distances*	
Policy Option 1	Formally integrate land-use and transport planning processes and related institutional arrangements at the city level
Policy Option 2	Achieve mixed-use development and medium-to-high densities along key corridors within cities through appropriate land-use policies and provide people-oriented local access, and actively promote transit-oriented development (TOD) when introducing new public transport infrastructure
Policy Option 3	Institute policies, programmes, and projects supporting Information and Communications Technologies (ICT), such as internet access, teleconferencing, and telecommuting, as a means to reduce unneeded travel
Strategy 2: ***Shift*** *towards more sustainable modes*	
Policy Option 4	Require Non-Motorized Transport (NMT) components in transport master plans and prioritize transport infrastructure investments to NMT, including wide-scale improvements to pedestrian and bicycle facilities, development of facilities for intermodal connectivity, and adoption of complete street design standards, wherever feasible
Policy Option 5	Improve public transport services including high quality, and affordable services on dedicated infrastructure along major arterial corridors in the city and connect with feeder services into residential communities
Policy Option 6	Reduce the urban transport modal share of private motorized vehicles through Transportation Demand Management (TDM) measures, including pricing measures that integrate congestion, safety, and pollution costs, aimed at gradually reducing price distortions that directly or indirectly encourage driving, motorization, and sprawl
Policy Option 7	Achieve significant shifts to more sustainable modes of inter-city passenger and goods transport, including priority for high-quality long distance bus, inland water transport, high-speed rail over car and air passenger travel, and priority for train and barge freight over truck and air freight by building supporting infrastructure such as dry inland ports
Strategy 3: ***Improve*** *transport practices and technologies*	

Policy Option 8	Support work towards more sustainable transport fuels and technologies, including greater market penetration of options such as vehicles operating on electricity generated from renewable sources, hybrid technology and natural gas
Policy Option 9	Cities can support and/or catalyze national auto fuel economy targets, plans, policies and standards by adopting locally appropriate incentives that aid the adoption and use of cleaner, more fuel efficient vehicles, including: procurement of fuel efficient vehicles for municipal fleets (both light and heavy duty), adopting congestion charging schemes for city centers that allow preferential access to low emission vehicles, provide low cost/free municipal parking for low emission vehicles, allow low emission vehicles priority access to low occupancy traffic lanes. Cities can also plan for and deliver municipal charging infrastructure for electric vehicles/plug-in hybrids and support car sharing schemes to lower vehicle use. Enforce standards for fuel quality and tailpipe emissions for all vehicle types, including new and in-use vehicles, set out by national authority
Policy Option 10	Enforce standards for fuel quality and tailpipe emissions for all vehicle types, including new and in-use vehicles, implemented by national authorities.
Policy Option 11	Enforce vehicle testing and compliance regimes, including formal vehicle registration systems and appropriate periodic vehicle inspection and maintenance (I/M) requirements set out by national authority
Policy Option 12	Adopt Intelligent Transportation Systems (ITS), such as electronic fare and road user charging systems, transport control centres, and real-time user information, when applicable
Policy Option 13	Achieve improved freight transport efficiency, including road, rail, air, and water, through policies, programmes, and projects that modernize the freight vehicle technology, implement fleet control and management systems, and support better logistics and supply chain management
*Strategy 4: People First Policy with a focus to **Protect** people and environment*	
Policy Option 14	Work towards zero-fatality policy with respect to road, rail, and waterway safety and implement appropriate road design and infrastructure, speed control, traffic calming strategies, strict driver licensing, motor vehicle registration, insurance requirements, and better post-accident care oriented to significant reductions in accidents and injuries
Policy Option 15	Promote monitoring of the health impacts from transport emissions and noise, especially with regard to incidences of asthma, other

	pulmonary diseases, and heart disease. Assess, assess the economic impacts of air pollution and noise, and devise mitigation strategies, especially aiding sensitive populations near high traffic concentrations
Policy Option 16	Enforce national air quality and noise standards, also taking into account the WHO guidelines, and mandate monitoring and reporting in order to reduce the occurrence of days in which pollutant levels of particulate matter, nitrogen oxides, sulphur oxides, carbon monoxide, and ground-level ozone exceed the national standards or zones where noise levels exceed the national standards, especially with regard to environments near high traffic concentrations
Policy Option 17	Implement sustainable low-carbon transport measures to mitigate the causes of global climate change and contribute towards national energy security
Policy Option 18	Adopt social equity as a planning and design criteria in the development and implementation of transport infrastructure projects. This leads to improved quality, safety and security for all and especially for women, universal accessibility of streets and public transport systems for persons with disabilities and elderly, and affordability of transport systems for low-income groups, and up-grading, modernization and integration of intermediate public transport
Policy Option 19	Encourage innovative financing mechanisms for sustainable transport infrastructure and operations through measures, such as parking levies, fuel pricing, time-of-day automated road user charging, and public-private partnerships such as land value capture, including consideration of carbon markets, wherever feasible
Policy Option 20	Encourage widespread distribution of information and awareness on sustainable transport to all levels of government and to the public through outreach, promotional campaigns, timely reporting of monitored indicators, and participatory processes
Policy Option 21	Develop dedicated and funded institutions that address sustainable transport-land use policies and implementation, including research and development on environmentally sustainable transport, and promote good governance through implementation of environmental impact assessments for major transport projects

5. LINKS FOR FURTHER INFORMATION

AECOM (2007) *Case Studies of Transportation Public-Private Partnerships around the World* (Available at http://fhwicsint01.fhwa.dot.gov/ipd/pdfs/int_ppp_case_studies_final_report_7-7-07.pdf)

Asian Development Bank (ADB) (2005) *ASEAN Regional Road Safety Strategy and Action Plan*. ADB, Manila

BMU Low Emission Zones description: http://www.bmu.de/english/air_pollution_control/general_information/doc/40740.php

CAF Urban Mobility Observatory http://omu.caf.com/

Environmentally Sustainable Transport for Asian Cities: A Sourcebook. UNCRD, Nagoya (Available at http://www.uncrd.or.jp/env/est/docs/EST_Sourcebook.pdf)

European Cyclists' Federation http://www.ecf.com

European Low Emission Zones http://www.lowemissionzones.eu/

ELTIS Urban Mobility Portal http://www.eltis.org/

Global Transport Knowledge Partnership: www.gtkp.org

IDB Sustainable Transport: http://www.iadb.org/en/topics/transportation/sustainable-transport,2875.html

Institute for Transportation and Development Policy www.itdp.org

International Association of Public Transport www.uitp.org

ITDP BRT database http://www.chinabrt.org/default.aspx

Singapore Land Transport Authority http://www.lta.gov.sg/

Sustainable Urban Transport Project (GIZ) www.sutp.org

Transport and Climate Change http://www.transport2012.org/

UN Decade of Action (Road Safety): http://www.decadeofaction.org/

UNCRD Environmentally Sustainable Transport (EST) project http://www.uncrd.or.jp/env/est/

UNFCCC http://unfccc.int/

Victoria Transportation Policy Institute www.vtpi.org

Vision Zero Initiative http://www.visionzeroinitiative.se/

WHO Road Safety Report http://www.who.int/violence_injury_prevention/road_safety_status/2009/en/index.html

World Bank Urban Transport: http://go.worldbank.org/1K4AXE3VM0

WRI Embarq www.embarq.org/

CHAPTER 5 – MUNICIPAL SOLID WASTE MANAGEMENT: TURNING WASTE INTO RESOURCES

To Establish an Ecological Civilization Oriented toward the Future

Cities should respect nature, consider the urban ecological environment as an asset, integrate environmental issues into urban planning and administration, and accelerate the transition to sustainable development. They should promote the use of renewable energy sources and build low-carbon eco-cities. They should strongly advocate for conservation of resources and promote environment-friendly manufacturing. Cities and their citizens should join together to create sustainable lifestyles and an ecological civilization in which people and environment co-exist in harmony.

Shanghai Declaration on Better Cities, Better Life

INTRODUCTION[1]

Cities are at the nexus of a further threat to the environment, namely the production of an increasing quantity and complexity of wastes. The estimated quantity of Municipal Solid Waste (MSW) generated worldwide is 1.7 – 1.9 billion metric tons.[2] In many cases, municipal wastes are not well managed in developing countries, as cities and municipalities cannot cope with the accelerated pace of waste production. Waste collection rates are often lower than 70 per cent in low-income countries. More than 50 per cent of the collected waste is often disposed of through uncontrolled landfilling and about 15 per cent is processed through unsafe and informal recycling.[3]

[1] This chapter was authored by Prasad Modak, with valuable input and contributions from Yang Jiemian, Yu Hongyuan and Choudhury Rudra Mohanty.

[2] UNEP (2010). Framework of global partnership on waste management, Note by Secretariat, http://www.unep.or.jp/Ietc/SPC/news-nov10/3_FrameworkOfGPWM.pdf

[3] Chalmin P. and Gaillochet C. (2009). From waste to resource, An abstract of world waste survey, Cyclope, Veolia Environmental Services, Edition Economica, France.

As a Mayor, you may have to face challenging waste management decisions addressing issues that require immediate attention as well as potential issues that require strategic and integrated planning and implementation.

Establishing and improving facilities for collection, recycling, treatment and disposal for MSW management can be very costly. For example, building and operating sanitary landfills and incineration plants require huge investments and incur substantial operation and maintenance costs. Furthermore, it is becoming increasingly difficult to find suitable locations for waste treatment facilities due to the prevalence of the Not In My Backyard (NIMBY) attitude amongst communities. Meanwhile, if waste is growing at 3-5 per cent a year and rural-urban migration increases a city's population at a similar rate, then a city's waste generation will double every 10 years.[4]

Urban managers are therefore encouraged to pursue the paths of Integrated Solid Waste Management (ISWM) and Reduce, Reuse and Recycle (3Rs) that place highest priority on waste prevention, waste reduction, and waste recycling instead of just trying to cope with ever-increasing amounts of waste through treatment and disposal. Such efforts will help cities to reduce the financial burden on city authorities for waste management, as well as reduce the pressure on landfill requirements.

We live in a world of increasing scarcity. Raw materials from natural resources are limited, financial resources are often insufficient, and securing land for final disposal is getting more difficult. Clearly, city authorities should set policy directions aiming for resource efficient, recycle-based society if they are to provide a clean, healthy and pleasant living environment to its citizens for current and future generations.

Although waste management responsibilities primarily lie with cities and municipalities, many of the successful cases in waste management involve a wide range of stakeholders in their implementation, as can be seen in the case studies cited here. This gives a clear message to cities and municipalities that they should not try to do everything by themselves. Rather, the key to success is to do what they are good at, and collaborate with other sectors in the society, such as private sector, communities and in some cases

[4] UN-HABITAT (2009). Solid Waste Management in the World's Cities: Pre-Publication Series, UN-HABITAT, Nairobi

with the informal sector, in the interest of expanding waste management services and improving efficiency and effectiveness.

1. ISSUES AND CHALLENGES

City leaders are faced with several challenges in their effort to streamline waste management services. A few of the pressing issues include rapidly increasing quantities and diverse characteristics of waste, the undesirable consequences of conventional methods of waste management, and failure to tap the resource value of waste.

1.1 RAPID INCREASE IN VOLUMES AND CHANGING CHARACTERISTICS OF MUNICIPAL SOLID WASTE – A GLOBAL TREND

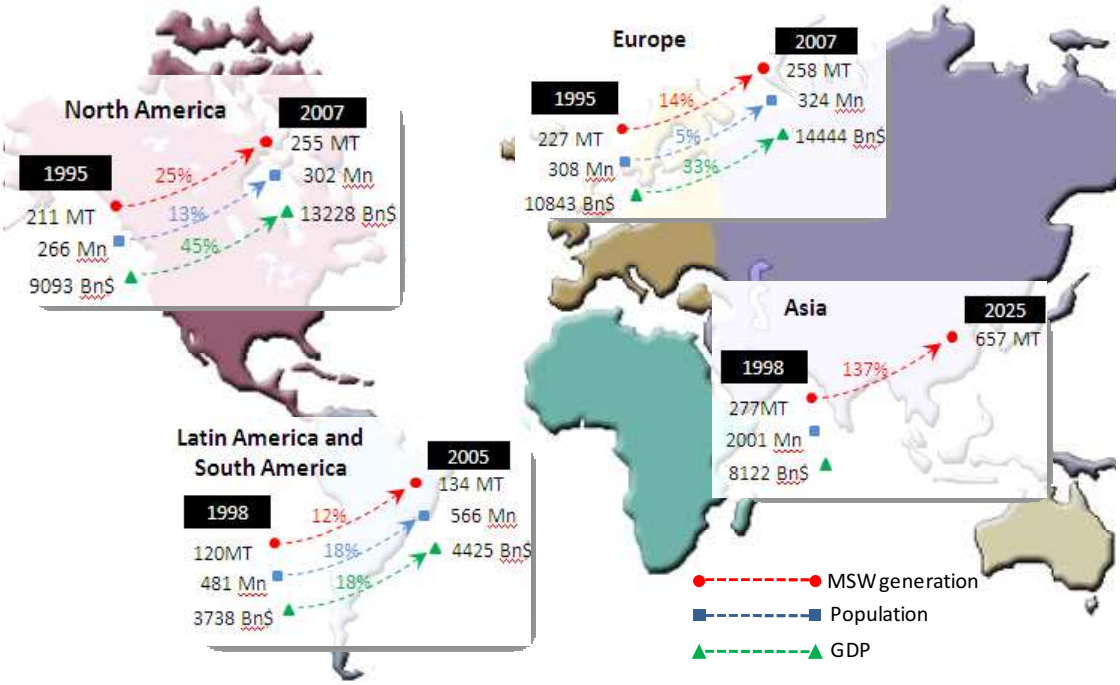
There is an overall correlation between the generation of MSW, wealth (Gross Domestic Product, GDP per capita) and urbanization[5]. Future projections estimate that the world's waste production could reach up to 27 billion tons by 2050, a third of which may be generated in Asia, with a significant percentage of that being produced in large economies such as China and India. Figure 1 shows the correlation between MSW generation, population and GDP across the world and the expected rise in generation of MSW in Asia as projected by the World Bank.[6]

The types of MSW produced change according to the standard of living in the city. Wastes generated in low- and middle- income cities have a large proportion of organic waste, whereas the wastes in high-income cities are more diversified with relatively larger shares of plastics and paper (Figure 2). The changing composition of waste in turn influences the choice of technology and waste management infrastructure, and underscores the importance of waste separation.

5 Veolia Environmental Services (2006). From Waste to Resource. An Abstract of "2006 World Waste Survey." http://veoliaes.com/resource.php?id=566 (last accessed 15 July 2010)

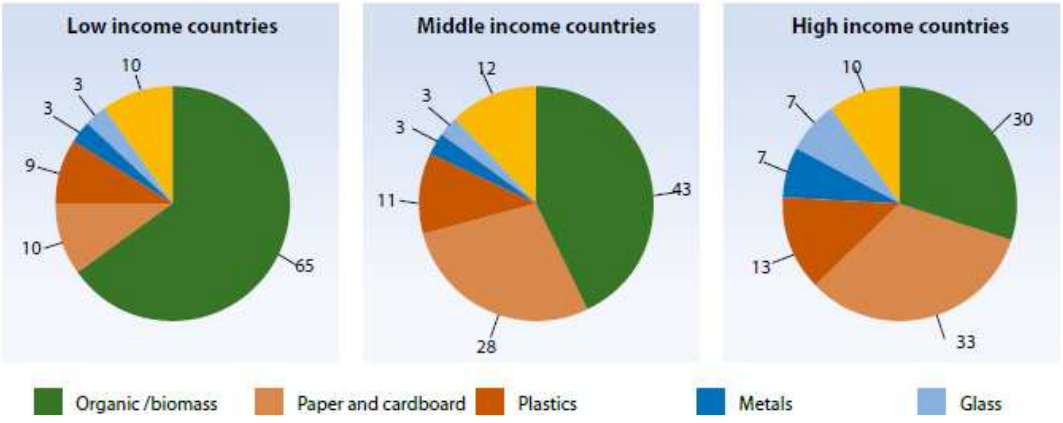
6 World Bank (2005). Waste Management in China: Issues and Recommendations, May 2005. www.go.worldbank.org/2H0VMO7ZG0

Figure 5.1. Correlation between MSW Generation, Population and GDP



Source: Modak (2011)[7]

Figure 5.2. MSW Composition in Relation to the Relative Wealth of the Countries



Source: UNEP (2011)[8]

7 Modak P. (2011). Synergizing Resource Efficiency with Informal Sector towards Sustainable Waste Management, Building Partnerships for Moving Towards Zero Waste, A Side Event for CSD19 held on 12 May 2011, Tokyo

Electrical and electronic wastes (e-waste) are rapidly growing forms of waste that are generating much concern. In 2005, 20 to 50 million tonnes of e-waste were generated worldwide, and by 2020, e-waste from used computers in emerging economies like South Africa, China and India will have increased by 200-500 per cent over 2007 levels.[9] E-wastes contain metals such as mercury, cadmium and lead that may leach into the environment and pose a health hazard to human beings, unless handled with care. Numerous cases have been reported where informal sector workers are engaged in dismantling used electrical and electronic equipment in order to recover metals, plastics and other materials for recycling, often without proper protection, exposing them to severe health risks.

Other types of waste streams of concern in the context of an urban lifestyle are construction and demolition waste and end-of-life vehicles. For example, about 10-15 per cent of waste generated in developed countries is due to construction and demolition activity,[10] while discarded vehicles generated in Germany, United Kingdom, France, Spain and Italy are responsible for approximately 75 per cent of waste generated in the European Union (EU-25).[11]

While facing the increased volumes and diverse characteristics of MSW that come with economic growth, cities responsible for urban waste management are struggling to handle the MSW produced in their jurisdictions. In developing countries, 20-50 per cent of the recurring budget of municipalities is often spent on solid waste management, although often only 50 per cent of the urban population is covered by these services. In low-income countries, collection alone drains 80-90 per cent of total waste management budgets. Open dumps and open burning continue to be the primary method of MSW disposal in most developing countries.[12] Figure 3 shows the waste management practices followed by the different parts of the world.

8 UNEP (2011), Waste – Investing in resource and energy efficiency, Towards a Green Economy, www.unep.org/greeneconomy/P ortals/88/documents/ger/GER_8_Waste.pdf

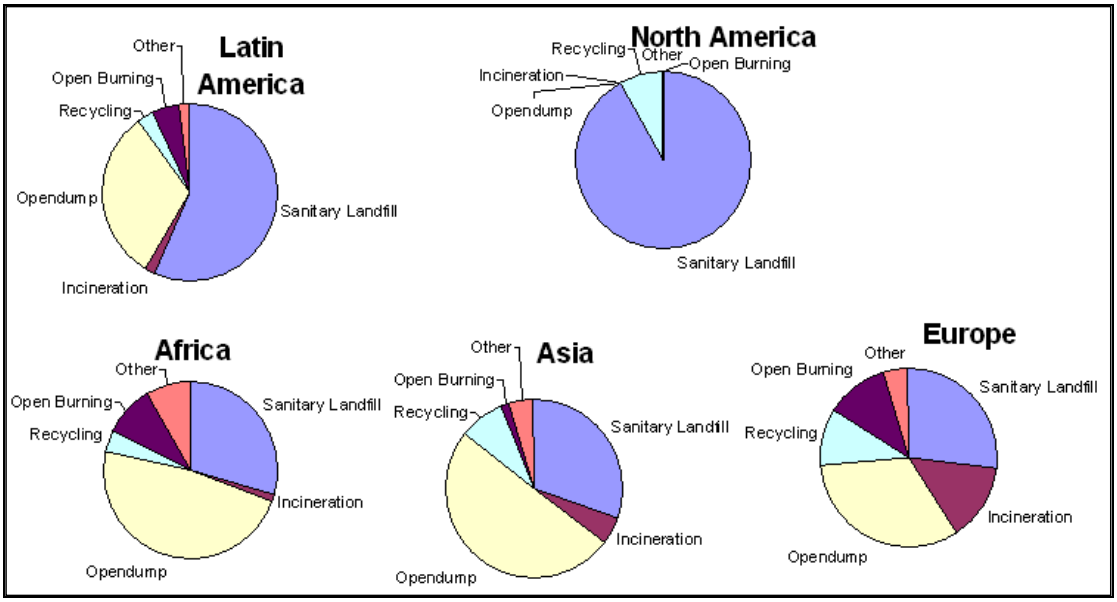
9 UNEP (2005). E-waste, the hidden side of IT equipment's manufacturing and use, Environmental Alert Bulletin, http://www.grid.unep.ch/product/publication/download/ew_ewaste.en.pdf

10 Bournay E. (2006). Vital waste graphic 2, Volume 2, Basel Convention, UNEP and GRID-Arendal, Second edition, http://www.grida.no/_res/site/File/publications/vital-waste2/VWG2_p32and33.pdf

11 Eurostat (2010). End-of-life vehicles (ELVs), Reuse and Recovery rate, last updated on 16.04.2010, http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data/wastestreams/elvs

12 Chandak, S. P. (2010). Trends in Solid Waste Management – Issues, Challenges, and Opportunities presented at the International Consultative Meeting on Expanding Waste Management Services in Developing Countries, 18-19 March 2010, Tokyo, Japan.

Figure 5.3: Waste Management Practices in Different Parts of the World



Source: Adapted from Chandak (2010)[13]

1.2. CONSEQUENCES OF CONVENTIONAL WASTE MANAGEMENT

Conventional waste management focuses largely on waste collection, treatment (composting and incineration) and disposal (landfills). Only limited attempts are made to adopt integrated waste management practices that involve waste reduction at the source, resource recovery and recycling. The resource value of waste cannot be realized unless separation of wastes is practised effectively at the source.

Meanwhile, in many cities in developing countries, collection rates remain low and the quality of collection services are poor. Waste collection services are generally non-existent in poorer neighbourhoods such as slums. While there are some successful examples where the private sector and communities are involved in waste management services, in many cities of developing countries, involvement of these segments of society is still very limited. The wastes collected typically end up in open dumps, where they may be burnt,

[13] Chandak S. P. (2010). Trends in Solid Waste Management – Issues, Challenges, and Opportunities presented at the International Consultative Meeting on Expanding Waste Management Services in Developing Countries, 18-19 March 2010, Tokyo, Japan.

and in some cases are deposited in illegal dumping sites.

A paradigm shift from conventional waste management practices to Integrated Solid Waste Management (ISWM) is essential for cities in order to effectively manage the waste stream. ISWM is a comprehensive waste prevention, recycling, composting, and disposal programme. An effective ISWM system considers how to prevent, recycle, and manage solid waste in ways that most effectively protect human health and the environment. ISWM involves evaluating local needs and conditions, and then selecting and combining the most appropriate waste management activities for those conditions. As a consequence of conventional waste management practices, many cities in developing countries are facing environmental and health risks as well as losing economic opportunities in terms of the resource value of the waste. Box 1 describes the opportunities of adopting ISWM as against conventional waste management practices and Box 2 highlights the health risks for waste pickers and communities due to conventional waste management practices.

Box 5.1: Conventional Waste Management Versus Integrated Solid Waste Management

Risks due to Conventional Waste Management	**Opportunities from Integrated Solid Waste Management**
• Poor efficiencies, undesirable health impacts (such as vector-borne diseases), environmental problems (such as deterioration of ground water quality due leachate contamination) and social issues (such as informal communities working in unsafe conditions) due to centralized approach to waste management • Developmental activities and consumption driven lifestyles leading to increased generation of waste Valuable resources go unutilized • No extensions towards innovation and creation of safe jobs • Fails to involve all stakeholders , particularly neglecting the contribution of communities and private sector participation • Health hazards to waste workers and prevalence of social evils like child labour • No attention given to other newer waste streams for special handling as well as recovering resources	• Combination of centralized and decentralized options with effective pollution control systems (such as leachate treatment and gas capture systems) leading to economic gains due to improved efficiency, overall cost reduction, minimal environmental impacts and social acceptance. • Strategically planned waste minimization and green procurement programmes leading to more sustainable consumption patterns along with economic development • Facilitates recycling of valuable resources such as plastic, glass, paper and metals, recovery of alternate energy sources such as Refuse Derived Fuel (RDF) from high-calorific value fraction of waste, recovery of biogas or compost from biodegradable waste • Encourages innovative technology development in newer areas such as waste to energy and recycling and promotes green jobs that ensure safe working conditions • Ensures multi-stakeholder participation in decision-making process by involving Non-Governmental Organization (NGOs), Community Based Organization (CBOs), rag pickers, private sector, residential and commercial communities with the government • .Brings waste workers into the formal economy and providing them with safe working conditions • Addresses management of both MSW and other newer waste streams such as e-waste, construction waste and scrapped vehicles.

Box 5.2: Health Risks for Waste Pickers and Communities

Risks to Waste Pickers

Informal waste pickers, who most often operate without any protective measures, are exposed to a wide range of health risks such as:

- HIV (due to handling of hospital waste)
- Tetanus (due to handling of jagged metals)
- Respiratory problems (due to exposure to smoke)
- Neural damage (due to lead)
- Injuries
- Premature drinking
- Stress
- Skin and gastric problems

Risks to the Communities

- There is a significant increase in the incidence of sickness among children who live in households where garbage is dumped or burned in the yard.
- Uncollected solid waste clogs drains and causes flooding and subsequent water-borne diseases.
- People living downwind of a burning dumpsite will likely suffer from respiratory diseases.
- Contaminated liquids or leachate, leaking from dumpsite could pollute city's drinking water supplies.
- Waste dumps potentially serve as breeding ground for Malaria, thus having implications in achieving Millennium Development Goals (MDGs).

Source: Gunn, S. (2009),[14] UN-HABITAT (2009),[15] with modifications.

1.3. WASTES NOT BEING VIEWED AS "RESOURCES"

City leaders should try to encourage a fundamental change in mindsets and attitudes toward waste. Public information campaigns need to encourage urban populations to help reduce the waste stream and to turn what used to be considered as "waste" into "resources."

- Link between "waste" and "resource":

  Resources can be recovered from waste if they are separated at the source, and are treated properly (see Table 1, Figure 4 and 5).

[14] Gunn, S. (2009). Health and Labour Considerations are an Integral Part of 3R Promotion! presented at the Inaugural Meeting of the Regional 3R Forum in Asia in November 2009 in Tokyo, Japan

[15] UN-HABITAT (2009). Solid Waste Management in the World's Cities: Pre-Publication Series. UN-HABITAT, Nairobi

- Significance of "upstream resource management":

  Equal or higher emphasis should be given to "upstream" resource management and waste reduction efforts, as compared to "downstream" waste management options such as treatment and disposal (Figure 6).

- Resource efficiency and circular economy:

  By reducing production of wastes, and by maximising the use of reusable and recyclable materials, a city can achieve greater resource efficiency. In other words, smaller amounts of physical resources could produce the same amount of products or services while generating less waste, as in the case of a closed loop economy. (Figure 7).

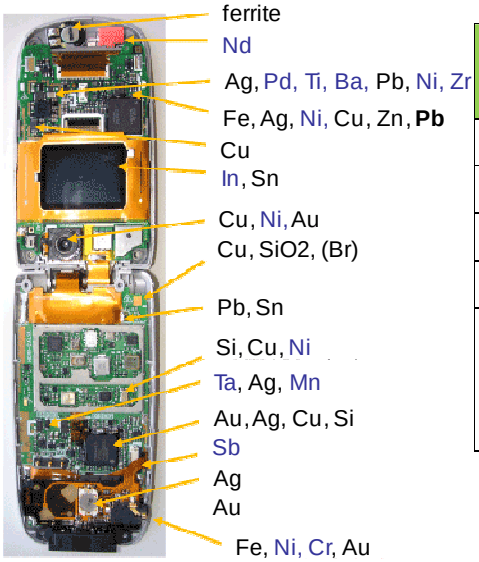
Table 5.1: Wastes and their Recycling Potential

Type of waste	Recycled products	Recycling potential
Biomass	Composts	Future of compost depends on its environmental and agronomic quality and the dynamism of its market.
Paper and cardboard	Recovered paper (recycled paper)	Increasing demand in Asia, particularly in PRC.
Plastics	Recovered plastics	Increasingly stringent regulations and growing demand for recovered plastics in Asia, favoring development and internationalization of this market. Cost of collection system and volatile prices are limiting factors.
Ferrous Metals	Steel	In 2004, world production of scrap metal rose to 450Mt and consumption reached 405.5Mt. Can be recovered from MSW, construction waste, etc.
E-wastes	Recoverable materials	Estimated that 10million computers contain 135,000 metric tons of recoverable materials, such as base metals, silicon, glass, plastic, and precious metals.

Source: ADB and IGES (2008),[16] with modifications.

[16] ADB and IGES (2008). Toward Resource-Efficient Economics in Asia and the Pacific: Reduce Reuse Recycle. Asian Development Bank, Manila

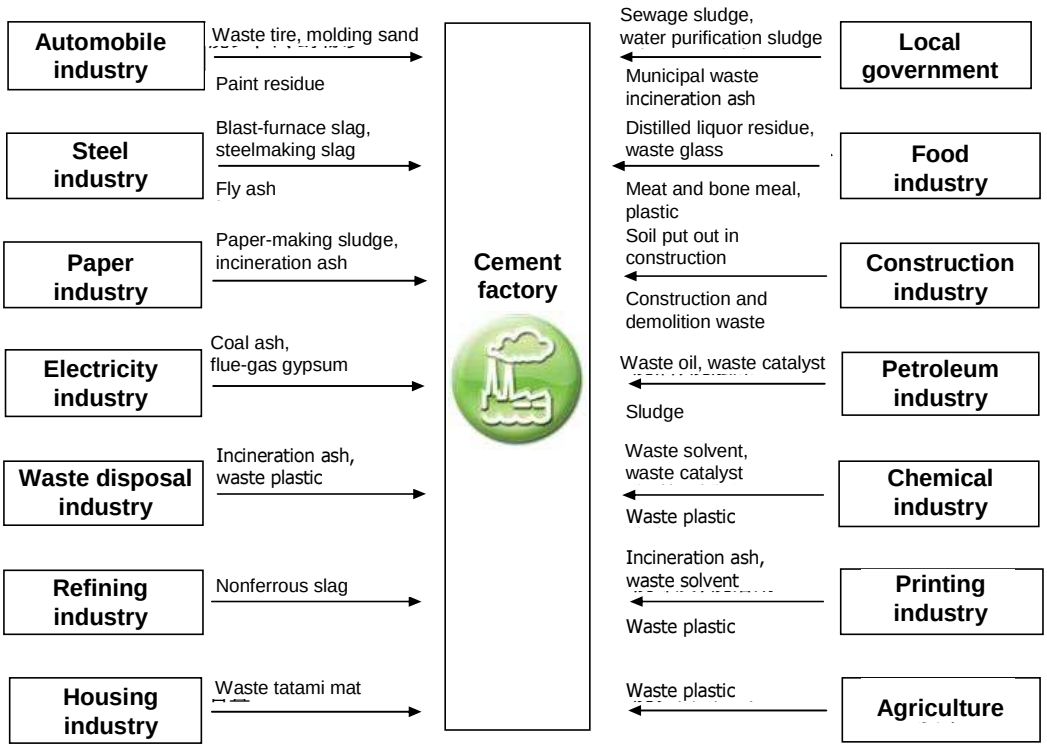
Figure 5.4: Valuable Metals That Could be Recovered from a Mobile Phone



Quantity of Non-ferrous Metals Included in One Mobile Phone (Unit: g)	
Gold	0.028
Silver	0.189
Copper	13.71
Palladium	0.014
Source: http://www.rieti.go.jp/jp/events/bbl/05060701.html	

Source: DOWA Eco-System Co., Ltd, http://www.coden.jp/rare-metal/use.html,

Figure 5.5: Effective Utilization of Waste and By-product Leveraging In a Cement Factory



Source: Sameshima (2009),[17] with modifications.

There are a number of reasons why cities should aim to improve resource efficiency in the local economy. From an environmental point of view, efficient use of resources can lessen environmental burdens at local level, such as urban air/water pollution, floods induced by solid waste clogging drainage canals, reduced availability and quality of freshwater supplies, and land degradation. High pollution levels, which may put public health at risk and translate into economic costs, can be reduced. From a global perspective, efficiency measures can greatly reduce green house gas (GHG) emissions from energy generation and use, materials extraction and processing, transportation, and waste disposal. This means that cities and countries that excel in resource efficiency could take advantages of win-win solutions to meet international obligations on climate change. Resource efficiency also contributes to improving energy security. Dependence on fossil fuel and inefficient use of energy supplies can expose cities to price and supply fluctuations. Cities can dampen their demand for oil, electricity and natural gas by implementing energy efficiency measures and thus insulate themselves from fossil fuel supply risks.

Figure 5.6: "Reduce" at Various Stages of Product Lifecycle

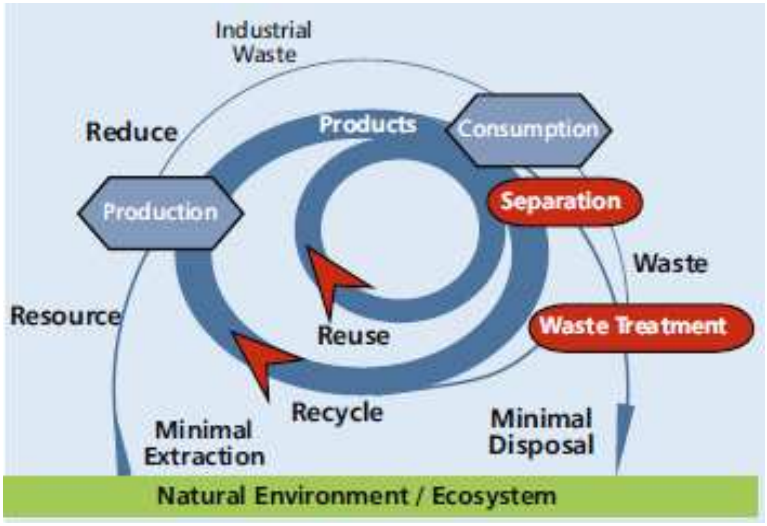
Upstream	Development and Production	• Resource-saving design	Reducing size/thinning of parts, using recycled materials
		• Long-life design	Adopting durable materials and structures, upgradeable design
		• Resource-saving production system	Reduce byproducts and losses, promote reuse
	Distribution and Sales	• Reduction of packaging materials in logistics	Use of returnable containers
		• Servisizing (Product Service System)	Shifting from selling "products" to services that provide "functions"
		• Avoid excessive packaging	Reduce plastic bags, promote simple packaging, selling by measure
	Purchase and Use	•Purchase only the essential goods	Promote 4Rs, including "Refuse"
		• Long use of products	Extend life of product by repair and maintenance
		• Wise use of second hand goods	Flea market, recycling shops
		• Sharing	Sharing cars, equipments
		• Recycling, reduction of wastes	Composting of organic wastes, at-source waste separation
Down-stream	Disposal	• Charging waste treating cost	Promote reduction of waste by introducing economic incentives

Lifecycle of the product

[17] Sameshima, F. (2009). Activities of Nippon Keidanren for Creating a Recycling Society presented at the Inaugural Meeting of the Regional 3R Forum in Asia in November 2009 in Tokyo

Source: Takada, Tanaka and Souma (2006)[18]

Figure 5.7: The Closed-Loop Economy[19]



One aspect that tends to be overlooked is the economic competitiveness that can be enhanced with resource efficiency. In view of the long-term upward trend and volatility of commodity prices, resource efficiency has become a major factor that determines the competitiveness of firms, cities and countries. Many profitable new business opportunities are available both in input-efficient production and in environmentally responsible recycling and waste disposal. Meanwhile, cities should also be mindful of the fact that over-reliance on conventional waste collection, treatment and disposal is not sustainable and it is too costly. Waste management should be designed and planned in a holistic, integrated way on the principles of ISWM and practices of 3Rs, with disposal

[18] Takada, K., Tanaka, T., and Souma, T. (2006). Reduce no sokojikara (The Real Strength of "Reduce") in Nikkei Ecology 2006.4: 38-53

[19] ADB and IGES (2008). Toward Resource-Efficient Economics in Asia and the Pacific: Reduce Reuse Recycle. Asian Development Bank, Manila

being just the last resort or least preferred option.

From the social perspective, developing countries can benefit from viewing the environmental technology industry as a potential source of employment or "green jobs" and long-term asset protection. The number of people involved in waste management in both formal and informal sectors is a significant number. Providing a better occupational environment and protective measures, and by formalising the informal sector workers, cities can contribute in a meaningful way to raising the living standards of its citizens. Improved resource efficiency could also lessen potential pressures and avoid root causes of social conflicts that could arise from resource competition.

2. POLICY OPTIONS FOR URBAN SOLID WASTE MANAGEMENT

City leaders are faced with a decision for the future. Either they continue with conventional methods of waste management and face the resulting impacts, or they pursue an alternative path that attempts to prevent problems by adopting ISWM and 3Rs. To work towards the transition to more sustainable cities, city leaders should first address the existing problem by reorganizing allotment of municipal budgets to upgrade waste infrastructure and services.

The lack of an adequate policy and regulatory framework complicates matters even further. Experience has shown that the command and control approach alone cannot and will not improve waste management practices. Command and control should be supplemented by market based instruments with incentives and disincentives so as to stimulate investments and entrepreneurship to transform waste management into an environmentally sound and socially acceptable business.

Some countries lack regulations on certain waste streams such as e-waste and construction waste. Certain countries (for example Brazil and India) that do not have formal infrastructures for recyclables collection, have only recently started legally recognizing the huge numbers of waste pickers who perform such a crucial service for the sector. By doing so, they are not only protecting and empowering the poor, but are also proceeding towards meeting relevant MDGs.

Therefore, cities should adopt appropriate policy options to work towards long term goals and provide an enabling framework to promote ISWM.

2.1 DEVELOPING MEANINGFUL PARTNERSHIPS WITH PRIVATE SECTOR, INFORMAL WORKERS AND COMMUNITIES FOR EFFECTIVE IMPLEMENTATION OF ISWM AND 3RS

A critical deficiency in waste management infrastructure has been a serious problem for many city leaders. Depending on the circumstances, a centralized approach necessitating the use of common waste management infrastructure and/or decentralized waste management infrastructure should be chosen. Public Private Partnerships (PPPs) could help implement waste management infrastructure projects that can not be financed wholly by the city leaders. For waste related infrastructure to be "accepted" by communities, it is critical to engage with the communities from the outset, to determine their needs and address their concerns with such projects. Further, preconditions such as capital investments, future financial sustainability and institutional mechanisms should also be satisfied so as to ensure the proper maintenance and functioning of these facilities. Additionally, the need for "resource management infrastructure" will assume added significance in the future. Examples of such infrastructure could include for example, product disassembly and recycling depots.

In order to capitalize on the experience and knowledge of informal waste pickers, it is important to formalize and organize them and involve existing waste recycling cooperatives and waste-picker associations in the recycling activities (see Case Studies 1 and 2). Once formalized, the waste pickers would receive required health-care, social security, safety equipment and dignity during their work. Micro-finance could also be provided to support entrepreneurship and recognize innovation.

Businesses in a city can come together to set up Eco Industrial Parks, where they can achieve enhanced environmental and economic performance through joint management of environmental and resource issues including energy, water, and materials. City leaders should also strengthen institutional capacity for skill development and awareness-raising. Some examples of the application of this strategy include funding institutions for research into environmentally sound and safe disposal of healthcare waste, mining of landfills, additional study into reverse logistics and closed loop supply chain processes for resources management, and so on.

It is also increasingly evident that waste, as a sector, assumes an added complexity given the various stakeholders which are part of it. Apart from city leaders, the waste sector

includes a range of other key stakeholders such as waste generators, industry, financing institutions, national governments and regulators, waste technology providers, academia, NGOs, community based organizations, international finance institutions and United Nations entities. Therefore, perfecting the "right" balance with the needs and aspirations of all stakeholders becomes quite challenging. See Box 3 on recently launched International Partnership for Expanding Waste Management Services of Local Authorities (IPLA) that brings together stakeholders associated with waste management on a common platform for networking and knowledge sharing. IPLA is a dynamic platform for exchange of knowledge across multiple stakeholders for putting ISWM and 3Rs into practice.

2.2 REDUCING MSW AND AIMING FOR "ZERO WASTE"

Policy instruments such as "volume based fees" for solid waste collection could lead to reduction of MSW generation. For example, effective implementation of volume based fees in Korea led to a 21.5 per cent reduction of MSW generation from 1994 to 2009.[21]

Cities striving to reduce their wastes should set clear indicators or quantifiable measurements that reflect the performance of the cities with regard to solid waste management. Indicators should be compared against targets in order to gain a reference point for whether the action being assessed was successfully implemented and to what degree. Some examples of indicators include resource efficiency, recycling rates and amount of waste landfilled.

[21] Ministry of Environment (2010), Republic of Korea, Annual Report of Volume Based Waste Fee.

Box 5.3. International Partnership for Expanding Waste Management Services of Local Authorities (IPLA)

IPLA is an international waste management network created to address the gaps in urban waste management due to weak capacities of City leaders. IPLA has been created to enable networking the City leaders across the world, stressing on the link between waste and resources and aiming to connect all key stakeholders through knowledge networks following the principles of ISWM and 3Rs.

The mission of IPLA is "to share knowledge, communicate across national boundaries and work to spread best practice in order to accelerate the uptake of waste-related infrastructure and services at various stages of waste management such as avoidance, prevention, minimization, separation, collection, transport, recycling, recovery, reuse treatment, and disposal".

IPLA was endorsed at the CSD-19 Intersessional Conference on Building Partnerships for Moving Towards Zero Waste held on 16-18 Feb 2011 in Tokyo, Japan. The Asian Institute of Technology in Thailand was chosen to be its global secretariat. Since its launch at CSD-19, there has been a worldwide expression of strong interest to join IPLA. More than one hundred partners, including cities and local governments, have officially registered with IPLA.

For further information, visit http://www.uncrd.or.jp/env/ipla/index.htm

2.3 INCREASING REUSE AND RECYCLING OF RESOURCES

Cities should strive to reconfigure businesses and infrastructure to deliver better returns on natural, human and economic capital investments, while at the same time reducing GHGs, extracting and using less natural resources, creating less waste and reducing social disparities. By promoting reuse and recycling of resources to displace virgin inputs for manufacture of a product, city leaders can ensure resource savings (see Case Study 3). Citizens have an important role to play in separating waste at the source in order to facilitate collection of waste streams. It is important to promote recycling businesses as they have also long been known to be a substantial job provider to various sections of society. Reducing generation, promoting reuse and recycling of wastes reflects the concept of balancing environmental conservation and economic growth through the effective use

of resources. City leaders should enforce market instruments such Extended Producer Responsibility (highlighted in Case Study 3) to ensure that producers take responsibility for recycling products. The rates of recycling in cities can be increased by establishing recycling facilities in collaboration with the private sector**.**

2.4 EFFECTIVELY MANAGING SPECIFIC TYPES OF WASTE STREAMS SUCH AS ORGANIC WASTE, E-WASTE, CONSTRUCTION WASTE AND END-OF-LIFE VEHICLES

Policies should address special waste streams such as organic waste, construction and demolition waste, e-waste and end-of-life vehicles. City leaders need to adopt specific acts and regulations with strong enforcement mechanisms to govern their end-use. Waste streams that require urgent attention such as non-biodegradable waste should be identified and measures should be taken to put the appropriate technology in place to manage them and derive economic value. In the case of organic waste streams that constitute a major portion of MSW, subsidies may be offered for adopting proven locally available technologies (see Case Study 4). Special attention should be given to waste management in slums and other low-income areas and disaster-prone regions. Policies should address upstream challenges that can help support effective management downstream. For example, with growing emphasis on the green economy, sustainable production and resource efficiency, new improved forms of technology will be required to allow for sustainable design. Design for Sustainability (DfS), Eco-Design, Design for Environment (DfE) and Design for Disassembly (DfD) all refer to an approach to design, manufacture, use and disassembly that allows for easy recyclability of used products, thereby widening the scope of materials suitable for recycling. This would be included under a comprehensive policy framework encouraging reuse and recycling of special waste streams as resources.

2.5 EXPLORING RISKS AND OPPORTUNITIES DUE TO CLIMATE CHANGE AND THE CLEAN DEVELOPMENT MECHANISM

City leaders should start recognizing risks to the waste sector from climate change and also capitalize on opportunities arising from climate change for the sector. It is important to identify and implement mitigation and adaptation measures to combat risks to the sector due to climate change impacts such as floods and proliferation of disease vectors

The waste sector is a significant contributor to GHG emissions accountable for

approximately 5 per cent of the global greenhouse budget with total emissions of approximately 1,300 metric tonnes of CO_2-equivalent as reported by the Intergovernmental Panel on Climate Change (IPCC). Existing waste-management practices offer a fairly decent GHG emissions mitigation potential. Dumpsites are the largest GHG emitters in the waste sector. Capitalising on the methane generated from the dumpsites, several landfill gas capture projects have been initiated and proved successful. The waste sector therefore offers opportunities for avoidance of GHG emissions that could be monetized in the form of carbon credits or Certified Emission Reductions (CERs). Although waste minimization, recycling and re-use are not eligible activities under the Clean Development Mechanism (CDM), they provide opportunities to reduce GHG emissions through the conservation of raw materials, improved energy and resource efficiency and fossil fuel avoidance. Very often, city leaders are pressed with other issues and local development imperatives that prevent any preference being given to investments in innovative waste management practices. Importantly, traditional policies and regulatory frameworks do not encourage, but rather disallow, private sector investments in such innovative approaches. However, the overall landscape is changing and innovative business models are emerging (see Case Study 4).

3. CASE STUDIES

3.1 Empowering and Formalizing the Informal Sector through a Trade Union and a Ragpicker Cooperative, Pune, India[22,23,24,25]

Pune is the second largest city in the state of Maharashtra in India and has a population of 3 million. The city's population increased by 40 per cent during the first decade of this century and 50 per cent of the population increase has been attributed to immigration.

The city contains 564 slums and, with the growing economic activity, the population of slum dwellers immigrating into the city is expected to increase at the rate of 6 per cent per year. The increase in population has put tremendous pressure on the city authorities to expand their waste management services. Further, informal waste picking and selling activities are rampant amongst the slum dwellers as a means of earning livelihood. The rag pickers, including women and children, were very often socially discriminated for the nature of activity they indulged in for survival.

Two individuals, Poornima Chikarmane and Laxmi Narayan, who were deeply affected by the dismal condition of the child waste-pickers in Mumbai, wanted to address discrimination and labour right issues and recognize the value of picking and recycling activity that had the potential of resulting substantial savings to city authorities. They realized the need for bringing together rag pickers through a mass movement and hence organized a "Convention of waste-pickers" called Kagad Kach Patra Kashtakari Panchayat (KKPKP) in May 1993. The convention served as a platform for rag pickers to voice their

[22] Chikarmane, P. and Narayan, L. (undated). Organising the Unorganised: A Case Study of the Kagad Kach Patra Kashtakari Panchayat (Trade Union of Waste-pickers). Women In Informal Employment Globalizing and Organizing (WIEGO), http://www.wiego.org/program_areas/org_rep/ (last accessed 11 August 2010)

[23] Medina, M. (2008). The Informal Recycling Sector in Developing Countries. Organizing waste pickers to enhance their impact. Gridlines Note 44. http://www.ppiaf.org/ppiaf/sites/ppiaf.org/files/publication/Gridlines-44-Informal per cent20Recycling per cent20- per cent20MMedina.pdf (last accessed 15 July 2010)

[24] Scheinberg, A. (2009). A Horse of Different Colour Presented at the Inaugural Meeting of the Regional 3R Forum in Asia, November 2009, Tokyo, Japan

[25] Kilby, P. (2009). From Rags to Respect: the Role of a Ragpicker Cooperative in Pune's (India) Household Solid Waste Management System. Presented at the World Vision Conference on "Measuring Effectiveness." World Vision, Australia http://210.247.227.129/Learn/Conferences/MeasuringEffectiveness/2009_Presentations.aspx (last accessed 15 July 2010)

grievances and hence received an overwhelming response from rag picking communities. Over 800 rag pickers from across the city attended the convention. It was agreed at the convention that KKPKP would be formed as a registered trade union to represent the collective identity and interests of scrap collectors. The news about the success of the convention spread fast across the networks of waste pickers and as a result KKPKP was formally registered in the year 1997. The trade union fought for the rights of rag pickers to a safe workplace and systematically built support for rag pickers among citizens.

KKPKP has 5025 members to date, a slate of officers, a Governing Board and a Representatives Council. The membership of the Union is drawn from among scrap collectors living in slums geographically spread across the City of Pune. The Representatives Council, consisting of 80 elected Representatives (75 women and 5 men), and the officers govern the Union. The Council follows a consensus approach and meets every month to deliberate, review, plan and take decisions on current issues.

Since 1996, Representatives have been selected through an election process, which ensures replacement of ineffective and unethical members. Representatives are not entitled to any remuneration or benefits from the Union other than those applicable to other members.

KKPKP functions as a savings-linked credit programme for the poor. Financial operations are centrally managed to minimise administrative costs and operationally the cooperative functions along the lines of self-help groups. The Credit Co-operative did not receive any external financial assistance for provision of credit in the first fifteen months of operation ending March 31, 1999. The entire loan requirement of members was met through savings. Group leaders appointed in the cooperative collected the savings and deposited it with the office of the co-operative. From May 1999, a sum of US$ 6522 in the form of interest free deposits had been collected from citizens who were willing to pay. Loans approved by group members are also disbursed centrally. Lending is to the extent of three times the amount saved and the two other members of the co-operative are required to be guarantors. The lending limit is US$ 543 and the rate of interest is 12 per cent per annum with an additional 12 per cent social security charge towards social security schemes for members. The payment of the annual premium to the New India Assurance Company is part of the annual municipal budget. Hospitalization costs of up to US$ 108 are reimbursed by the insurance company and claims are processed through KKPKP.

The formation of a trade union type organization faced strong opposition from retail scrap traders. Within months of the formation of KKPKP, the scrap traders tried to resurrect an otherwise defunct “Association of Scrap Traders”. However, because of intense competition within the retail segment of the scrap trade, the attempt to revive the association failed.

KKPKP organized and mobilised scrap collectors through public rallies and demonstrations in order to convince the city authorities and the state government to recognize scrap collectors as “workers”. They put forth a demand for the municipal endorsement of photo-identity cards issued by the Union in 1993 through several public demonstrations in which thousands of members participated. The Pune city government accepted the demand in 1995-1996 and became the first city authority in the country to officially register waste-pickers in recognition of their contribution to the management of urban solid waste.

KKPKP stands out as a unique workers organization that mobilized unprotected and unorganized waste pickers and itinerant buyers who are the poorest and most marginalized among urban workers. The organization integrated the informal workers into the formal waste management sector and addressed a range of issues surrounding waste picking activities such as exploitation, confronting extortion, fighting injustice, ensuring safe working conditions, child labour, economic and political issues associated with the activity, and lack of state recognition and labour rights. Following the endorsement by city authorities and recognising the easy replicability of the model, the Maharashtra State Government directed other city authorities in the state to follow KKPKP’s approach to formalize waste pickers.

Lessons Learned

- KKPKP is an example of how community mobilization can comprehensively and effectively succeed in uplifting the livelihoods of waste pickers by integrating these most vulnerable workers into a legally recognizable, structured and protective system.
- It further highlights how city authorities can work together with the informal sector to create a mutually beneficial relationship towards the realization of an integrated waste management plan.
- Through a combination of consensual, methodical and mature approaches to organizing waste pickers, and through the use of peaceful and disciplined methods of

social agitation (rallies, demonstrations, sit ins, etc.), it was possible to establish credibility with the government, private sector and citizens.

- Other than work-related economic issues, focusing on social development activities such as credit provision, education and child labour helped build KKPKP's credibility.

Impacts:

In 2002-03 the Pune Municipal Corporation became the first municipality in the country to institutionalize a *Scheme for Medical Insurance for all Registered Waste-pickers* in its jurisdiction.

Other Related Examples from the World:

- Brazil – A national campaign launched in Brazil had great success in reducing child labour in waste picking. The campaign has parents of child waste pickers enrolled in Bolsa Familia, a conditional cash transfer programme that gives parents a monthly stipend as long as they send their children to school, get them vaccinated, and obtain prenatal care. The stipend compensates families for the loss of income from child labour. Through this programme, supported by World Bank credits, more than 40,000 children left waste picking and are now attending school.
- Sao Paulo, Brazil – COOPAMARE (Cooperativa de Catadores Autonomos de Papel, Aparas e Materiais Reprovitaveis) was founded in Sao Paulo in 1989. It has 80 members along with about 200 independent waste pickers who sell its materials. COOPAMARE collects and sells about 100 tons of recyclables a month, at a lower cost than the city recycling programme. Its members earn $300 a month, twice the minimum wage.

3.2 HANDLING CONFLICTS BETWEEN FORMAL AND INFORMAL PRIVATE SECTORS IN CONTRACTING MUNICIPAL SOLID WASTE MANAGEMENT SERVICES, BOGOTÁ, COLOMBIA[26,27]

Bogotá, the capital city of Colombia has a population of 7 million inhabitants including the metropolitan areas. On an average, the city generates 6000 metric tonnes of MSW every day. Initially, MSW management services such as collection, transport, recycling and disposal were wholly taken care by the city authority with poor results.

The first attempt to streamline MSW management services in the city was initiated by the Asociacion de Recicladores de Bogotá (ARB). ARB is an association of recyclers that was formed in 1990. The Association resulted from the coming together of four recycling cooperatives that wanted to be recognized for their services. Currently, 24 recycling cooperatives in the city of Bogotá are members of ARB.

Waste management services were initially the responsibility of the city's department for public cleansing, called EDIS. Employees of EDIS went on strike in 1994 in order to convey their dissent with the decision of the city authority of Bogotá for privatization of waste management services in the city. At the request of the city authority, members of ARB stepped in during this period to offer their services to clean up the waste that was accumulating in the streets of Bogotá due to the suspension of work by EDIS. About 700 tons of waste was collected by ARB every day during this period.

The city authority did not meet the demands of EDIS and went ahead with the privatization process. Between 1994 and 1996 various private entities provided public waste services in Bogotá. The services were shared jointly by EDIS (45 per cent), private entities (45 per cent) and a foundation (Fundacion Social), and provided support to recycling organizations across Colombia. ARB was contracted to provide 10 per cent of the waste management services of the city.

During this time, EDIS was also in the process of being liquidated. It was completely shut down in 1996, leading to 100 per cent management of public waste management services (collection, transport and final disposal) by private entities. During the privatization

[26] Samson, M. (2009), Refusing to be Cast Aside: Waste Pickers Organizing Around the World, Cambridge MA, WIEGO

[27] Juber Martinez Hernandez, Direction of Monitoring and Evaluation, Special Administrative Unit for Public Services, Bogotá, Colombia

process, city authorities were faced with opposition from ARB since the Association was unable to compete in the tendering process. ARB did not meet the qualifying criteria outlined in the policy for contracting private entities for residential public services in Colombia, which allowed only stock holding corporations to compete. However, considering that it was important to allow inclusion of poor rag-pickers into the formal and mainstream economy, a few corrections in the policy requirement for bidders were made to allow organizations like ARB to bid in the tendering process.

City leaders should therefore take precautionary measures in framing policy guidelines and bidding criteria for public-private partnerships in order to ensure that the bidding process provides a level-playing field for both for-profit and not-for-profit organizations.

Lessons learned:

- The case study on outsourcing waste management services to private entities in Bogotá demonstrates the importance of including social and livelihood aspects when considering full-scale privatization of waste management services.
- The terms of contracts offered by the city authorities should ensure equal opportunity for recycling cooperatives to bid along with private entities, particularly in services such as collection and recycling where the recycling cooperatives have rich experience.
- Privatization of waste management services should not be encouraged at the cost of depriving rag-pickers of their livelihoods.

Impacts:

- Successful initial streamlining of solid waste management services in the city with the involvement of private entities.
- Apart from ensuring better living and working conditions for the rag-pickers, the initiative safeguarded the labour rights and successfully addressed the issue of child labour in waste-picking activities

Other Related Examples from the World:

- Private sector involvement has reduced the waste service cost by at least 25 per cent in countries such as United Kingdom, United States and Canada and at least 20 per cent in Malaysia.
- A World Bank project in Mauritius tested and proved that a new sanitary landfill should be constructed and operated by the private sector and that one company should

be responsible for all stages. Involving different private players for each stage such as design, construction and operation may lead to legal disputes over the adequacy of the construction in case of a leakage.

- In Stockholm, Sweden, five different private companies have been contracted to deliver 85 per cent of collection services while the remaining 15 per cent is taken care by the government.
- Dakar, Senegal developed experience with a public/private joint venture which, at first, was a monopoly but later transitioned to a more competitive privatization arrangement of multiple service contracts.
- In Surat, India, contracting of selected services such as night sweeping, waste collection and transportation to private companies increased the collection coverage to more than 90 per cent and reduced the number of road side garbage containers by 36 per cent.

3.3 PET Bottle Recovery and Recycling - Extended Producer Responsibility in Mauritius[28]

Plastic containers of beverages are abundant in modern society. Reuse and recycling of plastic bottles not only reduces virgin material input but also reduces wastes that land in final disposal sites. For example, a glass refillable bottle can be refilled and circulated over 50 times before it goes into recycling. A PET refillable bottle is refilled and circulated around 13 times before going into recycling, thereby reducing the material used in packaging.

Recycling of polyethylene terephthalate (PET) bottles is practiced widely in developed countries. Recycled PET flakes find a second life when being used as material inputs for fibre/textiles (42 per cent), sheets (50 per cent), bottles (5 per cent) and moulded products and others (4 per cent). While recycling is certainly an option, there are concerns that the amount of energy used for recycling could be considerably high, and whether these costs might be borne by city authorities. .

Recovery and recycling of PET bottles in Mauritius is a good example of enforcement of

[28] Contribution through communication with Professor T Ramjeawon, University of Mauritius

government regulation on Extended Producer Responsibility leading to stimulation of recycling. Being an ecologically sensitive small island developing State, Mauritius faces inherent challenges in management of rising volumes of MSW due to scarcity of appropriate space for disposal and treatment facilities, financial constraints and lack of capacity. Further, due to the growth of tourism establishments and inflow of tourists, the generation of solid waste is expected to rise in the island.

In an initiative to address the growing problem of plastic waste, the Ministry of Environment promulgated an Environment Protection Regulation related to PET bottles in 2001. Under the requirements of the regulation, the bottling companies had to establish a deposit-refund system to encourage the return of the maximum number of PET bottles. They were also required to set up a collecting/compacting system for the collected PET bottles so that these could be recycled / exported.

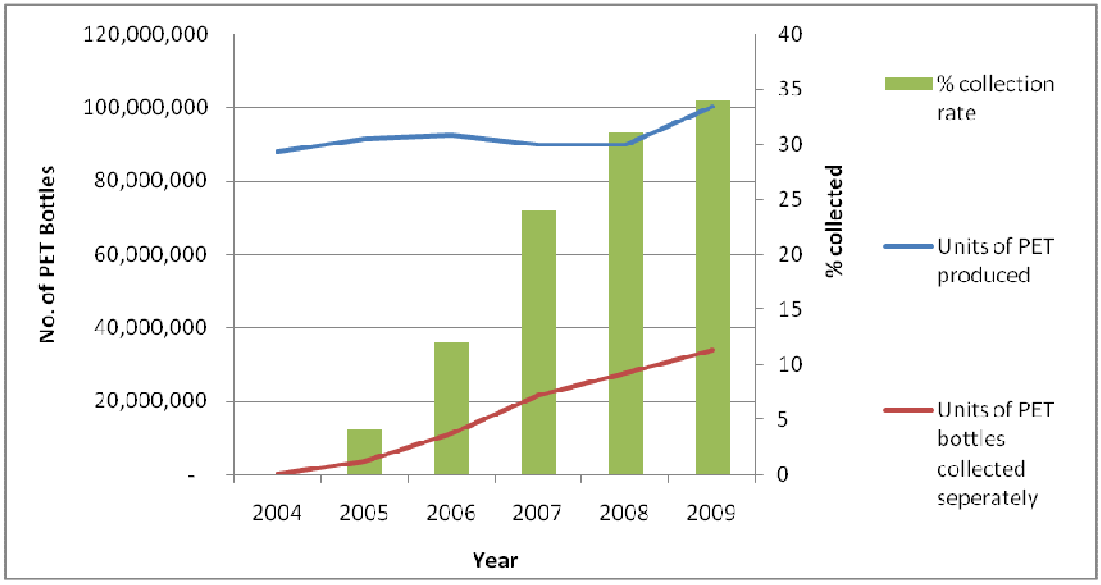
In response to the regulation, the four big producers of soft drinks in Mauritius, Phoenix Camp Mineral, Quality Beverages Limited and Compagnie Industrielle des Pailles, regrouped themselves into the Mauritius Bottlers' Association and hired a firm, Steel Scrap Ltd., to initially set up a collection mechanism for used PET bottles based on a voluntary take-back system. As part of the collection system, fifty-nine special bins were placed at strategic spots (beaches, market places, hypermarkets, etc.) throughout the island. This initiative was supported by a sensitization campaign where consumers were invited to dispose their used PET bottles in these bins. With the voluntary take back system in place, the collection rate was as low as 4 per cent in 2005.

To improve the collection rate, in 2005 the Bottlers' Association contracted the collection, processing and recycling of PET bottles to a private company called Polypet Recyclers. Since then, the private company has been purchasing used PET bottles from individuals, NGOs, schools and other organizations. The private company has a recycling capacity of 1200 metric tonnes per day. It owns and operates 6 trucks and charges the bottling companies at an average rate of US$ 396 per ton (depending on the market share). Further, the Bottlers' Association also promotes community initiatives with NGOs to create an opportunity for local residents to get additional revenue obtained from reselling PET waste. The private company purchases PET bottles from such collectors at the rate of Rs 7.00 per kg. For example, even housewives of low income families organized themselves and went from house to house to nearby communities in order to collect used PET bottles, since this gave them a fair source of income in return. The initiative was also supported by the

Ministry of Environment which further promoted separation of waste in all primary and secondary schools. Four different bins were distributed and the school community was encouraged to separate their wastes into plastic bottles, paper, biodegradable waste and other wastes. The schools entered into an agreement with the private company for collection of used PET bottles.

The collected PET waste is then collected, baled and sorted out according to colour and specific number. The waste is washed, granulated, re-washed and dried in specially designed machines. They are then ground and fed into other machines which melt them under heat and pressure. The PET waste is finally processed into pellets for export to South Africa. The private recycling company is required to show the customs proof of the amount of PET exported. The PET recycling initiative is thus easily replicable across other cities. It should be noted that with the involvement of the private company, the city authority could increase the collection rate of PET bottles from 4 per cent in 2005 to 34 per cent in 2009 (see Figure 8 below).

Figure 5.8. Increase in Collection Rate of PET Bottles



Source: Ministry of Environment, Mauritius

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Lessons Learnt:

- City leaders can promote reuse and recycling of beverage containers by establishing deposit systems and/or imposing fees on one-way bottles.

- Viability of a reuse and recycling industry depends on the size of the local economy. A study estimates that an industry could become profitable if there are more than 200,000 consumers in the city (METI-Japan, 2006).
- Privatization of recycling activity put into place systems, collection and recycling infrastructure. The private company also collaborated and networked with other recycling initiatives and the initiative led to a 30 per cent increase in recycling rate in the island in a period of 4 years.
- For recycling to be successfully implemented in cities, the process should be economically attractive.

Impacts:

- Up to 34 per cent of the 3000 metric tonnes of PET used on the island (or about 80 million bottles) are being successfully recycled.
- The initiative created about 100 indirect jobs on the collection side and also hired more than 30 workers directly in the recycling company.

Other Related Examples from the World:

- Many countries in Europe, such as Finland, Germany, Sweden, Austria, Demark, and Netherlands, have active “reuse” systems, through which beverage containers are collected and reused. Scandinavian countries are world leaders in reusing beverage bottles, with the rate exceeding 90 per cent.
- In Germany, deposit for non-refillable beverage containers is mandatory (at a deposit value of 0.25 Euro regardless of the volume) and regulated in the Green Packaging Ordinance, as means to promote the reuse/refillable system. Further, 161,000 jobs are directly connected to the manufacture, filling, distribution and selling of packaged beverages in Germany and 73 per cent of the jobs are associated with refillable containers. The initiative dramatically increased the bottle return rate to 95-98 per cent by imposing mandatory deposit on one-way bottles. PET bottles that end up in final disposal have been reduced to a minimal amount
- In Japan, the recycling rate of PET bottles reached 87.7 per cent in 2007.

3.4 COMMUNITY BASED COMPOSTING TO CONVERT ORGANIC WASTE TO RESOURCE AND GENERATE CARBON CREDITS, DHAKA BANGLADESH[29]

Due to rapid economic development, population growth and increasingly urbanized lifestyles, city authorities of Bangladesh are confronted with the issue of managing rising quantities and diverse streams of MSW with limited urban infrastructure and capability. The capital city of Dhaka generates 3500 metric tonnes of MSW every day. The city's waste is transported to a sanitary landfill at the Matuail site in Dhaka. Uncontrolled landfilling has been a common practice in the city. The city lacks adequate facilities for treatment, recycling and disposal of hazardous waste.

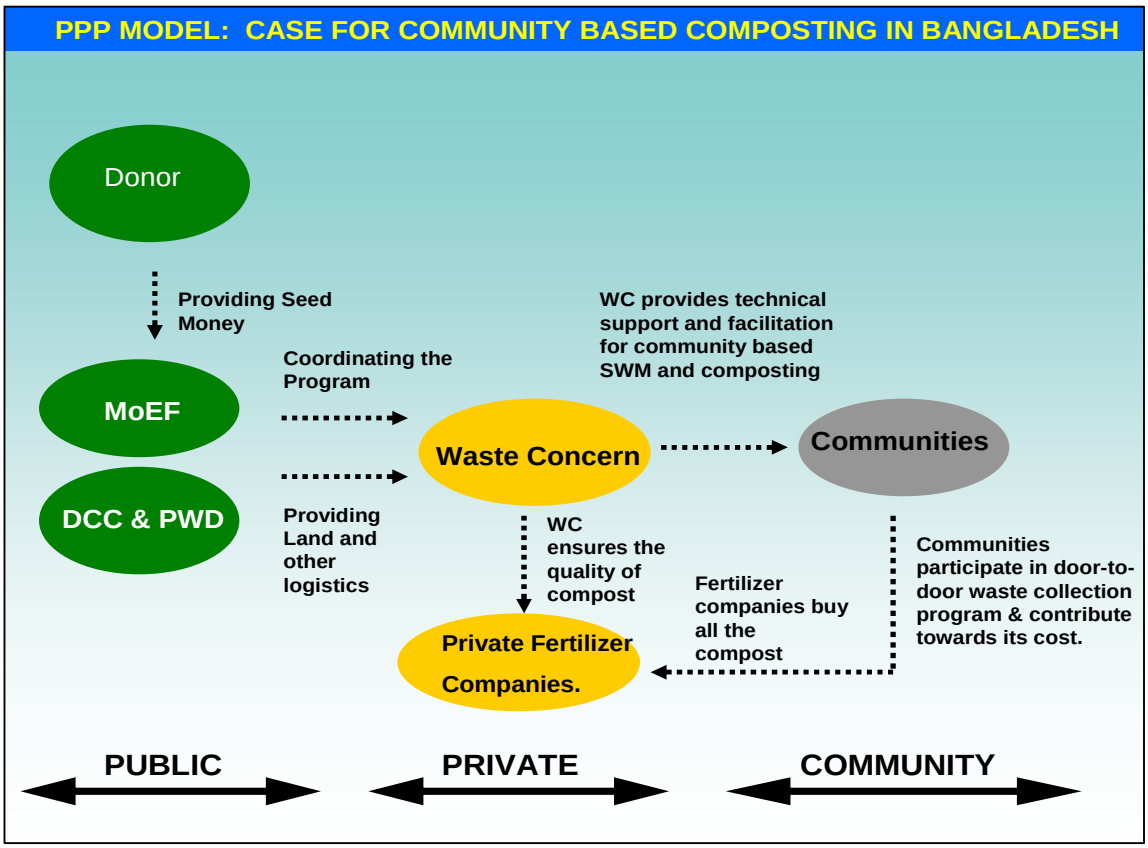
A major portion (about 80 per cent) of MSW generated in the city is organic in nature with a moisture content ideal for recycling into compost. Waste Concern, a local research organization and non-governmental organization, works in close partnership with the government, private sector, international agencies and local communities to implement community-based composting. It has successfully replicated the community based model of composting across several cities and towns in Bangladesh.

Since its launch of solid waste management projects in September 1998, Waste Concern has served 30,000 people in Dhaka city and 100,000 people in 14 other cities and towns in Bangladesh, including slums and low and middle-income communities. Its services include waste collection, separation and composting.

The centralized composting project in the city of Dhaka warrants special mention. The composting plant has a capacity of 700 tons per day and processes organic waste from the city of Dhaka in three phases. The project has led to many economic, social and environmental benefits such as new job opportunities to the communities and better livelihoods in the region. The public-private partnership model followed by Waste Concern is illustrated in Figure 5.7.

[29] Sinha, M. (2010). Community-based Waste Management and Composting for Climate/Co-benefits – Case of Bangladesh (2d) presented at the International Consultative Meeting on expanding Waste Management Services in Developing Countries, 18-19 March 2010, Tokyo, Japan

Figure 5.7. Partnership Model for Centralized Composting in Dhaka



The project included very interesting financial features which made it viable through community involvement and public private cooperation. The communities received door-to-door collection service and shared the cost of waste collection by paying a monthly fee based on their affordability. The private stakeholder had joint venture partners that included Waste Concern and its financial partners (banking institutions). The total investment required for the project was Euro 12 million. The mode of finance was 38 per cent equity, 45 per cent as soft loan and 17 per cent as loan from a local bank in Bangladesh.

A private sector company was involved to ensure the sale of compost by carrying out enrichment of the compost with nutrients and its subsequent distribution in the market. As a result, 75 per cent of the total revenue of the project came from sale of compost. The project was also successfully registered as a Clean Development Mechanism (CDM) project under United Nations Framework Convention on Climate Change (UNFCCC). A new methodology for accounting of emission reductions was developed by Waste Concern and its partners and was subsequently approved by the UNFCCC. Thus, the remaining 25

per cent of the project revenue came from community contributions in the form of a user fee and sale of certified emission reductions (CERs), making the project financially viable.

The main challenges to the project were the lack of a policy mechanism to create opportunities for developing public-private partnerships and absence of the practice of source separation of waste at the household level. The policy barrier was overcome by initiating a public-private cooperation by convincing the city government to grant a concession agreement to a private fertilizer company to collect and process waste. The private stakeholder self-financed collection and processing activities, including purchase of vehicle fleet and building the compost plant. Being a fertilizer company, the private stakeholder could also produce and sell quality compost to farmers.

The project is strongly reliant on close community partnership and is firmly integrated with house-to-house waste collection efforts. The community members of Dhaka collected and separated their organic waste at source and deposited it at local collection points. From here the organic waste was collected and transported by the private stakeholder to the main plant.

Dhaka's centralized composting plant serves as a successful working model of how combined effort and partnership among public, private and civil sectors can lead to the successful implementation of 3R activities that have direct and far reaching benefits for the environment, community, government and small business.

Lessons Learned

- Partnerships among local communities, private sector and civil sectors can lead to the successful implementation of 3Rs.
- Centralized organic waste composting can be a cost-effective method to manage biodegradable organic waste that otherwise releases undesirable greenhouse gases such as methane when disposed in a landfill.
- The success of composting projects rests on the extent of involvement of the communities and their cooperation with the city authority.
- An important aspect of the project was that it was not fully mechanized, due to which it could employ people from the informal sector. Avoiding mechanization led to savings in capital cost. Consequently, workers could be provided with better salary rates, good working conditions, health insurance, day-care facility and free meals.

Impacts

- The project reduced the landfilling budget of the city
- Valuable resource was recovered from organic waste in the form of compost and the project also created assured revenue for 10 years through sale of compost and CERs.
- 800 jobs were created for poor urban residents
- 50,000 metric tonnes of compost is produced every year for more sustainable farming.
- The project avoids greenhouse gas emissions in the amount of 89,000 tonnes of CO_2-equivalent per year.
- The project resulted in behavioural changes in urban communities that were actively involved in the project as they became convinced about the resource value of waste.

Other Related Examples from the World:

- The closure of the 25-year-old dumping ground and development of landfill gas recovery at the Gorai creek in Borivli has earned the city of Brihanmumbai, India US$ 5.7 million by trading of an estimated 31,000 CERs a year. The Asian Development Bank has been purchasing the carbon credits from the civic body as per market prices when the trading takes place. Dumpsite closure and methane capture projects are not uncommon. However, the initiative to capitalise on the methane generated and convert it to monetary terms is rare in many developing countries. The city's Gorai dumping ground closure and landfill gas project can be seen as a forerunner in this genre of projects.

4. BETTER CITY, BETTER LIFE: POLICY OPTIONS AND MEASURES FOR URBAN WASTE MANAGEMENT

The policy options and measures summarized below represent a menu of possible actions that city leaders may consider to improve their municipal waste management practices, which will in turn contribute to improving the living environment of its citizens. While specific programmes/projects and the scale of interventions may differ from city to city depending on their unique characteristics (geography, population, waste streams, etc.), overarching policy directions may apply regardless of such differences.

This is not an exclusive list, and there could be more options – the idea is to focus on the most critical and fundamental goals and policy options that could make significant, positive changes to cities and the lives of citizens.

Strategy 1: Develop meaningful partnerships with private sector, informal workers and communities for effective implementation of ISWM and 3Rs	
Policy Option 1	Promote public-private partnerships to implement infrastructure projects in different stages of municipal waste management such as collection, transport, recycling, composting, waste to energy, etc.
Policy Option 2	Organize informal waste collectors and recyclers into recycling cooperatives and associations and integrate them into the formal solid waste management programmes.
Strategy 2: Reduce municipal solid waste and aim for Zero Waste	
Policy Option 1	Create policy instruments such as “volume based fee collection” to make the polluter pay for the amount of waste generated
Policy Option 2	Set targets to achieve “Zero Waste” by using relevant indicators such as resource efficiency, recycling rate and waste landfilled in order to track the city’s performance over time
Strategy 3: Increase reuse and recycle of “resources”	
Policy Option 1	Enforce “separation of wastes at source” by creating incentives for efficient separation and disincentives for mixing
Policy Option 2	Introduce market instruments such as Extended Producer Responsibility and establish recycling facilities
Strategy 4: Effectively manage specific types of waste streams such as organic waste, e-waste, construction waste and end-of-life vehicles	
Policy Option 1	Support/subsidize proven local technologies for management of special waste streams that need immediate attention such as composting for organic waste management
Policy Option 2	Promote state-of-the-art technologies to facilitate sustainable design principles in manufacturing that could help improve recycling of special waste streams such as e-waste and scrapped vehicles
Strategy 5: Explore risks and opportunities due to climate change and the Clean Development Mechanism	
Policy Option 1	Take mitigation and adaptation measures to combat threats to waste sector from climate change
Policy Option 2	Explore opportunities such as CDM to monetize GHG emission reduction in waste management projects such as composting, landfill gas recovery and recycling.

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CHAPTER 6 - GREEN BUILDINGS FOR A RESOURCE EFFICIENT FUTURE

"The Urban Best Practice Area of the Shanghai World Expo not only presented original and valuable practices designed to improve the quality of urban life, but also acted as a platform for cities to share experiences in green urban construction and development"[1]

1. ISSUES AND CHALLENGES[2]

As an urban leader you know that investments in the built infrastructure, whether through new construction or refurbishment, can have some of the most long term impacts on the competitiveness of your city. An upfront investment of only 2 per cent in green building design, on average, can result in life cycle savings of 20 per cent of the total construction costs – more than ten times the initial investment. [3] In comparison to the average commercial building,[4] the cost benefits of green buildings[5] are appreciable and include 8-9 per cent decreased operating costs, 7.5 per cent increase in building value, 6.6 per cent improvement on return on investment, a 3.5 per cent increase in occupancy ratio, and a 3 per cent increase in rent ratio.

Apart from the economic benefits, there is a growing body of evidence that green building occupants are more productive. Improvements in indoor environments are estimated to save $17-48 billion in total health related gains and $20-160 billion in worker performance. [6] So from this perspective, city leaders should strive to build green infrastructure just to obtain the significant productivity benefits. Yet it should also be noted that zero net energy buildings are technologically feasible. Moreover through proper design, energy efficient features, and with integrated renewable energy applications, buildings can be net energy producers. Finally cities challenged by water scarcity, either now or in the future, should strive for buildings with reduced water footprint.

1.1. URBAN MANAGEMENT ISSUES

Political will and strong leadership at the top levels of city government are needed if we are to transform the built sector. To encourage such leadership we may sometimes need to educate city

[1] http://en.expo2010.cn/sr/node2282/gallery2/more.htm

[2] This chapter was authored by Mohan Peck with valuable input and contributions from Yang Jiemian and Yu Hongyuan.

[3] Kats, G. (2003). The Costs and Financial Benefits of Green Buildings: A Report to California's Sustainable Building Task Force

[4] GSA Public Buildings Service (2008). Assessing Green Building Performance: A Post Occupancy Evaluation of 12 GSA Buildings

[5] McGraw Hill Construction, Green Building SmartMarket Report, 2006

[6] Fisk, W. (2000) Health and productivity gains from better indoor environments and their relationship with building energy efficiency. Annual Review of Energy and the Environment: 25, 537-66

leaders to strengthen their conceptual understanding about sustainability and its long-term, systemic benefits to the economic vitality of a city. Strong executive leadership has been the key driver for the successful transition to green building and sustainable development in cities like New York, Curitiba and Sydney.

City operating budgets are always tight and allow little tolerance for investing in building upgrades, even when they have a good payback and return on investment. A city's limited capital budget generally skews decisions based on first cost rather than life cycle cost. Lack of interdepartmental communication often prevents collaborative decision-making that would justify the investment in green building for the best long-term interests of the city.

1.2. ISSUES IN THE BUILDING SECTOR

Another important measure to promote development of more green buildings is to increase incentives for builders and developers to build green. The benefits of green buildings, especially in energy savings and worker productivity, accrue over the long term. While green buildings are more cost-effective, the benefits accrue to the final owners and users of the building, and not to the builder. Additional construction costs for green buildings, generally 2-5 per cent, cannot be easily passed on to owners and therefore are often a financial disincentive to builders. The challenge is to create a mechanism that allows some of the value of the long-term benefits to be transferred to the builder to offset first-time costs (see section 2.2 below).

Another barrier is lack of information and sourcing for green building products. Architects and builders lament the scarce and poorly accessible information available on green products and high-performance building systems. The lack of information about performance and cost attributes of building elements can force projects to depend on specialized consultants. Alternatively, builders and contractors risk costly call-backs to remedy green products that don't perform well. Another consequence of limited product information is skepticism from municipal building and safety departments. Green products can only deliver their air quality and energy conservation benefits if regulators allow them to be used. The challenge is to get the information and to educate the marketplace.

As the regulation of building design and construction becomes increasingly complex, developers and clients have difficulty assessing the costs and requirements of complying with regulations. Improved communication of local building codes and their implications for green process and product choices would allow developers and clients to make choices among efficiency, aesthetics, product choice, and cost that would satisfy regulators without costly delays and changes.

This leads us to characterize the general objectives for green buildings. High performance and sustainable buildings should:

- Maximize natural resource efficiency and human health benefits throughout the life-cycle of a building – from siting through design, specification, construction, operation, maintenance, renovation, and demolition
- Employ integrated design
- Optimize energy performance
- Protect and conserve water
- Enhance indoor environmental quality
- Reduce environmental impact of materials

2. POLICY OPTIONS TO PROMOTE GREEN BUILDINGS

2.1. EXECUTIVE LEADERSHIP

As Mayor, you might consider establishing, empowering, and staffing a cabinet level position focused on Sustainability. City employees should be empowered through a value system that rewards decisions which make the city green and sustainable. City officials can lead by example, implementing green strategies and proven technologies on city facilities before asking the private sector to make the necessary investments. They may consider: a) auditing city facilities for energy and water performance; b) using the audits as benchmarks to develop an environmental "accounting" and set goals for improvement; and c) holding the departments accountable for achievement of their goals. A validation and rewards programme could be launched for city employees who take initiative in advancing green building and sustainable development initiatives. Instituting a course of professional development focused on sustainability for the city's engineers, architects, and code officials could also be useful, engaging the NGO community as educational providers.

As Mayor, you may consider implementing policies and requiring training for departments in the use of life cycle evaluation, consideration of long term operating costs, and assessment of environmental impacts as criteria for their decision-making. The leadership of all departments associated with the City's built environment, including those responsible for operations and the funding of operations, must collaborate to develop policies that are both fiscally and environmentally sound. An example would be Finance and Water working together to establish a requirement for permeable parking lots and sidewalks that absorb rain water as a step to help avoid the need for massive stormwater infrastructure investment. The city budgeting process could be changed so that every city facility and department is responsible for paying its own utilities from their respective operating budgets. Savings (or some portion thereof) should accrue to the facility or department rather than to the general fund, to reward responsible behavior.

Green building demonstration at the Shanghai Expo

The Shanghai Expo was a platform for the demonstration of green building applications, including new energy technologies, active and passive architectural designs, and a host of energy saving measures. The Expo pointed the way to a major green legacy for future urban development.

Solar power was used extensively in the Expo Park. It was incorporated into the Theme pavilions, the Expo Center, the China pavilion, the Nanshi electric power plant, and several other pavilions. The total solar power generation capacity of the Park reached 4.5 megawatts.

Heat pumps tapping geothermal and river water sources provided energy for air conditioning in a number of pavilions, in the Expo Axis, the Expo Center and the Expo Performance Center.

The Expo Park contains four large green spaces covering a total of 1 million square meters. A wetland system and other water recovery technologies were used for Houtan Park and the water system of Bailianjing.

As per the Planning and Design Guidelines for the Park, LED lighting is used for all landscape lighting at night in the Park, the lakeside areas and the Urban Best Practices Area. This significantly reduced energy-use for lighting.

There were numerous other green building features in the pavilions within the Park. These included siting for natural ventilation, maximizing daylighting, installing green roofs, green walls and shades for natural cooling, use of green building materials, permeable pavement, rain water recycling and water-saving equipment.

2.2. MEASURES TO CATALYZE INVESTMENTS IN GREEN BUILDINGS

City leaders may wish to establish green building labeling schemes as these can provide more information to potential buyers on the benefits of green buildings, and at the same time it provides builders with a new marketing tool.

Favourable tax policies can incentivize construction of new green buildings. The difference in cost for green construction is 2-5 per cent more than business as usual. [7] Fiscal measures can help reduce that difference. The same is true for favourable interest rate financing policy, which when combined with favorable tax policies can further encourage green building construction. Special funding for financing energy-efficient retrofits of existing buildings is important. Such retrofits often pay for themselves in a relatively short period of time, but without special funding they may not occur.

Energy price reform can accelerate the realization of energy savings by making the case for renewable energy applications and energy efficiency measures more economically feasible.

[7] McGraw-Hill Construction (2007) Greening of Corporate America SmartMarket Report.

Shanghai Eco-Building

Within the Shanghai Expo Urban Best Practices Area, the city of Shanghai constructed an environmentally friendly building featuring traditional shikumen-style natural ventilation systems and a geothermal heating system. Modeled on an eco-friendly office building in the Xinzhuang area of Shanghai, it was remodeled into a residential structure in the Expo Park to demonstrate energy efficiency concepts. The building aims to achieve zero energy consumption. Plants help cool the building and skylights filter the sun and help make rooms airy. The house taps solar and wind power for its energy needs. Rainwater is collected for building use and light-emitting diode (LED) technology was adopted for lighting. The four-story structure containing eight apartments comprises around 3,000 square meters and the residence will be piloted in new construction within the city after the Expo.

Transforming the marketplace requires overcoming the barriers to widespread adoption of renewable energy technologies. In addition to the high—though declining—up-front cost of installing renewable energy systems, obstacles include confusing rules about permitting and connecting systems to the grid, a lack of consumer understanding of technologies and financing options, and a dearth of trained installers and inspectors.

Mayors and other local government officials are in a unique position to remove many of these barriers, clearing the way for the renewable energy industry to flourish. Local governments, residents, business owners, advocacy groups, and other stakeholders can take a multifaceted approach to promoting renewable energy by purchasing renewable energy systems directly, streamlining local regulations, and developing programmes that make clean energy options more accessible and affordable for consumers. By investing in renewable energy, local governments can boost the local economy in addition to enhancing national energy security and improving the environment.

Many in the real estate finance and investment community are finding their efforts hobbled by anecdotal data, lack of precedents, perception of higher costs, and inadequate underwriting, valuation and risk management protocols. More awareness-raising is needed to help overcome these barriers and facilitate the flow of debt and equity investment among all stakeholders (investors, lenders, developers, technology experts, building owners and managers, and risk managers) to share experiences, best practices, and new paradigms and to confront novel challenges. Cities can overcome these challenges by undertaking some mix of the following policy options and incentive programmes.

Create Direct Incentives: Up-front cash incentives encourage customers to install renewable energy technologies by helping reduce high equipment costs. Although production-based incentives don't reduce up-front costs, they do generate revenue that can help secure financing and offset financing costs. Direct incentives are useful to a broad range of consumers, especially those who can't take full advantage of other incentives such as tax credits. With direct cash incentives, programme administrators can track programme participation and installed capacity, along with any problems encountered and their solutions

Adopt Feed-In Tariffs: Feed-in tariffs are intended to increase the adoption of renewable energy technologies and encourage the development of the renewable energy industry, but they also bring significant ancillary benefits to the table, including enhanced economic development and environmental improvements. For cities that want to assure investors about future revenue, drive more capital to the market, and get more renewable energy applications integrated into new green buildings, a feed-in tariff can be a useful policy. See also Chapter 3 - Transforming the Urban Economy, for a case study of feed-in tariff application.

Offer Loans and Fiscal Measures for Energy Efficiency and Renewable Energy Systems: State, utility, and local government loan programmes encourage customers to implement energy efficiency measures or to install renewable energy systems by allowing consumers to spread up-front equipment costs over the life of a loan. These loan programmes offer lower interest rates, better terms, and lower transaction costs relative to private lenders. Loan programmes may be more politically viable than cash incentives, and they can even become self-sustaining through a revolving fund mechanism. Governments can also provide tax write-offs for energy efficiency and renewable energy investments to encourage their uptake.

Create a Property Assessed Clean Energy Financing Programme: This approach to financing offers a number of benefits to renewable energy system owners including a long-term, fixed-cost financing option; a loan tied to the property (instead of the system owner's credit standing); a repayment obligation that transfers with the sale of the property; and the potential to deduct the loan interest from federal taxable income as part of the local property tax deduction. For local governments the benefits are also clear. This financial model can help local governments meet climate and energy goals with little to no liability or exposure to a municipality's general fund. These programmes do have administrative costs, but those costs can be included in the bond issuance and be repaid by programme participants. Because the programme can be structured to fully leverage private investment, a municipality or county can implement a property assessed clean energy programme with almost zero budget impact.

Develop or Improve Renewable Energy Access Laws: Solar access laws encourage more widespread adoption of solar energy by increasing the likelihood that properties will receive sunlight suitable for solar energy production, protecting the rights of property owners to install solar systems and reducing the risk that systems will be shaded and compromised once installed.

Streamline and Improve Renewable Energy Permitting Processes: Simplifying permitting requirements and processes can increase the likelihood of successful renewable energy installations and save a significant amount of time and money. Creating consistent permitting processes across a state or region benefits renewable energy installers by providing a standard set of operating procedures, reducing uncertainty, and allowing them to produce more accurate estimates.

Promote Installer Licensing and Certification: Consumers, local governments, and the industry should all benefit from an energy efficiency and renewable energy market that encourages high-quality installations through licensing and certification. Consumers benefit when contractors are

essentially "pre-screened" according to government standards. The expectation is that encouraging licensing and certification will result in baseline standards being met, which will in turn lead to higher consumer confidence and satisfaction (and therefore fewer contract disagreements). Licensed and certified installers benefit from possessing credentials that demonstrate their proficiency and experience with installing clean energy technologies. Licensing and certification benefits local governments by promoting high-quality installations and building a skilled workforce. Using nationally recognized programmes relieves municipalities of the need to create their own certification standards.

Improve Building Energy Efficiency Codes: Improving building energy codes for public and private buildings helps achieve community-wide energy-reduction, environmental, and sustainability goals, and results in significant near- and long-term energy cost-savings. Building codes that mandate certain levels of energy efficiency help ensure that renewable energy systems will be used most cost-effectively.

Engage the Utility: Work with the electrical utility to promote energy efficiency. Many utilities will cover the costs of basic energy audits and even some efficiency measures, such as replacing incandescent light bulbs with CFLs. Government can lead the way by requiring energy audits of all government buildings and investing in energy efficiency improvements.

Improve net-metering rules. Net metering encourages customer investment in renewable energy by allowing customers who install such systems to receive credit for excess electricity generation, which improves their return on investment. Utilities benefit from net metering if customer-sited generation is located in an area that allows a utility to avoid distribution and transmission system upgrades. Utilities also benefit when they own renewable energy credits associated with net-metered generation and can use those credits to meet national renewable energy requirements.

Optimize rate structures for renewable energies. Working with your utility to create rate structures optimized for renewable energy technologies will improve the economics of renewable energy in your community.

Rhône -Alpes Eco-Building

This eco-building in the Urban Best Practice Area of the Shanghai Expo is based on a building in Valence in the Rhône-Alpes region of France. It showcases economic innovations and a sustainable environment, and is widely reputed for its high quality of work/life balance.

The building's design incorporates state of the art energy-efficient equipment for heating, ventilation and air conditioning, as well as environment-friendly materials to reduce energy consumption and improve indoor air quality, making it a standard for eco-building in the Rhône-Alpes region.

The pavilion is built with innovative natural building materials made from recyclable calcined clay. This helps to keep energy consumption to a minimum while providing a comfortable environment in terms of temperature, humidity, light and sound effects. A planted rooftop functions to purify the air, regulate temperature, add coolness in summer, and ensure quick drainage during rainstorms.

2.3. POLICY MEASURES FOR REDUCED WATER USE

Use Low Impact Development. Capturing and reusing storm water runoff can greatly reduce the consumption of imported, potable water, as well as the energy usage and CO2 emissions associated with importing water. When runoff is diverted and captured before it flows into surface waters, it can be used onsite either to replenish groundwater supplies through infiltration or for graywater uses, like landscape irrigation and toilet flushing. These techniques are known as low-impact development, the central objective of which is to maintain individual sites' pre-development hydrology. Low impact development uses common sense and simple technology— landscaping with native plants, rain barrels, "green roofs," porous surfaces for sidewalks, parking lots and roads, and other measures—to retain rainfall onsite or to help rainfall soak into the ground, rather than flowing into and perhaps polluting the nearest body of water. In effect, low impact development mimics nature's own filtration systems. In addition to reducing water and energy use, the result is less water pollution from contaminated runoff, less flooding, replenished water supplies, and often more natural-looking, aesthetically pleasing cityscapes.

Recycle and Reuse Wastewater. Because water suitable for reuse is often a by-product of existing wastewater treatment processes, this type of water recycling is a low-energy source of water supply. This is especially true in areas where enormous amounts of energy may be required to import water. Recycled water can be delivered to users, usually at less cost than non-recycled water, for anything from irrigating golf courses, parks, and crops, to mixing concrete, to firefighting.

Promote and expand water regulations in building codes. A number of countries now label products that meet water-efficiency performance criteria. Typical labeling programmes set specifications for the labeling of products that are at least 20 per cent more efficient than the current standards while performing as well or better than their less-efficient counterparts. All water savings realized through the use of labeled products and services also often have a corresponding reduction in energy consumption. The US Environmental Protection Agency estimates that if just one out of every 100 American homes were retrofitted with water-efficient fixtures, about 100 million kilowatt-hours of electricity per year would be saved each year. Local governments can expand and promote such programmes by: i) offering rebates for the purchase of labeled water-efficient products; ii) offering tax credits for purchasing such labeled products; iii) requiring labeled water-efficient products in new construction and in government buildings through appropriate building codes.

2.4. POLICIES FOR IMPROVED INTERNAL ENVIRONMENT AND AIR QUALITY

Strengthen building codes and planning requirements. Building codes can mandate that the construction industry choose only better building materials and interior finish products with zero or low emissions to improve indoor air quality. Building codes can also require more daylighting, better quality lighting products, as well as enhanced ventilation and air filtration.

The Benefits of Daylighting

Higher occupant productivity and satisfaction are likely to result from the better visual quality that is provided by good daylighting design. Daylight provides the truest and most vivid color rendition of all available light sources. There is also evidence that the high concentration of blue wavelengths in daylight help the eye to see more detail with greatest precision, especially at lower light levels. Mental stimulation is perhaps the biggest benefit of natural light. Daylight reinforces natural circadian rhythms and the production of neural transmitters, such as seratonin. Higher illumination levels have been associated with greater mental acuity and the simple variability of daylight may be key to mental stimulation. Students with the most daylighting in their classrooms progressed 20 per cent faster on math tests and 26 per cent faster on reading tests in one year than those with less daylighting.[8]

Carnegie Melon University's Intelligent Workplace design studio found that daylighting improves worker productivity by 5 per cent to 25 per cent. In one case study it found that an extra up-front cost of $370,000 saved almost $700,000 in energy and operating costs for a typical workplace. However, the resulting gains in productivity were worth as much as $14 million. Here's why: In a typical building, energy costs average $1.50 to $2.50 per square foot, while salaries exceed $200 per square foot. Cutting energy use in half typically saves $1 per square foot per year, while boosting productivity just 5 per cent saves more than $10 per square foot.[9]

3. CASE STUDIES

3.1. MADRID BAMBOO ECO-BUILDING

Like many cities, Madrid has a housing shortage. Providing new affordable public housing in a sustainable manner is not an easy task. But a recently developed award winning design is attracting much attention. As a result, Spain's capital city Madrid contributed a highly ecological exhibition to the World Expo 2010 Shanghai -- a bamboo building. The 18-meter high building of bamboo originated from a residential block in southern Madrid. The architecture received an award from the respected Royal Institute of British Architects.

The building, which was displayed in the Urban Best Practices Area of Shanghai Expo 2010, is highly energy efficient and represents an advanced model for urban living through the use of renewable energies and green building products. Energy-saving glass, which can help absorb light, is installed in part of the building to adjust to the climate of Shanghai and minimize the effect of greenhouse emissions.

Water, wind power and solar energy are transformed into electricity inside the building, which is fully self-sufficient in terms of energy generation and produces zero CO_2 emissions.

[8] Heschong Mahone Group (1999). Daylighting in Schools: An Investigation into the Relationship Between Daylighting and Human Performance

[9] http://www.cool-companies.org/profits/

The pavilion is based on the leading role that some architects are giving bamboo in their latest housing schemes in Spain. There are two main reasons for doing so -- it's eco-friendly and it's low cost. The Bamboo Housing area is a rent-control project founded and operated by the municipal government of Madrid. Currently, it is home to 88 families.

The Madrid Bamboo Eco-building at the Urban Best Practices Area of the Shanghai Expo.

Photo courtesy of Shanghai Expo.

Bamboo louvers mounted on folding frames cover the façades of the building in Madrid's Carabanchel public housing development in the city's southern suburbs. The basic parallelogram block contains units of different shapes and sizes which, thanks to their interior design, all have a dual east-west orientation as well as access to a private garden on the eastern side. The louvers, or shutters on folding frames, provide various functions. They help control temperatures and reduce noise; they form an attractive façade; they provide shade to the extensive veranda areas forming part of the living space inside each apartment; they are a sustainable material; and they also allow the living space to be opened completely to the outside world to let in light and air during pleasant weather.

A further green aspect is the use of solar water-heating panels on the roof, plus wind chimneys to ventilate internal bathrooms and kitchens. These elements on the rooftop are not visible from below, as the bamboo-clad facades are extended upwards on steel frames to conceal it. The bamboo is treated to last, fireproofed, and can easily be replaced over time.

Lessons learned:

Local governments should actively encourage innovation in the design of public housing projects. When free to experiment, architects can make more creative use of new materials and renewable energy technologies. Innovative designs can enhance livability while at the same time reduce building operation and maintenance costs.

3.2. HAFENCITY ECO-BUILDING

“HafenCity" is one of the largest urban renovation projects in Europe in which old facilities are being renovated into commercial and residential eco-buildings. At the Shanghai Expo, an example of a HafenCity eco-building was constructed as an urban best practice pavilion. The structure incorporates a district heating system, intelligent ventilation system, and many other sophisticated technologies to create a quality eco-building. It is certified as a "passive-house", which means an ultra-low energy building that requires little energy consumption for heating or cooling. Solar, wind and geothermal energy are used as additional energy sources for cooling, heating and power supply. A special brick wall is applied on three exterior sides to maintain warmth in winter and cool in summer; the rest of the exterior is a glass curtain wall that allows natural light into interior spaces. The building consumes only 50 kilowatt-hours of energy per square meter each year, a fourth of what is normally required.

The urban best practice pavilion is based on the community of Haften City in Hamburg, Germany. This is a new community development in the heart of the city’s industrial port where leading-edge standards are being put into place. Ecological sustainability is inherent in the design of many of the new buildings, but the underlying concept of HafenCity itself is founded on the sensible use of resources.

The development will provide homes and workplaces, cultural and recreational opportunities, as well as high-quality public spaces. Hamburg is no longer growing on its periphery. Instead old areas of the port are being upgraded – expanding the usable area of the city by 40 per cent. Overall, HafenCity is being densely built. This density yields an efficient utilization of land that is made more livable by its waterside location.

In some former industrial sites, contaminated soil had to be removed; thus enhancing the ecological value of the old industrial area. Plazas, promenades and parks are now taking shape on a total area of approximately 27 hectares. HafenCity will not have a single parking garage above ground – except for the Elbphilharmonie Concert Hall. Generous space is provided in underground parking garages in the basements of buildings, but parking above ground is strictly limited.

Because the HafenCity development is in the heart of the port city, it can be reached very easily without a car. Two subway stops guarantee excellent connections to local public transport services. Cyclists and pedestrians can cover the route between the new city district and city center in minutes.

Within HafenCity, mixed use development of commercial, retail, restaurants, and residential buildings ensures short distances to almost everywhere. Through a close-knit network of foot and bicycle paths, pedestrians have two and a half times as many kilometers of pathway at their disposal as motorists. Seventy per cent of foot and cycling paths are separated from motorized traffic on promenades, piers and squares, and 30 per cent are adjacent to the water. Since HafenCity has few extended blocks of buildings, pedestrians and cyclists seldom have to take a long way round. Thoroughfares exist between many free-standing buildings with guaranteed public rights of way.

Publicly available bicycles are ready for use, supplied by the new Hamburg city bike rental system. Low car ownership is also being promoted in eastern HafenCity. This means that residents of a building will agree to go without a car of their own, and instead participate in a car-sharing system.

Supply of heat to the new district is provided by innovative means. An upper emission limit value of 175 grams of carbon dioxide per kilowatt hour (g/kWh) will not be exceeded. Compared with gas-powered heating units in individual buildings, this amounts to a reduction of 27 per cent. All buildings in western HafenCity are connected to district heating networks for this purpose. In combination with decentralized heat generated by fuel-cell technology and solar thermal energy, this produces a very efficient blend of energy. Geothermal plants are also used in individual buildings.

Heat supply for HafenCity's eastern section will see CO_2 emission limits reduced even more significantly to just 89 g/kWh. The concept incorporates a local energy supply network, fed by various power units both within and outside HafenCity. A woody biomass-fired combustor, a biomethane fuel cell and a heat pump – almost all renewable energy sources – will be deployed. Because of its decentralized structure, the system can grow with the new neighborhood. Flexibility was a crucial factor, since development of HafenCity will continue into the 2020s, and future energy demand cannot be accurately estimated.

Sustainability is also being pioneered in the implementation of individual construction projects. Since 2007, HafenCity has been awarding gold and silver Ecolabels for special achievements in developing sustainable buildings. The award is designed to motivate private and public developers to handle resources responsibly. In addition to the ecological factors, the label also evaluates economic and social sustainability.

Initially the Ecolabel applied to residential and office space construction. But since increasing numbers of buildings with retail or hotel uses and multi-uses are going up in central and eastern HafenCity, these building types are also being certified as of 2010. The aim is to reach a level of 30 per cent gold certification throughout central and eastern HafenCity, although the actual level achieved is expected to be a lot higher. In the future, buildings which include residential uses will only be able to be built if they comply with the gold standard Ecolabel.

Lessons learned:

Urban redevelopment projects that convert brownfields to greenfields can capture the imagination of a city and help recast the image of the city as an innovative, creative and livable space.

Integrated approaches to rethinking a community can solve multiple urban challenges related to land use, housing shortages, energy supply, transportation and access to cultural services.

3.3. US GREEN BUSINESS COUNCIL'S LEED PROGRAMME

LEED is an internationally recognized green building certification system It provides third-party verification that a building or community was designed and built using strategies aimed at improving performance across a number of important metrics. Those metrics include: energy savings, water efficiency, CO2 emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts.

Developed by the U.S. Green Building Council, LEED provides building owners and operators a concise framework for identifying and implementing practical and measurable green building design, construction, operations and maintenance solutions.

LEED is a flexible framework that can be applied to all building types – commercial as well as residential. It works throughout the building lifecycle – design and construction, operations and maintenance, and significant retrofit.

LEED gives building owners and operators the tools they need to have an immediate and measurable impact on their buildings' performance. Architects, real estate professionals, facility managers, engineers, interior designers, landscape architects, construction managers, lenders and government officials all use LEED to help transform the built environment to sustainability. State and local governments across the country are adopting LEED for public-owned and public-funded buildings. Apart from the U.S., the LEED scheme is being applied to projects in Canada, Brazil, Mexico and India.

LEED rating systems are developed through an open, consensus-based process led by LEED committees. Each volunteer committee is composed of a diverse group of practitioners and experts representing a cross-section of the building and construction industry. The key elements of the consensus process include a balanced and transparent committee structure, technical advisory groups that ensure scientific consistency and rigor, opportunities for stakeholder comment and review, and a fair and open appeals process.

LEED points are awarded on a 100-point scale, and credits are weighted to reflect their potential environmental impacts. A project must satisfy all prerequisites and earn a minimum number of points to be certified. Basic certification requires 40-49 points, Silver requires 50-59 points, Gold requires 60-79 points, and Platinum requires 80 or more points.

The Green Building Certification Institute assumes administration of LEED certification for all commercial and institutional projects registered under any LEED Rating System.

Lessons learned:

Building standards with measurable criteria have proven to be a good basis around which communities of practitioners can come together to design and build more sustainable buildings. A framework should allow enough flexibility for its application across all manner of residential and commercial buildings. Different levels of certification allow builders to pursue certification levels commensurate with their level of available financing.

3.4. GREEN BUILDING CONSTRUCTION IN A HOT CLIMATE -- MASDAR CITY, UNITED ARAB EMIRATES

Illustration of the Masdar Headquarters building and its innovative green architecture.
Image credit: Adrian Smith + Gordon Gill Architecture

Masdar City is being designed and developed in an integrated way following sustainable development principles. It will be a carbon-neutral, zero-waste city for 40,000 inhabitants powered entirely by renewable energy. Building performance indicators are divided between design, construction, and operation. The specifications cover performance requirements for buildings, building structure, components, systems, materials, finishes and supply chains. A restricted materials list specifies materials with negative environmental impacts whose use should be avoided.

The Masdar Headquarters building is meant to set an example for future development in the city. This example will reduce energy use and waste production in each building to a level that can be handled by the city's renewable energy systems and its waste-to-energy plants. This building is set to become the world's first mixed-use, positive-energy building. The building is designed to produce more energy than it consumes, produce zero solid and liquid wastes, and reduce its water needs by 70 per cent.

The design of Masdar HQ is dominated by adaptations of traditional wind towers which draw hot air upwards during the day. At night, the wind cones reverse roles acting as inlet wind towers drawing cool night air downwards to cool the building structure.

The building's form shades the entire building structure to reduce its solar heat gain. A seven-acre large canopy with a substantial overhang dominates the building's roof and is structurally integrated with the cones that support it to create a superstructure around which the building spaces and functions are arranged. In addition to its role in shading, the roof canopy also incorporates one of the world's largest photovoltaic and solar thermal arrays, simultaneously producing electricity from solar photovoltaics and providing thermal energy for solar cooling.

In addition to these form-giving passive strategies, the building also features many passive strategies that are less obvious to the casual observer. One example is the use of high-thermal-mass exterior glass cladding to reduce heat gain while keeping transparency to preserve views and increase daylighting. Under the building, earth ducts are used to reduce the building temperature through contact with the almost constant temperature of the earth below. The ducts also act as underground pedestrian passages that connect the building with the proposed mass transit system. The building's walls are constructed of heavy masonry with a 30 per cent glazing ratio to achieve a high thermal mass and reduce the indoor heat gain.

The building also has a number of active systems to cool and ventilate the building, including ground source cooling, an efficient underfloor air distribution system integrated into office furniture, and the world's largest solar thermal driven cooling and dehumidification system. The design also features the use of integrated renewable energy generation, such as wind turbines and the above-mentioned photovoltaic systems. The installation of these renewables will help make the building a net energy producer, generating 3 per cent more energy than it consumes.

Water scarcity in the Gulf States makes it necessary to implement water conservation strategies. At Masdar the plan is to save 70 per cent of the building's water use compared to business as usual. This

in turn will reduce the city's energy demand, since most of the water supply comes from desalination plants. Rainwater and condensation are collected, stored, and used -together with grey water from showers, laundries, and lavatories- to irrigate the shaded roof garden. Grey water is also used to flush toilets.

Masdar HQ's plans to reduce the building's environmental footprint also address the energy embodied in the materials used to construct it. Recycled materials and rapidly renewable materials were specified wherever possible. Flexible, modular, prefabricated materials and furniture were also specified to make the process of recycling them easier.

Passive solar design strategies alone are estimated to contribute 52 per cent of energy savings. The remaining portion of the 103 per cent in energy savings (including the 3 per cent of positive energy generation) is achieved through efficient active systems (20 per cent) and renewable energy generation (31 per cent).

Lessons learned:

In many green buildings in Europe and the United States, the role of passive design strategies is overshadowed by that of efficient energy systems. This is partly due to the climatic conditions in their cities where buildings have considerably greater heating loads than cities in tropical regions. This resulted in the preeminence of engineering concerns over the architectural designs of the architect.

In tropical regions, with much of the sustainable design process geared towards blocking heat away rather than generating it efficiently, the contribution of passive strategies in overall energy savings in green buildings is larger.

3.5 WATER EFFICIENCY IN GREEN BUILDINGS AND GREEN SPACES

George Washington University (GWU) wanted to convert Square 80, an underutilized parking space and trash collection area, into an urban, multi-functional, sustainable plaza. Completed in 2010, it now serves as an urban plaza with a central open space and an outdoor classroom for the university's Sustainable Landscapes programmes. Square 80 harvests 100 per cent of on-site rainwater for irrigation, maintenance and other amenities. It fits well with the University's Sustainable Vision: "The GWU community is building a greener campus, providing research and intellectual discourse on policies and pathways to sustainable systems, and equipping students with the skills and knowledge to contribute to a sustainable future."

The project was part of the Sustainable Sites Initiative, a partnership of the American Society of Landscape Architects, the Lady Bird Johnson Wildflower Center at The University of Texas at Austin, and the United States Botanic Garden. The programme's objective is to transform land development practices with the first national rating system for sustainable landscapes. Square 80 is one of about

150 projects within the initiative's pilot programme. The U.S. Green Building Council, a stakeholder in the initiative, anticipates incorporating these guidelines into future iterations of the LEED Green Building Rating System.

Key elements of the project included rainwater harvesting, use of native plants, installation of porous paving, roof water collection, cisterns, biofiltration planters, a raingarden and a bioswale.

Rainwater Harvesting - The plaza design implements numerous low impact development practices in order to clean, store and reuse the harvested rainwater. These practices maintain and enhance the pre-development hydrology of urban watersheds.

Native Plants - The majority of the plants used at Square 80 are native species. The remaining plants, with the exception of the lawn, are non-invasive, adaptive species that tolerate regional soils and climate. After they were established, the trees, shrubs, grasses and groundcover no longer required supplemental irrigation, so harvested rainwater could be completely allocated to the open lawn.

Pervious Paving - Conventional impervious paving causes water to quickly sheet flow over the surface and into gutters and storm drains, often causing flooding during a heavy rain event. Pervious paving allows water to move vertically through the paving material to slowly infiltrate and recharge groundwater. Water flows through the joints between pavers, filters through the gravel subbase, percolates into the native subgrade and ultimately recharges the groundwater. At Square 80, excess water that does not infiltrate the soil below is collected into a pervious PVC underdrain and channeled to the underground cistern for storage and reuse on site. Including pervious paving in any urban setting creates a cleaner environment and can save on costly stormwater infrastructure and filtration systems.

Roof Water Collection - Utilizing existing gutter and downspout systems, rainwater can be re-routed to rain barrels and cisterns. These components allow the reuse of water that would otherwise flow into storm drains. At Square 80, overflow from the rain barrel is piped to the underground cistern, while water in the 300-gallon rain barrel is used for routine maintenance.

Cisterns - Using cisterns for rainwater harvesting makes it possible to eliminate reliance on potable water. In the plaza, all stormwater collection systems convey water to three underground cisterns with 8,000, 10,000, and 15,000-gallon capacities, respectively. Rainwater from the buildings' roof downspouts, the drain inlets and trench drains, the pervious paving, and the overflows from the biofiltration tree planters, rain garden and bioswale are all collected and stored in the underground cisterns. Prior to the water reaching the cisterns, it is flushed by the vortex fine filter separators, which remove small debris. The stored water is redistributed to either the irrigation system or the rainwater fountain feature at the center of the plaza.

Biofiltration Planter - At the plaza, runoff from the paved sidewalk flows toward the linear trench drains at the edge of the walkway. The trench drains act as a water runnel, conveying water to a series

of biofiltration tree planters. The soil is depressed below the paved surface to retain stormwater while it slowly infiltrates the soil into the native subgrade. These planters are designed to hold six inches of standing water. Native Willow Oak trees and native grasses are planted at Square 80.

Biofiltration Planters and Rainwater Garden at the George Washington University Square 80 green space.

Rain Garden and Bioswale - A rain garden is a shallow planting bed depressed six to eight inches that collects water runoff from impervious surfaces like sidewalks, roads, compacted lawns and roof downspouts. A bioswale is a rain garden with a slight gradient. It captures surface water during a rain event, and allows the water to flow slowly and infiltrate the enriched soil into the native subgrade. In Square 80's rain garden, Blue Flag Iris is planted with a Sweet Bay Magnolia, while the bioswale has a diverse planting of native grasses and groundcovers.

Rainwater Irrigation Pump - Square 80 is irrigated using filtered rainwater from on-site collection. Water lines are gravity fed from underground storage cisterns to the irrigation pump, which then distributes it to the planting beds organized in zones. Ninety per cent of the irrigation system is designed as drip irrigation, the most efficient way of delivering water to plants by supplying slow, steady and precise quantities of water.

Rainwater for Fountain - The rainwater fountain sources 100 per cent of its water from on-site rainwater harvesting. A designated cistern collects and stores approximately 600 gallons of water beneath the plaza surface. In addition to the pump, the fountain system is equipped with a UV filtration unit that helps clean the rainwater by removing bacteria, algae and protozoa, making it safe for human interaction. The use of this UV filtration process reduces the amount of chemicals needed for water treatment.

4. Policy Options on Green Buildings for Better City, Better Life

Strategy 1: Executive leadership on green buildings

POLICY OPTIONS	
option 1	Establish a city cabinet-level position focused on Sustainability.
option 2	Lead by example, implementing green strategies and proven technologies on city facilities before asking the private sector to do the same; audit city facilities for energy and water performance to establish a baseline and set goals for improvement; hold departments accountable for achievement of their goals.
option 3	Require training for departments responsible for physical infrastructure in the use of life cycle evaluation, consideration of long term operating costs, and assessment of environmental impacts as criteria for decision-making.
option 4	Foster interdepartmental communication to enable collaborative decision-making that would justify the investment in green building for the long-term interests of the city.
option 5	Change city budgeting process so that each department is responsible for paying for utilities from its own operating budget. Savings should accrue to the department to reward responsible behavior.

Strategy 2: Catalyze investments in green buildings

POLICY OPTIONS	
option 1	Establish green building labeling schemes to provide information to potential buyers and to provide builders with a new marketing tool.
option 2	Create favourable tax policies to incentivize construction of new green buildings by making up the 2-5 per cent higher cost for green construction.
option 3	Create favourable interest rate financing policy to further encourage green building construction.
option 4	Establish special funding for financing energy-efficient retrofits of existing buildings. Without special funding, such retrofits may not occur.
option 5	Reform energy price schemes (taxes, subsidies) to accelerate the realization of energy savings by making the case for renewable energy applications and energy efficiency measures more economically feasible.

Strategy 3: Promote renewable energy applications and energy efficiency in the built sector

POLICY OPTIONS	
option 1	Accelerate demand for renewable energy applications through provision of direct cash incentives to customers.
option 2	Adopt feed-in tariffs to assure investors about future revenue, drive more capital to the market, and get more renewable energy applications integrated into new green buildings.
option 3	Offer soft loans (lower interest rates, better terms, lower transaction costs) for renewable energy systems.
option 4	Create a property assessed clean energy financing programme. Because these programmes can be structured to fully leverage private investment, a city can implement such a programme with almost zero budget impact.
option 5	Develop or improve renewable energy access laws. These will protect the rights of property owners to install solar systems and reduce the risk that systems will be shaded and compromised once installed.
option 6	Improving building energy efficiency codes for public and private buildings to achieve city-wide energy reduction that will result in significant near- and long-term energy cost-savings.
option 7	Streamline and improve renewable energy permitting processes to encourage RE installations, save time and money, and benefit installers by providing a standard set of operating procedures.
option 8	Strengthen installer licensing and certification programmes. Consumers, local governments, and the industry should all benefit from a renewable energy market that encourages high-quality installations.
option 9	Improve utility net-metering rules. This will encourage customer investment in renewable energy by allowing customers who install such systems to receive credit for excess electricity generation, which improves their return on investment. Utilities benefit by gaining new generation that supports distribution in that area.
option 10	Optimize rate structures for renewable energies: Working with your utility to create rate structures optimized for renewable energy technologies will improve the economics of renewable energy in your community.

Strategy 4: Policy measures for reduced water use

	POLICY OPTIONS
option 1	Promote low impact development by capturing and reusing stormwater runoff instead of polluting nearby waterways. Stormwater can be used onsite either to replenish groundwater supplies or for graywater uses, like landscape irrigation and toilet flushing.
option 2	Encourage recycling and reuse of wastewater. This is a low-energy type of water supply as reusable water is often a by-product of existing wastewater treatment processes.
option 3	Fix leaking drinking water pipes. Water treatment processes use large quantities of energy to treat and distribute water to customers. Yet many drinking water systems lose as much as 20 per cent of water each year due to leaks in their pipe networks. Improving this infrastructure would save water and energy.
option 4	Promote and expand the water regulations in building codes. Local governments can expand and promote such programmes by: i) offering rebates for the purchase of labeled water-efficient products; ii) offering tax credits for purchasing such labeled products; iii) requiring labeled water-efficient products in new construction and in government buildings
option 5	Require and provide incentives for agricultural water-use efficiency. Since cities often compete with regional farming for water supply, it is important to include agriculture in regional water planning. Even modest water use efficiency measures have the potential to vastly improve water use efficiency.

Strategy 5: Policies for improved internal air quality

	POLICY OPTIONS
option 1	Strengthen building codes to mandate that the construction industry choose only better building materials and interior finish products with zero or low emissions to improve indoor air quality. Building codes can also require more daylighting, better quality lighting products, as well as enhanced ventilation and air filtration.

5. LINKS FOR FURTHER INFORMATION

- www.buildup.eu/home : energy solutions for better buildings.

- www.ecoarchwiki.net : Building case studies, good energy-oriented work
- www. intendesign.com : Integrated energy design in public buildings:
- www.esprojects.net/en/energyefficiency/
- California Integrated Waste Management Board Green Building Web site: http://www.calrecycle.ca.gov/GreenBuilding/. Includes the manual Designing With Vision: A Technical Manual For Material Choices In Sustainable Construction (Pub. #431-99-009), http://www.sustainable.doe.gov/freshstart/articles/ptipub.htm
- A Guide to Irrigation Water Needs of Landscape Plants in California: www.dpla.water.ca.gov/urban/conservation/landscape/wucols/
- Department of Health Services, Indoor Air Quality Web site: www.cal-iaq.org
- U.S. Department of Energy Web site: www.sustainable.doe.gov/buildings/gbintro.shtml
- Environmental Building News: www.buildinggreen.com/
- U.S. Green Building Council Web site: www.usgbc.org
- Building Green: overcoming barriers in Philadelphia
- http://www.pecpa.org/sites/pecpa.org/files/downloads/2-27-08_BuildingGreen_FINAL.pdf
- IEA (2008) Energy Efficiency Requirements In Building Codes, Energy Efficiency Policies For New Buildings
- Sustainable Building Practices for Low Cost Housing, UN Habitat, 2010

CHAPTER 7 – EMBRACING SCIENTIFIC AND TECHNOLOGICAL CHANGE

To Promote Scientific and Technological Innovation as a Path to Development

Cities should strengthen scientific research and technological innovation, as well as establish and improve systems for using new technologies. They should accelerate the application of scientific findings in order to improve the quality of people's lives and create new industries and jobs. They should apply principles of openness and mutual benefit in strengthening scientific and technological exchanges and collaboration to promote urban development around the world.

Shanghai Declaration on Better Cities, Better Life

1. ISSUES AND CHALLENGES[1]

1.1. SCIENCE AND TECHNOLOGY, GLOBALIZATION AND INNOVATIVE CITIES

As local leaders, it is important for us to understand that cities that are innovative can achieve advantages in globalization. The success of cities and their inclusion in globalization can be measured by the capacity they have to bring out new ideas and spread them. Therefore, as local leaders, our role is to design policies that foster linkages and innovation networks. Key to the ability of a city to innovate is its ability to develop systems that allow it to use the assets of science and technology. This chapter will suggest a framework of measures that local governments can adopt to employ science and technology as a strategy for sustainable local development.

The rise of digitalization that has occurred in the past decades is having a direct impact on cities. Regional and urban disparities are reinforced or diminished through access and utilization of electronic infrastructure. One challenge for urban leaders is to develop strategies that would enable a city to actively participate in the knowledge economy.

In modern societies, cities are more affected than rural areas by natural and man-made disasters. Experience has shown that science and technology can play an essential role in enhancing the safety of cities. Research in science and technological innovation should be directed toward improving the ability of cities to plan for and cope with a range of threats and to successfully manage crises when they do occur.

[1] This chapter was authored by Jose Monroy, with valuable input and contributions from Li Guangming.

The sustainable development of cities is challenged by many risks related to pollution, hazardous waste, climate change and resource scarcities. The application of scientific and technological advances in the areas of energy, safe drinking water, environmental protection, and information and communication technologies can help meet those challenges and provide solutions for sustainable urban development.

Science and technology innovation can be a key driver of economic growth and prosperity. Developing an innovation culture within the city can help science and technology initiatives take wing. City leaders can achieve an innovation culture by promoting entrepreneurial spirit, enhancing training of the technological talent pool, strengthening science and technology policies, stimulating the growth of hi-tech industries, expanding the protection of intellectual property, and fostering scientific awareness through public education.

Creating an innovative urban environment requires strong links to the science and technology communities. Such links permit industry's uptake and commercialization of public-sector research results, which can augment industry's own research agenda. Feedback to the research community allows it to better orient its research to address social and economic problems. Within urban areas, innovation environments often take the form of Science and Technology Parks. Science and technology (S&T) parks closely related to universities are strong engines of economic growth. They are instruments that can help sustain a knowledge-based economy and enable market-oriented technological development. As places of creation and innovation, S&T parks attract investments, as well as highly-qualified professionals.

The Stanford Science Park emerged in the 1950s as a university-owned park associated with Stanford University. It pioneered the use of clustering of technology-based firms and property-based initiatives close to centres of learning. Located in the San Francisco Bay Area, Stanford Science Park initially hosted Hewlett Packard, General Electric and Lockheed Martin and played a pivotal role in the development of Silicon Valley.[2] Nowadays, it remains at the forefront of innovation as it is home to some of the most groundbreaking new companies, like Google and Facebook.

1.2. KEY ELEMENTS AND ADVANTAGES OF SCIENCE AND TECHNOLOGY PARKS

In urban areas, S&T parks can be focal points for fostering innovation and connecting cities with the global economy. A S&T park can be defined as an organization whose main purpose is to improve the well-being of the community where it is located by encouraging a culture of innovation and competitiveness through knowledge-based institutions and related businesses. Managed by professional experts, a S&T park nurtures and directs the exchange of knowledge and technology between universities, R&D institutions, companies and markets. By doing so, a S&T park promotes the establishment of innovation-based companies by incubation and spin-off processes.

[2] http://lbre.stanford.edu/realestate/research_park

S&T parks are a core element for sustainable development in urban environments in the 21st century. They allow cities to be connected and attractive in the global economy by developing industries that will lead the way in the decades to come. In order to achieve this purpose, S&T parks are characterized by several key features:

- The establishment and management of a S&T park results from a collaborative effort of multiple stakeholders: firms, public authorities, academia, members of the financial sector as well as educational and research institutions.
- A science park involves the provision of infrastructure and support services for businesses. This supposes strong investments in real estate in order to make available of first-class office space and facilities.
- S&T parks, by enabling technology transfers (both in terms of physical hardware as well as the more important software of knowledge, skills, procedures, know-how, etc), perform an economic development function. Science parks draw together large businesses and start-ups in the same place: they enable clustering as well as the development of networks and trust. This allows the transmission of ideas and knowledge, which foster new companies, innovation and ultimately, growth.
- Local governments can identify a specific economic sector they wish to develop because they can judge whether they have a comparative advantage in it. This is why science parks may have a focus on a particular type of industry such as ICT or bioengineering.

For instance, the Indian city of Bangalore provides an interesting illustration of an urban area that concentrated its science and technology efforts for the development of an ICT cluster.[3] Historically, Bangalore has been the site of important military infrastructures. Public policy has also favored Bangalore as a science and technology site by locating the seat of the Indian Space Programme in the city. These precedents were essential in setting the stage for the emergence of ICT in Bangalore: they allowed the development of an industrial culture in the city.

Having its own University since 1964, Bangalore was also home to several research institutions, most notably the Indian Institute of Science, which prepared the Indian elite in the science field. Further, the State of Karnataka, where Bangalore is located, was also very proactive in the development of science and technology as it adopted a voluntarist policy in favor of ICT in 1997. This materialized in the development of two important science parks, the International Tech Park Limited and Electronics City, which allowed Bangalore to successfully become an ICT hub in Asia. Nowadays, the city accounts for the production of 35 per cent of India's software and hosts 55,000 ICT professionals as well as 103 ICT R&D centers.

[3] Grondeau, A. (2007). *Formation and emergence of ICT clusters in India: the case of Bangalore and Hyderabad*. Geojournal. 68: 31.

2. POLICY OPTIONS TO ENCOURAGE SCIENCE, TECHNOLOGY AND INNOVATION

2.1. INNOVATION AS AN ENABLER OF DEVELOPMENT

In both advanced and developing countries, innovation plays a central role. Innovation is a generator of employment as well as of stronger productivity through knowledge creation and its following application and dissemination. Likewise, innovation is a tool to advance social development. In order to foster innovation, it is essential to prioritize efforts in long-term sources of growth: education, infrastructure and research.

This process should comprise structural reforms in innovation policy. Innovation policy needs a new conceptualization in order to shift from a targeted policy focused on R&D and specific technologies to a more comprehensive approach comprising the many actors and factors that play a role in innovation performance.[4] With this, the policy's goal should not be merely innovation as such, but its application in order to make life better for individuals and society at large.

In this process, cities have an essential role to play. As local leaders, we need to understand that cities are at the forefront of innovation. They are the spaces where innovation takes place: while concentrating different actors and elements, they have the capacity to interrelate them. Specifically, cities can undertake particular actions that would enable their transformation into innovation environments:

- Cities can concentrate on the development of science and technology parks. The establishment of a S&T park sustains the local production of goods and services oriented to the information economy. Further, it attracts innovative companies in which ICT is the main means of networked organizations.
- Cities can also focus in the establishment of a new social organization, in which the main organizational support is Information and Communication Technologies (ICTs). Through the new interaction networks opened by ICTs, various groups and social movements can find new channels of expression.
- Finally, cities can prioritize the individual and collective use of ICT intensive goods and services.

Through promoting these actions, local governments can ensure that cities are truly attractive and connected to global communication networks. Allowing connectivity and interaction is an important step to foster innovation. Innovation cannot occur if a city is not integrated and up to date with the major orientations occurring in globalization. An innovative environment may be territorially located

[4] OECD (2010). *Ministerial report on the OECD Innovation Strategy: Innovation to strengthen growth and address global and social challenges*.

within a city and its surroundings, but through communication networks, it interacts and is connected to the rest of the world.

2.2. GENERAL GUIDELINES FOR DEVELOPING S&T PARKS

If you are a local leader aiming to enhance your city's integration into the knowledge economy through the establishment of a science park, you can follow general guidelines that would assist in its conceptualization and development:

- A Project Management Team (PMT) composed of management and local development experts, responsible for leadership of the park should be designated. Local governments can assist the PMT by organizing workshops drawing on best practices, case studies and S&T park master planning development from advanced economies: sharing such information might prove essential to understand how to successfully develop science parks. The specific aim of these workshops should be to assist in the preparation of feasibility studies[5] that carefully assess the challenges associated with developing a science park and also the opportunities which the city can take advantage of in order to increase the park's chances of success.
- A S&T park should focus on the challenges of their potential customers in order to truly address their needs. This can be achieved by the inclusion of the stakeholders and the parties involved in the conceptualization and management of the park: through collaboration and cooperation, S&T parks can preserve stakeholder trust and rally their support.
- Further, local governments must remember that the success of a science park is strongly determined by the development of a long-term vision for it. The challenge that local leaders face is to imagine a vision combining both a solid practical approach based on needs with an ambitious projection, in order to generate enthusiasm. The long-term vision and strategy of the park should be established in a master plan that embodies how the S&T park will achieve its objectives.
- From project inception, local governments should also seek ways to secure funds and generate interest amongst potential international park clients. Carefully developed feasibility studies and a clear vision established in a master plan might prove essential to legitimize the park as an investment project.

As local leaders, we have to be proactive in the development of S&T park strategies. We need to truly include stakeholders in the planning and management process as well as to clearly understand the objectives we wish to pursue. In addition, we must remember that other factors also intervene in the

[5] Connell, P., *Building Science Parks for the 21st century: Strategic issues and feasibility analysis.* International Association of Science Parks.

success of the park and are important to take into account. Of these factors, the existence of an entrepreneurial culture in local society is most relevant. It should be a priority of the science park to encourage such a culture by cooperating closely with universities and businesses.

Another frequent factor in the success of S&T parks is the presence of projects that serve as an anchor to development. Such projects lead the way, generate initial revenues, attract small companies for servicing large companies and foster enthusiasm, thus triggering development. Finally, and perhaps more importantly, local governments must adapt science parks to local circumstances. Whilst valuable lessons can be learned from experiences with S&T parks around the world, models should not be copied; each project's characteristics should depend on what is at hand. The idea is to adjust the science park to "answer to local competitiveness".[6] Science parks should be based on the strengths they see in their scientific and business environment.

UNESCO provides capacity development and technical assistance in S&T park development. UNESCO has organized several training workshops in this field and supports member states in all phases of S&T park development such as in preparing a feasibility study of S&T park development.

2.3. THE PIVOTAL ROLE OF UNIVERSITIES

In the development of science parks, local governments have to remember that universities play a pivotal role.[7] Universities are spaces where new ideas and knowledge are created. They are also sites where interaction and networks leading to innovation are fostered. As such, as local leaders, we must remember that for a science park to succeed, it is essential to establish strong linkages with universities. When a science park is developed, local governments can get universities involved as either shareholders (with an ownership share) or as stakeholders (with an interest in the management of the park). It is up to local leaders to carefully assess what place research will take in the overall strategy of the park.

However, it is important not to overemphasize the institutional aspect. Institutional linkages could prove to be less significant when compared to the synergies that can emerge between research institutions and companies through the sharing of premises and the sharing of knowledge. Therefore, local leaders should concentrate on how to encourage synergies between research-based institutions and business to occur. Physical proximity between research institutions and business encourages the development of a culture of both formal and informal meetings in a relaxed environment. This can later on materialize in a constructive collaboration. In addition, if interaction between research and business occurs, it can lead to an enhancement in the mutual understanding of both parties. Business and research could cooperate in defining what kind of knowledge should be produced and what kind of

[6] European Investment Bank (2006). *Science Parks: A tool for the development of the knowledge economy?* Scope for the EIB Group Support.

[7] Ibid.

knowledge should be applied. This could prove to be of great importance in the establishment of a strategy for the creation of value.

UNESCO actively promotes the interaction between science, technology, innovation and economic development through its University-Industry Science Partnership (UNISPAR) Programme. UNISPAR promotes links between universities and the productive sector, with emphasis on the establishment of science and technology parks. Within the framework of UNISPAR, an active programme is UNESCO Chairs.[8] The main partners are universities and research institutes, NGOs, foundations and public & private sector organizations. The programme offers, training, academic exchanges, research and a platform to share information. One of the most active UNESCO Chairs in science, technology and innovation is hosted by the Sun Yat-Sen University in Guangzhou, China.

2.4. PROACTIVE MANAGEMENT TO FOSTER COMMUNICATION AND NETWORKS

Once the park has been conceptualized and is in place, local governments give importance to its effective management. Management is at the core of the success of any science park.[9] Managers, through their decisions and actions, can help trigger innovation among business, enhance technology transfer and provide support to enterprises, especially small and medium enterprises, when it comes to networking, management and international strategies. Local leaders must carefully choose the park leadership, as managing a science park is a delicate task. Managers should have a multidisciplinary mindset combining the expertise of a scientist, a politician and a business person.[10] Further, managers should be skillful in interacting with the local environment and reaching the actors involved in the innovation system, especially entrepreneurs.

Concretely, there are 4 components that managers can emphasize to assure the provision of high-quality services and management to the actors in a park:

1. Development programmes that fully integrate incubation schemes should be put in place. The existence of such programmes allows the development and diffusion of entrepreneurship, especially among small and medium enterprises.
2. Managers should also focus on creating a pleasant work environment. In order to do so, they can encourage a culture of sharing infrastructure services such as offices, conference rooms and telecommunications as well as to provide leisure and cultural activities. This would enable communication and motivation among park actors.

[8] http://www.unesco.org/en/unitwin/university-twinning-and-networking/

[9] Baccanti, M. *Modern trends in the management of science and technology parks*. International Association of Science Parks.

[10] European Investment Bank (2006). *Science Parks: A tool for the development of the knowledge economy?* Scope for the EIB Group Support.

3. When managing office space, managers should keep in mind to allow flexible premises in terms of size. This permits the hosting of companies ranging from small incubated start-up firms to large companies. As such, partnerships can be developed. By being physically close together, small and large companies can interact and communicate. Large companies have brands and power, while small companies have entrepreneurship and novelty. Together, by combining their skills, they have the potential for effective innovation.
4. Managers should take care of the reputation and the image of the park. This involves developing a marketing strategy that can attract attention in the global information economy.

S&T parks exist to foster innovation. With this in mind, managers must actively help businesses to overcome barriers to innovation. These may include access to finance and access to technology. For each of these, managers must ascertain how they can help users of the S&T park to overcome these barriers. For example, how can they really help new companies bridge the gap between research and commercialization of a new technology?

2.5. DESIGNING S&T PARKS: THE "LEARNING VILLAGE" MODEL

Science and Technology parks are generally urban mega projects or peri-urban projects located next to university campuses. They are large-scale infrastructure and real estate projects that have the capacity to transform a city. Further, by utilizing high-quality architectural and landscape design components in their master plans, science parks have the ability to change the physical appearance of cities.

Since science parks present an enormous potential to physically and economically transform urban areas, as local leaders, we must remember to seek ways to successfully integrate urban mega projects into the existing urban fabric and environment. Science parks have the capacity to transform a city, but they must do so while successfully relating to it. Thus, it is important to conceptualize science parks as fully integrated living urban environments that combine different uses. They must be communities, not just work spaces.

Planning science parks following the "learning village" model can be an effective way to make them truly vibrant urban communities. Three elements compose the "learning village" model:

- Businesses
- Educational centers
- Residential areas

Integrating these three elements allows technology parks to become urban areas where people can work, play and sleep. Concretely, it means including different land usages, a clear design promoting public space, as well as efficient linkages to public transportation into the master plan. Science parks are not just spaces where people work during the day and are empty at night but spaces that urban

residents can enjoy and appreciate at any given time. This can exponentially multiply the efficiency of a S&T park, by making it a pleasant urban area where the environment fosters innovation through its livability. The everyday use of the latest IT-based improvements in the science park can also contribute to and support its success. They allow inhabitants and users of science parks to be globally connected, while living, learning and working in a clear geographical area.

3. CASE STUDIES

3.1. SOPHIA ANTIPOLIS, FRANCE - A PIONEERING EXPERIENCE IN S&T PARK DEVELOPMENT

A building within the Sophia-Antipolis science and technology park
Photo credit: www.sophia-antipolis.org

Located in the French Cote d'Azur, next to Nice, Sophia Antipolis is one of the pioneering science and technology parks. Developed over a period of over 30 years, Sophia Antipolis is the product of a close collaboration between public authorities, research institutions and the private sector.[11] Essential in the development process was the role played by Pierre Laffitte, a local politician who assumed a proactive leadership in the conceptualization of the park by bringing together different actors in the political, business and research spheres.

Using science and technology to promote regional development in a highly centralized country - France is characterized by a deep culture of centralization. The French capitol has traditionally concentrated many of the political, cultural, economic and social forces and activities that

[11] http://www.sophia-antipolis.org/index.php?option=com_content&view=article&id=14&Itemid=15&lang=fr

lead the country. In an effort to spread economic development throughout the territory, the French Central Government created a National Agency in charge of Regional Development (DATAR) responsible for implementing regional economic development plans. These regional plans were strongly based on the establishment of regional universities, research and innovation centers that would spur growth in middle-sized cities. However, in the 1960s, Nice and the Cote d'Azur were mainly perceived as touristic and recreational areas and were not really targeted as focal points of regional development utilizing science and technology.

An engineer by training, Pierre Laffitte was convinced that, in order to be truly effective and successful, research and innovation had to be in tune with business needs. Wishing to bring economic development to the Cote d'Azur and to make it a leader in innovation, he had the groundbreaking idea to develop a research cluster in the municipality of Valbonne, in the Nice region. This countered regional development plans that placed Nice as a recreation cluster.

Orchestrating local groups and public authorities for the establishment and success of a S&T park - With the aim of realizing his ambition of establishing a S&T park in the Cote d'Azur, Pierre Laffitte organized the creation of SAVALOR, a non-profit Group of Economic Interest (Groupement d'Intérêt Economique) that, in French law, allows two or more parties to share and lead common actions in order to further develop their activities. This allowed him to bring together local and regional governments with research institutions and private business partners, most noticeably IBM and Texas Instruments. SAVALOR played a main role not only in bringing actors together, but also by acquiring land.

The creation of a Syndicat Mixte d'Aménagement, a local planning unit in charge of developing the area followed. Strict planning rules were established that conceptualized Sophia Antipolis as not only a research and business center but also as a community mixing residential areas, parks and recreation facilities. It is essential to point out that the site where the park is located is topographically and geographically unique, set in between mountains and in proximity to the Ocean. As such, there was strong attention placed to the quality of the urban environment being created, by putting emphasis on architecture and the provision of green areas and open spaces. In the development process, it was the philosophy of the project to take advantage of the quality of life of the area and the pleasant surroundings to establish a unique space that would encourage innovation and research.

In its initial stages, the project did not benefit from direct support from the French Central Government. Sophia Antipolis nonetheless benefited from the moral support of the DATAR, the National Agency in charge of Regional Development. It was from local government units that the project derived its main support. In particular, Sophia Antipolis was backed by a strongly proactive research policy from the Departement Alpes Maritimes, the territorial administrative unit where the project is located. The Departement government placed research and innovation as the core of its local development strategy, thus encouraging and supporting the Sophia Antipolis project. The local government gave strong financial support to university education and National Research Centers in the S&T park site.

All these actions allowed Sophia Antipolis to realize its ambitions as a European science hub with an international reach. According to 2008 figures, the park hosted 1400 companies, 30,000 employees, 5,000 students and 4,000 public researchers. It is home to companies in diverse science fields, ranging from chemistry and biotechnology to ICT. The park is also marked by the presence of a local association that organizes cultural events and fosters informal communication and networks among tenants. This creates a local spirit, and fosters trust and innovation.

Lessons Learned:

The case of Sophia Antipolis illustrates the importance of local leadership in the success of a science park. In the development process of the park, the role played by a visionary leader with a clear ambition was essential in orchestrating political support for the project. Further, the leadership nurtured networks between different actors in both the private and public sphere – researchers, local and regional government authorities and business. By challenging some national French development plans, Sophia Antipolis illustrates how ambition and perseverance are pivotal in realizing a project.

Sophia Antipolis is a pioneering example in S&T park development. It is one of the first urban development projects using science and technology as a strategy of development, therefore its story and characteristics are most valuable.

3.2 SAN DIEGO, CALIFORNIA - THE IMPACT OF A UNIVERSITY IN ESTABLISHING A BIOTECH CLUSTER

Biotechnology is a rapidly growing high-tech industrial sector

Photo credit: www.xconomy.com

On the border with Mexico, San Diego is located outside the usual US high-tech regions of Northern California and the American Northeast corridor. The economic base of the Californian city was strongly dependent on defense spending (the military has a strong presence), tourism and real estate. However, in the past two decades, San Diego's economic activities have shifted their orientation. The city became one of the most economically diverse and knowledge-based, fast-growing regions in the United States. San Diego used innovation in science and technology to become a dynamic, state-of-the-art research cluster. Nowadays, San Diego is home to 75 research institutions, 1,900 IT companies, 600 biomedical and life science companies and 250 clean tech companies.

Strongly focusing on research, the city has one of the largest critical masses of biotech R&D and clinical testing institutions in the US. San Diego's success is a story of how a university, research institutions, the business sector and the government came together to establish a world class biotech and communications cluster.[12] Important connective institutions allowed the establishment of networks and the dissemination of information, thus fostering a culture of cooperation and innovation. In this process, a strong navy presence in the city was a powerful asset, as the military was often involved in R&D research projects. The military can act both as a source of R&D funding and as a large and sophisticated consumer.

The pivotal role of research institutions - In the development of San Diego's biotech cluster, three educational and research institutions were essential in triggering R&D efforts and projects: the University of California at San Diego (UC San Diego), and the world-famous biomedical research centers, Scripps Research Institute and Salk Institute, which operated as the industry foundation and brain trust. Founded in the 1950s and 1960s, the three institutions were created to encourage education and research and succeeded in attracting talented and entrepreneurial researchers. UC San Diego was nonetheless the leading institution. Its reputation in biotech research was almost unsurpassed for cluster development. Biotech companies concentrated around UC San Diego or alternatively located in industrial parks within 10 minutes of each other and with easy access to university labs and scientists. Thus, proximity fostered cohesion and provided the city with a collegial spirit.

Alumni and scientists from the three institutions have been responsible for initiating dynamic R&D firms. These firms have often played the role of incubators for new companies. Most notable in this regard are UCSD alumni Ivor Royston and Howard Birndorf, founders of Hybritech, a breakthrough bioengineering firm. The company made millions, legitimizing and directing attention to the biotech field as a great potential investment opportunity. It built trust in the local business and financial community as it proved that biotech investments were a viable reality in San Diego. Further, former employees of Hybritech that deeply benefited from the company's success reinvested their resources in the area by supporting other start-ups. Hybritech left as a legacy a culture of local venture capitalists ready to invest in R&D projects. It created a culture prone to take risks in innovation.

[12] Wu, W. (2005). *Dynamic Cities and Creative Clusters*. World Bank Policy Research Working Paper 3509.

The role of mediating institutions to nurture networks - Essential in the success of the cluster has been the free flow of information and communication between company leaders, university faculty, research scientists and students. UC San Diego has played a pivotal role by launching CONNECT, a networking programme bridging the university to financial and business interests. CONNECT was in fact a joint project of UC San Diego, the city government of San Diego and the private sector. Its main aim is to commercialize local science and technology achievements worldwide and to attract entrepreneurs and investors. CONNECT has supported the development of more than 2,000 start-up companies.

BIOCOM, a life sciences association comprised of 550 companies and research centers in Southern California, also plays a pivotal role in the nurturing of exchanges and communication.[13] It has promoted informal networking and given professional development assistance. More importantly, it allows biotech firms to have a unified political voice, which has proven essential to secure water availability from the local government for future development projects.

Lessons Learned:

San Diego provides a clear illustration of how a university can play a pivotal role in a strategy that uses science and technology to promote new economic activities. UC San Diego was the keystone of San Diego's growth. It acted as the element that made all the other actors and ideas in the innovation environment come together. It helped to nurture networks and facilitate innovation and research. The university has successfully leveraged support from existing companies to create future growth and has enabled innovation networks to sustain that growth. Through BIOCOM and CONNECT, San Diego showcases how mediating organizations can successfully support the development of a science and technology hub.

San Diego's biotech industry illustrates how local political actors, universities and business can come together and trigger development based on science and technology. Governmental involvement was reduced to a minimum. It was the university and research institutions, closely working with the business sector, that took the lead. However, it is essential to point out that if Federal and State resources had not been present to fund UC San Diego, the biotech cluster would have simply not existed. The case illustrates the resiliency of local actors to truly collaborate, exchange ideas, create networks and mobilize capital to use science and technology to change the economic base of a city.

[13] http://www.biocom.org/

3.3 CAMPUS BIOMETROPOLIS, MEXICO CITY - AN INTERNATIONAL MEDICAL RESEARCH HUB FOR LATIN AMERICA

An illustration of future development of the Medical Research Hub in Mexico City

Image credit: architecture-now2.blogspot.com

Campus Biometropolis is an initiative by Mexico City Government and the Mexican National University, UNAM. It is a 71 hectare urban mega project located in the South of Mexico City. By fostering networks and encouraging innovation and research, Mexico City's government expects to develop a new economic sector through the creation of an international medicine hub in Latin America.

Campus Biometropolis is part of a broader long-term economic development strategy by the municipality following the concept of the city of knowledge. Mexico City's government has the ambition of making Mexico City a strong player in the information economy. It strives to take the city's economic transition into the next phase of economic development by triggering activities related to the knowledge economy. Campus Biometropolis is meant to be a physical space where this ambition can materialize. It is destined to be a physical space of the city of knowledge where innovation and research are produced but also where people can live, work and enjoy the city. The project is comprised of 5 specific components:

- Education and research hospitals
- Labs and applied research facilities

- New technology companies
- Schools of medicine
- Residential and commercial areas

Further, as an urban mega project, Campus Biometropolis is structured around 3 clear lines of development: research and development, environment and urbanism. These three lines interact and embody the project's development strategy.

Research and Development - In the Southern area of Mexico City, there is an existing cluster of institutions in the medical field developed in the past six decades. These institutions comprise specialized state hospitals and public health institutions as well as research facilities linked to the National University. However, despite this concentration, the institutions haven't been integrated. Campus Biometropolis aims to accomplish that. In terms of research and development, the main objective is to enable networks and cooperation between existing institutions in order to provide a space for innovation and top international research in the medical and biological field. By emphasizing Mexican research, Campus Biometropolis expects to elevate it to international standards.

The government carefully assessed in which specific medical sectors Mexico City had a comparative advantage because of its existing institutions and facilities. It identified 5 areas to be developed further:

- Oncology
- Nutrition and Diabetes
- Geriatrics
- Cardiovascular Diseases
- Infectious Diseases

As a project, Campus Biometropolis is closely linked to the industry and risk capital communities and counts on many stakeholders from the private sector. The government lends support in legal areas, for example by speeding support for patent registrations. All these actions are expected to establish a healthy business environment.

Environment - Campus Biometropolis' location is truly unique. It is sited in the crater of an ancient volcano. The project is well integrated into its surrounding physical environment. Fifty percent of the project site is destined to be green areas and there will be a natural protected area administrated cooperatively by the Municipal Environmental Office and the National University. In this way, Campus Biometropolis is meant to foster a unique sense of place.

Urbanism - Campus Biometropolis is meant to introduce a new concept of urban development in Mexico City. The project is a physical space that embodies the idea of the city of knowledge. Marcelo Ebrard, current Mayor of the city, referred to the project as representing a "new urban model". It is a space where activities deemed for the future have a coexisting relationship to the environment that

surrounds them. This is made possible by paying close attention to the quality of the public realm, especially infrastructure planning. Key to this is promoting public transportation with intermodal centers for good connections, and by facilitating smooth traffic circulation.

Lessons Learned:

Campus Biometropolis provides an interesting illustration of the actions that local governments can undertake to promote sustainable urban development through the use of science and technology. The project provides a clear example of how science and technology can be used to trigger new economic activities directly linked to the information economy. Campus Biometropolis was seen as a needed platform in Mexico City. Its objective is to build confidence amongst Mexican research organizations to innovate and trigger projects that deliver products and services at top international standards.

The project also provides an interesting illustration of how projects can be conceptualized to be in harmony with their existing environment. Campus Biometropolis doesn't just demonstrate how local governments can mobilize science and technology to create spaces for the city of knowledge; it also shows how such spaces can be conceptualized in order to be a truly unique, distinctive environment.

3.4 MEDIA 21 -- TRANSFORMING SINGAPORE INTO A GLOBAL MEDIA CITY

A building in Media City lights up the night sky of Singapore
Photo credit: http://www.mof.gov.sg

Singapore is a highly planned city and it conducted an assessment of various options it could undertake to ensure the city's continued success in the future global economy. It decided to develop the Media 21 initiative. This project envisions Singapore as Asia's leading media marketplace and financial hub. It aims to make Singapore a global city that creates, develops, trades and distributes media services and projects in the international market. In focusing on media, Singapore is targeting a wide range of industries encompassing printing, broadcasting, film, publishing, and digital, internet-based media. As part of the Media 21 project, the city government is building a conglomeration of state-of-the-art buildings meant to locate and cluster high-tech Media companies. The Singapore Media Development Authority's (MDA) main objective is to develop in Singapore a vibrant media cluster that fosters homegrown media enterprises while appealing to foreign direct investments.

Several clear principles being followed are outlined in the Media 21 strategy:

1. **Establish Singapore as a media exchange center**. This entails appealing to the best world media companies by providing state of the art infrastructure, a skilled workforce and an incentivized operating environment. To support this initiative, the Singapore government will extend the city's financial infrastructure to make it reach the Media sector.

2. **Export made-by-Singapore content**. This strategic thrusts aims at boosting exports by Singapore media production units through cooperation agreements with overseas governments and industries. It is expected that this would allow access to joint ventures as well as foreign distribution networks and markets.

3. **Deploy digital media**. The government realized that the city was missing a state-of-the-art system of digital production, so it aims at attracting high-end digital production companies by establishing a multi-disciplinary digital post-production studio. Among other things, this initiative also comprises strong R&D investments in digital media technologies as well as creating a Media Lab and a Digital Technology Development Scheme providing support to projects in digital media.

4. **Internationalize Singapore media enterprises**. Because the size of the Singapore internal market is rather small, media enterprises must expand their markets overseas. As such, it is the purpose of the government's MDA to provide support in encouraging international market development. It will play the role of matchmaker to ease business networking and co production efforts with overseas actors.

5. **Augment media talent**. In order to make Singapore a global media city, it is essential to develop media aptitudes and a cultural mindset open to experiment with media instruments. As such, the MDA, in collaboration with the Singapore Ministry of Education, plans to foster creative writing and artistic design at the pre-school, primary and secondary levels. Further, the government aims at developing media talent at the University level in order to attract foreign employers.

6. **Foster a conducive business and regulatory environment**. The objective is to guarantee that policies and initiatives meet international best practices: a positive regulatory environment is essential for businesses to prosper. The challenge is to ensure that regulations are consistent and clear, and provide a friendly operating environment for media production companies.

Lessons Learned:

By integrating Fusionopolis with university research centers, it is Singapore's aim to go beyond the idea of a simple science park. Singapore wants to develop a Media Hub. The key in this strategy is interdisciplinary work. By bringing together different fields of expertise in science and technology and over 3,000 scientists from over 50 countries, Singapore aims to be at the top of international research.

Fusionopolis is not conceptualized as only work and research spaces. By mixing commercial activities, residential areas as well as office space, it is an urban environment where the scientist can work, live and play. Residential areas are equipped with state-of-the art appliances; they include seamless environments as well as experimental network appliances. This makes Fusionopolis a clear illustration of what the city of the future could look like. A science hub based on the knowledge economy where the urban environment is internationally oriented and supported by the most innovative technology applications.

3.5 THE "TORCH PROGRAMME" IN CHINA -- A NATIONAL POLICY FOR ESTABLISHING SCIENCE PARKS

Beijing's Zhongguancun Science Park is part of a national plan to build up scientific and technological research capacity.

In the early 1990s, the Chinese government launched a comprehensive science and technology policy initiative under the umbrella of the "Torch Programme". The initiative aims to "mobilize the technological capabilities and resources of research institutes, higher education institutions, and large and medium-size enterprises to develop high and new technology products, establish technology-oriented enterprises, and pave the way for the commercialization of innovations that will emerge from science and technology research".[14]

The development of science parks is at the core of the programme. Science parks were established in 53 large Chinese cities since the beginning of the 1990s. The Chinese government is actively seeking to promote technology diffusion and foster synergies between the companies, academic and financial institutions surrounding the parks. By introducing state-of–the art infrastructure and new technological resources to the industrial base, the Chinese government estimated that the selected cities would become focal points for high-tech development. Tax exemptions and the encouragement of foreign direct investment (FDI) were policy instruments mobilized to back up the initiative.

The application of these policies showed early signs of success. The Torch Programme succeeded in developing clusters of high-technology firms in the science parks it established. This concentration

[14] Hu, A.G. *China's Technology Park and Regional Economic Growth.* Prepared for "The Fourth International Conference on the Chinese Economy: The Efficiency of China's Economic Policy". Cerdi, Clermont-Ferrand, France. October 23-24, 2003.

promoted economic spillovers in the cities where the parks were located, supporting economic growth. However, as the development of science parks was strongly linked to FDI and policy incentives rather than natural technological synergies, their contribution to sustainable growth remains contested.

Lessons Learned:

Despite some limitations, the "Torch Programme" showed measures of success by promoting urban and regional growth. Most importantly, it illustrated how a government can be truly proactive in designing a national science and technology policy. It presents a clear picture of the policy instruments that governments can use for science and technology initiatives.

The "Torch Programme" raised an important question for policy-making. Is it possible to design a science and technology policy that fosters networks merely through policy incentives rather than natural technology linkages? The question remains unanswered. However, the initiative does prove that the government can play an important role.

3.6 THE INNOVATION HUB -- GAUTENG, SOUTH AFRICA

The Gauteng Innovation Hub is at the forefront of efforts to build a knowledge economy in Johannesburg and Pretoria, South Africa

A new industrial strategy for a changing world - The political transformation that South Africa experienced beginning in 1994 caused strong transformations in the country's provincial economies. Gauteng, the province where Johannesburg and Pretoria are located, dealt with the changing context by establishing a new Trade and Industrial Strategy that could benefit both cities. In the mid-90s the economy was being strongly influenced by the rise of information technologies. Foreseeing the effects that the knowledge economy might have, Gauteng Province articulated its new industrial strategy accordingly. It established three development priorities, closely related to growing economic sectors in the knowledge economy:

- The strategy aimed at making Gauteng a "smart" province by focusing on industries linked to information and communication technologies (ICT).

- Gauteng also concentrated its efforts to facilitate the transition of its industrial base into high-value added manufacturing.
- The third facet of the strategy involved further development of the service sector, in particular the tourism industry. A well-established and innovative service sector is a powerful support for knowledge-based activities.

Gauteng decided to focus its economic development strategy on the knowledge economy after a careful assessment of its economic characteristics and structure. The assessment noted that Gauteng has a large proportion of South Africa's formal employment and benefits from a well-developed tertiary education sector. It is also home to South Africa's largest concentration of research activities composed of a number of science councils, universities and R&D centers. The combination of these elements signified a likely high-demand for electronics and ICT products as a potential source of growth in the future.

The development of a science park at the core of the strategy - In order to foster its integration into the knowledge economy, Gauteng decided to create a research-intensive cluster. This is how The Innovation Hub, a science and technology park, came to be. Through the provision of supporting infrastructure, the Provincial Government aimed to attract high-technology companies of all sizes and stages of growth.

While attracting new economic actors related to the information economy, Gauteng also promoted innovation, through the exchange of knowledge and the access to local and global markets. One rationale behind The Innovation Hub was to attract foreign direct investment. It was argued that the arrival of new resources and the transfer of innovation and knowledge would foster economic activities linked to science and technology in the country.

In planning The Innovation Hub as a local economic development strategy, there was careful evaluation of the feasibility of the project. Several assessments were made:

- Were the actors for such a development in place?
- Could the Province provide the adequate level of resources and support needed for a S&T park development? How would the available resources articulate with the ambitions?
- What was the main ambition of the S&T park? What did Gauteng want to achieve with the S&T park? Were the possible models of development well understood?

The Innovation Hub Development - After undertaking evaluation studies to establish a long-term vision for the project, The Innovation Hub was launched in February 2000. The park was established on a site midway between Johannesburg and Pretoria, and close to the University of Pretoria. In the initial stages of the park, The Innovation Hub became a member of the International Association of

Science Parks, an international network of science parks, which provides key technical expertise and recommendations for conceptualization and management.

The leadership of the S&T park resides mainly with public authorities. The Gauteng Provincial Government operates as the main shareholder of the park through Blue IQ Investment Holdings. The Gauteng Provincial Government plays a pivotal role in the success of the park, as it has key functions. It provides funding to put in place the core infrastructure and incubation facilities. In collaboration with other parties, the Gauteng Provincial Government is in charge of strategic direction and long-term vision for the Hub. Further, the provincial Government also guarantees support at the local and national levels for the park. As a main shareholder of the park, the Gauteng Provincial Government ensures access to the Gauteng Economic Development Agency (GEDA) and its related venture capital instruments. Further, it assures access to other local and provincial sources of revenue, such as international donor funds and local sources of development finance.

It is important to acknowledge that the Gauteng Provincial Government, while being the main shareholder of The Innovation Hub, has a wide range of entities as cooperative partners: these include the local business community, local governments, research centers and universities. This close collaboration is essential to enable synergies.

One of the main roles of the science park has been to act as an incubator of business start-ups. This accomplished through the provision of technical and infrastructure support for the new companies. Incubation activities have allowed the hub to attract and foster firms in a wide range of fields related to science and technology including bioscience, electronics, ICT and engineering.

Lessons Learned:

The Innovation Hub illustrates the actions that urban leaders in developing countries can undertake to reduce the digital divide. The project is part of a strategy aiming at pushing Johannesburg's and South Africa's integration into the knowledge economy. It shows the proactive role of the Provincial Government in bringing actors together, sharing knowledge and best practices and establishing a long-term development and business incubation strategy. This allowed the Innovation Hub to become a successful and functioning science and technology park in Africa.

4. Better City, Better Life – Summary of measures to tap science and technology for urban innovation and development

Developments in science and technology are pointing the way to new directions in sustainable urban development. Investing in science and technology allows cities to become truly integrated into the knowledge economy; and innovative cities can develop significant advantages in globalization. At the same time, investing in science and technology enables the development of clean, high-tech activities that are expected to experience strong growth in decades to come.

As local leaders, we have to be proactive in the development of a local science and technology strategy. This can be realized through the establishment of S&T parks. The emergence of S&T parks should be based on a careful evaluation of the comparative advantages that a city may have in science and technology. Above all, a S&T park must enable networks, foster communication and involve a wide range of stakeholders (research institutions, local governments, and the business sector). Building linkages between these different actors allows urban areas to truly become innovation environments which set the stage for growth. Science and technology can be a driving force for development in the 21st century. As local leaders, we must embrace this idea and design policy accordingly.

Strategy 1: Foster urban areas as innovation environments through the creation of networks and linkages that encourage innovation in science and technology.

POLICY OPTIONS	
option 1	Shift Innovation policy from a targeted policy focusing on R&D and specific technologies to a more comprehensive approach comprising the many actors and factors that play a role in innovation performance.
option 2	Make innovation in science and technology a catalyst of growth through the development of Science and Technology Parks (S&T Parks). Policy-makers are responsible for finding structures articulation between the physical territory and the much subtler social, spatial, economic, cultural and innovation systems present in urban areas. This can be achieved through the establishment of S&T Parks.

Strategy 2: Develop clear guidelines and a clear vision of the use that the city wants to make of science and technology.

POLICY OPTIONS	
option 1	Designate a Project Management Team composed by management and local development experts. The Team should encourage the development of feasibility and assessment studies aiming to identify in which science and technology sectors the city has a comparative advantage. Opportunities should be acknowledged, but also challenges and difficulties.
option 2	Involve multiple stakeholders in the development of the park. The establishment of an S&T Park results from a collaborative effort between firms, public authorities, academia, members of the financial sector as well as educational and research institutions. This would help the S&T Park to focus on the challenges of its potential customers, thus truly addressing their needs.
option 3	Establish a long-term vision for the S&T Park embodied in a master plan. As local leaders, in order to generate enthusiasm, we need to imagine a vision that combines a solid practical approach based on needs with an ambitions projection. As a planning document, the master plan would materialize this.

option 4	Establish strong linkages with universities. Universities are spaces where new ideas and knowledge are created, and where interaction and networks leading to innovation are fostered. Depending on local conditions and the place that research will have in the S&T Park, governments can decide to make universities participate either as stakeholders (owning entirely or partially the Science Park) or as stakeholders (with an interest in the management of the Park).

Strategy 3: Encourage a proactive management style to foster communication and networks. Managers should combine the skills of a politician, a scientist, and a business person.

POLICY OPTIONS	
option 1	Promote synergies between research institutions and businesses. In this, concentrating on proximity can be essential. Proximity encourages a culture of informal collaboration, which later on can materialize in trust, exchange and ultimately innovation and growth.
option 2	Managers should put in place development programmes that fully integrate incubation schemes: such programmes allow the development and diffusion of entrepreneurship.
option 3	Managers should allow flexible premises in terms of office size in order to host both small start-up companies and large firms. Their interaction and collaboration can lead to combined skills in entrepreneurship and novelty, and ultimately innovation.

Strategy 4: Conceptualize S&T Parks in order to be communities where people can work, play and sleep that are integrated within their existing urban environment.

POLICY OPTIONS	
option 1	Design S&T Parks to combine business areas with education centers, residential areas and cultural facilities. As urban mega projects, S&T Parks should provide high-quality architectural and landscape design that closely integrates them with their surrounding urban fabric.
option 2	Incorporate the use of the latest IT improvements in order to make the S&T park a pleasant and efficient environment. This will allow S&T park inhabitants to be globally connected while living, learning and working in a clear geographical unit.

5. Related Links

- International Association of Science Parks: http://www.iasp.ws/publico/intro.jsp
- New York Academy of Sciences: http://www.nyas.org/
- European Investment Bank Conference: "Science Parks - a tool for the development of the knowledge economy?"
- http://www.eib.org/projects/events/conference-science-parks-a-tool-for-the-development-of-the-knowledge-economy-luxembourg.htm
- UNESCO Science and Technology Park Governance http://www.unesco.org/new/en/natural-sciences/science-technology/university-industry-partnerships/science-technology-park-governance/
- Science Parks around the World (by region) http://www.unesco.org/new/en/natural-sciences/science-technology/university-industry-partnerships/science-parks-around-the-world/

Case Studies

- Sophia Antipolis, France: http://www.sophia-antipolis.org/
- The Innovation Hub, South Africa: http://www.theinnovationhub.com/
- Campus Biometropolis, Mexico City: http://www.biometropolis.mx/
- Biopolis and Fusionopolis, Singapore: http://www.a-star.edu.sg/?tabid=860
- Masdar, Abu Dhabi: http://www.masdarcity.ae/en/index.aspx

CHAPTER 8 – USING INFORMATION AND COMMUNICATION TECHNOLOGIES FOR SMART AND CONNECTED CITIES

To Build a Smart and Accessible Information Society

Cities should recognize that information and communication technologies are essential to a vibrant social, economic and cultural life of the city. Cities should invest in information and communication technology infrastructure so as to strengthen services across multiple sectors, and to build an intelligent digital nervous system supporting urban operations. They should strengthen the use of information technology in education, reduce the digital divide, and increase the access of residents to information.

Shanghai Declaration on Better Cities, Better Life

1. ISSUES AND CHALLENGES[1]

1.1 ICT AS A MANAGEMENT TOOL

As an urban leader, you should recognize and take advantage of the capacity of information and communication technologies (ICT) to enhance management systems. The phrase that has been coined, "ICT for smart cities," is particularly apt. Besides improving sustainability monitoring and control capabilities for city executive offices, agencies and managers, ICT connectivity can be a prime source of urban economic growth and social cohesion.

ICTs present innovative ways of managing our cities — smart buildings, intelligent traffic management, new efficiencies in energy consumption and waste management, and not least exchanging information and knowledge and communicating on the move in an increasingly converged information society. ICT approaches, including e-governance, enable access to information and time-saving convenience for citizens. When properly deployed and managed, these technologies allow cities to save capital expenditures while transforming government

[1] This chapter was authored by Warren Karlenzig, with valuable input and contributions from Chen Chao and Mohan Peck.

personnel and citizen behaviour to become more sustainable over time. Through e-governance, local governments can become more efficient both in terms of internal operations as well as through their relationships and transactions with citizens, businesses and other levels of government.

ICT allows cities to have a virtual presence on the Internet. A good website with meaningful content can be a powerful tool to attract business, new residents and tourists. A virtual city can also convey the quality of life that might be expected in the city, including the diversity of its neighbourhoods, the availability of arts and culture, as well as access to green spaces and leisure activities.

Smart cities are centred on the utilization of networked infrastructure. This digital infrastructure has the capability to improve economic, resource and political efficiency while enabling more effective social, cultural and physical urban development. Through the utilization of digital technology, it is possible for cities to achieve lower carbon emissions from land use planning, infrastructure, buildings and transportation. ICT can play an important enabling role in the avoidance of high carbon-emission development.

From the onset of your urban planning efforts, ICT can provide simulation software that can help planners and architects model the optimal locations of buildings, schools, health services, and public transportation routes to reduce mobility needs in support of low-carbon lifestyles. So called “e-planning” practices using publicly accessible portals in conjunction with geographic information system (GIS) data can also help facilitate citizen participation in urban planning processes, particularly when such approaches are used to complement (not replace) public participatory processes.[2]

In building design, ICT is being used to optimize natural solar energy and lighting and also to accommodate renewable energy use; these strategies combined can reduce fossil fuel energy consumption. New smart or intelligent buildings are constructed using ICT to help orient buildings and building features to take “passive” advantage of natural conditions, including sunlight for lighting and heating and wind for cooling. Once these structures are completed and occupied, ICTs support the maintenance of smart buildings with features such as sensors and controls designed to improve efficiency and tailor energy use to actual demand. Besides saving energy and operational costs, ICT-integrated building systems can increase personal comfort and productivity, through optimization of light (including natural lighting), cooling, heating and fresh air. Unoccupied spaces, rooms, or entire buildings can be maintained with minimal use of energy, greatly increasing overall urban building energy efficiency. These issues are covered in depth in the Chapter on Green Buildings.

ICT is an essential enabler of smart grids, which are needed to significantly increase the operating efficiency of existing power grids and their centralized electric power production facilities. ICT-enabled smart grids collect, store and distribute energy, while managing variations in electricity loading. Smart grids provide more effective monitoring and distribution of the

[2] “Handbook of Research on e-Planning: ICTs for urban development and monitoring,” Carlos Nunes Silva, University of Lisbon, Lisbon, Portugal, 2010: http://www.igi-global.com/Bookstore/TitleDetails.aspx?TitleId=41793&DetailsType=Preface

supply of energy from distributed energy systems, including solar and wind energy systems, allowing more effective use of these renewable energy technologies. Smart grids can also interact with building control systems to provide more efficient building heating, cooling, lighting and appliance power use.[3] More information on smart grids can be found in the Chapter on Science and Technology Innovation.

The mobile sector provides probably the most dynamic source of ICT micro-enterprises. In many parts of the developing world, ecosystems of mobile entrepreneurs have sprung up to serve local demand for mobiles and for associated applications and services. In many cities, there is a proliferation of shops and market stalls selling used and new mobile phones; kiosks that offer mobile phone applications, ringtones, wallpapers and content, and services such as installation and setup; device repair services ranging from swapping out components to re-soldering circuit boards to reflashing phones in a different language; and repairers who rely on informal social networks to share knowledge on common faults and repair techniques. Selling airtime on the streets employs large numbers of people in low-income countries. Such services can play an important role in sustaining the use of ICTs, especially among poor segments of the economy. In some countries, ICT micro-enterprises have also played a role in extending connectivity to rural areas to foster communication with cities and markets. According to Grameen Bank, there were more than 350,000 village phone ladies in Bangladesh by the end of 2008.

For both developed and developing nations, ICT enables online education programmes, or e-learning. In general, intelligent cities and communities are characterized by high capacity for learning and innovation, which is built into the creativity of their populations, their institutions of knowledge creation, and their digital infrastructure for communication and knowledge networks.

The complementarities between ICT and municipal service sectors are many. Consider ICT and transportation investments. Both respond to the need of improving connections between people and businesses, reducing costs of commuting and information transfers. ICT innovations applied to public transportation systems for scheduling, route changes and other logistics notification can vastly improve service quality, which increases ridership more cost effectively than large-scale capital investments.[4]

[3] "Reinventing the City: Three Prerequisites for Greening Urban Infrastructures," WWF International (in conjunction with Booz & Company), Gland, Switzerland, 2010, p.8: http://www.slideshare.net/itsgowri/wwf-low-carboncities

[4] "Cities and Green Growth: Issues Paper for the 3rd Annual Meeting of the OECD Urban Roundtable of Mayors and Ministers," 25 May, 2010, OECD Conference Center, Paris. P.15

ENABLING ACTIONS AND TECHNICAL CHALLENGES

Because there is increasing evidence of the positive effects of ICT on productivity growth,[5,6] enabling actions for smart cities should include regulatory reforms, such as reducing barriers to entry which are critical for private investment in broadband and other ICT networks. First-movers in ICT network investments seem to enjoy significant benefits. The Paris suburb of Issy-les-Moulineaux, by providing superior broadband infrastructure, a business-friendly climate and innovative e-services, has managed in less than a decade to radically change its industrial structure, reducing local unemployment to virtually zero.

The promise of ICT in enabling urban sustainability management must be tempered with the challenges of proliferating data and other potential cultural impediments that come with digital systems. In developing effective ICT systems for sustainability management, cities will need to be able to effectively manage rapidly proliferating data from sensors, reports, databases and other sources. Currently many database systems managed by cities are developed with separate technologies, according to "siloed" functions (planning and transportation agencies, streets maintenance and sanitation, air and water environmental monitoring agencies, financial departments, etc.). Data from such entities and newly emerging systems (such as smart grids and intelligent buildings, intelligent vehicle fleets) would need to be normalized on an "apples-to-apples" basis through an integrated network. To be useful, such data would need to be aggregated, sorted and presented in a meaningful way so city decision-makers could act upon the data based on past, present and potential future conditions. Challenges to such a scenario include cultural issues around the ability of institutions and individuals to share data, and to trust the data that is being provided by outside parties.[7]

If properly designed, integrated and managed, the end result of ICT use is improved performance in management of health, safety and family services, education, energy and water supply and use, and transportation and materials logistics.

2. MENU OF OPTIONS: INFORMATION AND COMMUNICATION TECHNOLOGIES

2.1 EXECUTIVE DECISION-MAKING SUPPORT

When deployed at the executive management level, ICT can enable better support for complex decision making for urban sustainability. A variety of information technology based systems, including sustainability "dashboards" are using visual indicators to help managers more easily understand—and take action—regarding a variety of physical, scientific, environmental and

[5] "Cities and Green Growth: Issues Paper for the 3rd Annual Meeting of the OECD Urban Roundtable of Mayors and Ministers," 25 May, 2010, OECD Conference Center, Paris. P.15

[6] "Investment in ICT and Broadband for Economic Recovery and Long-Term Growth," Robert Atkinson, International ICT Summit on ICT Economic Stimulus," Ankara, Turkey, 17 February 2010 http://www.slideshare.net/atifunaldi/investment-in-ict-and-broadband-for-economic-recovery-and-longterm-growth

[7] "Reconteur on Smarter Cities," Reconteur Media, London, 1 June, 2010, p. 5: http://www.itm-power.com/cmsFiles/media/TimesRaconteur_010610.pdf

economic conditions. One technological solution example is called *City Cockpit* –an integrated management information and decision support system that can assist city authorities in managing the growth and changes within a city based upon key performance indicators related to areas such as traffic, environment, and finance.[8] The emerging city of Masdar, Abu Dhabi uses sustainability indicators on greenhouse gas emissions generated through energy, waste and water use that are compiled in a "dashboard" for the master developer and project managers showing whether potential buildings, transportation, infrastructure and even the travel activities of construction contractors can meet the city's carbon neutral goals.[9,10]

Operations Center for Emergency Response – Rio de Janeiro

The city government and a leading technology provider teamed to build an operations Centre that integrates data and processes across city departments and agencies. The aim is to improve city safety and reduce response times to various types of incidents, from flash floods and landslides to traffic accidents. Part of the Centre includes a high-resolution weather forecasting and hydrological modelling system for the city, which can predict heavy rains up to 48 hours in advance. The Rio Operations Centre consolidates data from various urban information systems for real-time visualization, monitoring and analysis. The system was initially designed to forecast floods, which are a recurring natural disaster in the city. However, the system is being extended to cover many other types of events occurring in the city, whether that is the annual Carnival, the exit of fans from a stadium soccer match, or a traffic accident. The Centre will allow city leaders to make decisions in emergency situations based on accurate, real-time information.

2.2 E-GOVERNMENT

In many countries local governments are successfully deploying publicly accessible web portals in support of "e-government" capabilities. Citizens can use these Internet sites to make applications, get service updates and lodge complaints related to areas such as solid waste management, storm water drains, roads & traffic, factories, licensing issues, water supply, pest control, and building permitting. Executive management and city agencies can benefit from e-government by reduced volume of customer service costs and more efficient internal processes, document and information management. One excellent example of e-government services is the publicly accessible internet site that was initiated by The Municipal Corporation of Greater Mumbai (MCGM) in 2007. It serves its numerous city agencies and more than 12 million

[8] "City of the Future," Siemens, Page 2. http://www.it-solutions.siemens.com/b2b/it/en/global/Documents/Publications/city-of-the-future_PDF_e.pdf

[9] "Pacific Cities Sustainability Indicators Metrics Workshop Agenda," Gordon Falconer, Cisco, Singapore, 23 August 2010. Communication with author

[10] "Interview: A sustainable future," RFP magazine, Issue 44, August 2008: http://www.rfpmagazine.com/rfp_pages/interviews_16.htm

citizens, as well as countless users outside of Mumbai. The Indian state of Maharashtra introduced e-governance to its municipalities to provide "single-window" city services to its citizens to increase efficiency and productivity of its cities, and to provide timely and reliable management information.[11] Mumbai's portal helps the city and its many agencies manage birth and death registrations, waste, transportation, medical services, schools, medical colleges, disasters, taxes, town planning, city infrastructure, retail shops as well as social programmes. The system is available to the public at: http://www.mcgm.gov.in.

2.3 E-LEARNING

e-learning is being increasingly adopted by municipal education systems to enhance learning. It generally refers to the use of technology as classroom aids, although over time, there has been a gradual increase in fully online learning. Computer-supported collaborative learning is one of the most promising innovations to improve teaching and learning with the help of modern information and communication technology. It focuses on collaborative or group learning whereby instructional methods are designed to encourage students to work together on learning tasks.

Online courses allow students to proceed at their own pace. If they need to listen to a lecture a second time, or think about a question for awhile, they may do so without fearing that they will hold back the rest of the class. Through online courses, students can earn their diplomas more quickly, or repeat failed courses without the embarrassment of being in a class with younger students. Students also have access to an incredible variety of enrichment courses in online learning, and can participate in college courses, internships, sports, or work and still graduate with their class.

Virtual classrooms can often use a mix of information and communication technologies. Participants in a virtual classroom can use emoticons to communicate feelings and responses to questions or statements; they can 'write on the board' and even share their desktop. Other communication technologies available in a virtual classroom include text notes, microphone rights, and breakout sessions. Breakout sessions allow the participants to work collaboratively in a small group setting to accomplish a task, as well as allow the teacher to have private conversations with individual students.

In addition to virtual classroom environments, social networks have become an important part of e-learning. Social networks have been used to foster online learning communities around various subjects. Mobiles, such as handheld computers and cell phones, can be used to assist in such things as language learning. It is generally considered that schools have not caught up with the latest social networking trends.

[11] eGovernance@city: Integrated Solution for Mumbai City Management, Siemens Corporation, August, 2007. Also see "City Portal Reference, Municipal Corporation of Greater Mumbai, Siemens Corporation: http://www.citylabs-live.com/Portal/ref/ref_mumbai.pdf

2.4 MORE EFFICIENT MANAGEMENT OF URBAN TRANSPORT

Urban transportation systems have seen some of the most active areas of deployment of ICT, particularly through mobile devices that citizen users can easily access, such as cell phones. Cell phone alerts can provide information on public transit route and schedule changes, while e-payment options for handheld devices including phones can make transit ticket purchases and payment discounts more convenient.

Social media, such as Twitter for instance, are being used to enable ridesharing for taxis and other forms of transportation. Korean municipalities are particularly active in the deployment of ICT technologies as a means of enhancing energy efficiency of urban infrastructure. The Gangnam-gu district of Seoul, home to corporate headquarters, multinationals and information technology venture firms, first adopted a carbon mileage system that can be used through mobile devices and is now pioneering other innovative service provisions for reducing corporate and personal carbon footprints via wireless technologies. These technologies are best implemented or adopted, in the case of social media, by urban and regional transit management agencies.[12] A case study on the application of information and communication technologies to traffic demand management is found in Chapter 4 on Sustainable Urban Transport.

Smart Transportation System – Shanghai[13]

Shanghai, host of the 2010 World Expo, is making a concerted effort to harness ICT to manage data connected to the city transport network. The city is committed to developing a "smart" transportation sector. Efforts are focused around three major projects:

*Electronic ID management system***.** One major headache for public transportation management in Shanghai has been the rampant spread of unlicensed taxicabs. To combat this and to better monitor public transport, the city has issued smart ID license tags and cards to most of the city's 180,000 public transportation vehicles, 48,000 taxis and 180,000 transport workers. All major transport stations and vehicles are now equipped with smart card readers in order to prevent the forgery of transport licenses and the operation of unlicensed vehicles.

*Public transport smart cards***.** Smart integrated circuit (IC) cards are widely used by the public in Shanghai for public transport, as well as for purchases in some retail stores. The city uses the data captured by usage of the smart IC cards to improve the collection of passenger flow information. This is achieved by integrating card readers with GPS tracking, so that city transportation office can understand the pattern of passenger flow.

*Bus smart information system***.** Under this system, Shanghai's city buses have devices on them that allow real-time communication between the vehicles, operators and bus stops. This enables the operator to monitor usage and vehicle position as well as passenger flow and other data, such as fuel consumption. GPS data for each bus is fed to the operator's

[12] "Managing Asian Cities: Sustainable and Inclusive Urban Solutions," Asian Development Bank, 2008, p. XI

[13] "ICT for City Management," Economic Intelligence Unit, 2010, p.64

information system and disseminated by an exclusive digital broadcasting signal. Information screens on the buses and at bus-stop signs relay scheduling news, predicting how long a wait before the next bus arrives.

2.5 REDUCING THE DIGITAL DIVIDE

As an urban manager in a developing country, a first priority should always be increasing access to ICT services by investing in the expansion of ICT infrastructure (broadband and wireless networks). Increasing access to ICT services reduces the digital divide and has positive impacts on lifting the incomes and providing access to financial services of impoverished families. Mobile phones have become the primary means for global ICT connectivity, with over 5 billion[14] subscriptions to mobile phone services as of 2010, according to the International Telecommunications Union (ITU). One study estimated that increasing the number of mobile phones per 100 people by just 10 increases GDP growth by as much as 6 per cent in developing countries.[15] In Africa, for instance, mobile phones are used to transfer money instantly for those who don't have bank accounts. Through such an electronic credit system, the poor in Kenya are buying high-efficiency stoves through their mobile phone electronic credit or they can receive deposits for goods sold to city markets. The cell-phone-based Carbon Micro Credit system uses unique identifiers to allow millions of developing world families to claim on a bi-weekly or monthly basis carbon offsets they produce by using more efficient cooking methods such as a modern charcoal stove or solar cooker, instead of using polluting cook stoves burning firewood or organic material.[16]

2.6 DIGITIZATION OF LAND REGISTRATION AND INFORMATION SYSTEMS

As discussed in Chapter 2, Delivering *Effective Urban Management*, land registration and information systems require urgent improvement in many developing nation large cities. ICT holds promise in providing developing nation cities with new ways to track, store and manage this critical information. In Asian cities, for instance, more than 50 per cent of urban populations live on land where title is disputed or unknown. With GIS system information, planners have access to rich information on natural resources (wetlands, vegetation types and geological formations, including potential hazard zones) and human activity (illegal settlements, construction, and encroachment). When digitized land registration systems are combined with frequently updated data from geographical information systems (GIS), disparities in land title, zoning and observed land uses can be better understood, reconciled and updated. Planners can then ultimately act based on more current and accurate information. The entities leading in the

[14] http://www.itu.int/net/pressoffice/press_releases/2010/06.aspx

[15] "One cell phone per child," Dan Costa, PCMag.com, 1 May 2009: http://www.pcmag.com/article2/0,2817,2344283,00.asp

[16] "Transforming the African brand through sustainability," Richard Seireeni, *The Huffington Post*, 7 May 2010: http://www.huffingtonpost.com/richard-seireeni/transforming-the-african_b_199242.html

implementation of these technologies might include metropolitan, regional and state land and transportation planning entities.[17]

3. CASE STUDIES

3.1 SINGAPORE DIGITAL MASTER PLAN 2015[18]

Singapore has launched a ten-year information and communication master plan that will propel the nation into the future with a line-up of activities and goals that spell benefits for its citizens, businesses and global partners. The vision is to turn the country into an Intelligent Global City, powered by information and communication technologies. It will change the way Singaporeans live, learn, work and play.

Minister for Information, Communications and the Arts, Dr. Lee Boon Yang states that, "Innovation, integration and internationalisation are the basis of the master plan. The capacity to innovate and create new business models, solutions and services will enable Singapore to be more competitive in a globalised environment. Equally important is the ability to integrate resources and capabilities for economic progress and digital opportunities for all Singaporeans."

The master plan was developed with broad participation of government, citizens, educators and the business community. A steering committee chaired by the Information and Communication Development Authority (IDA) with representatives from the ICT industry, sectors like education, healthcare, manufacturing & logistics, finance, tourism & retail and digital media, as well as the government, are guiding the implementation of the plan.

The goals of the plan are ambitious. It wants Singapore to be No. 1 in the world in harnessing ICT to add value to the economy and society. It wants to achieve a two-fold annual increase in value-added[1] to the economy of the ICT industry to S$26 billion. It aims for a three-fold increase in ICT annual export revenue to S$60 billion. It aspires to create 80,000 new additional jobs. Finally, it aims for at least 90 per cent of homes using broadband, and 100 per cent computer ownership for all homes with school-age children.

The master plan is not only about economic competitiveness. It also explores ways to ensure that the elderly, less-privileged and people with disability can also enjoy connected and enriched

[17] "Managing Asian Cities: Sustainable and Inclusive Urban Solutions," Asian Development Bank, 2008, p. XI

[18] This case study was summarized from information available at http://www.ida.gov.sg

lives or self-improvement and life-long learning. This helps bridge the digital divide and creates opportunities for all.

To achieve the targets, the master plan outlined four key strategies:

1. to spearhead the transformation of key economic sectors, government and society through more sophisticated and innovative use of ICT;

2. to establish an ultra-high speed, pervasive, intelligent and trusted ICT infrastructure;

3. to develop a globally competitive ICT industry; and

4. to foster a savvy ICT workforce and globally competitive ICT manpower.

In harnessing ICT technologies for the key economic sectors, activities will be directed to enhancing healthcare, education, tourism and e-government and to provide seamless delivery of financial services and supply-chain management.

The Next Generation National ICT Infrastructure is under construction and will be completed by 2012. It will be capable of delivering broadband speeds up to 1 Giga byte per second and will offer pervasive connectivity around the country. The infrastructure will enable a host of new broadband-enabled services and applications, such as immersive learning experiences, telemedicine, high definition TV, immersive video conferencing and grid computing.

To develop a globally competitive ICT industry, initiatives are strengthening the domain and technology capabilities within the industry. Local ICT enterprises are being supported for expansion and growth into overseas markets. Efforts are providing networks and market intelligence. The focus is on providing ICT solutions and research and development.

To support the growth of the economy and the ICT industry, the ICT competencies of the general workforce are being raised. Techno-strategists who have both the technical and business expertise are being groomed to achieve business and organisational goals through the strategic and innovative use of ICT. Incentives and other initiatives are in place to attract the best students from schools to take up ICT as a career.

Education

In the education sector, the goal is by 2015 for all schools to be competent users of information and communication technologies in education. Efforts to enhance education include three components. The iACCESS component will provide pervasive and cost-effective ICT access for learning anytime, anywhere. The iLEARN component will provide interactive digital resources for independent learning. The iEXPERIENCE component will empower learners through collaborative, intelligent applications that are adaptable to different learning styles.
Fifteen to twenty per cent of schools will be designated as *Experimental Schools*. They will be the ones to trial innovative applications of ICT in teaching and learning. Another five per cent will be identified as *Schools of the Future*, as they will maximize the use of information and communication technologies to empower education, to raise the bar in technology use.

Digital Media

The master plan will support Singapore's efforts to become a global centre for digital media. (See case study in chapter on science, technology and innovation). It focuses on developing Singapore into a centre for the creation and commercialisation of digital media exchange technologies, and making available technologies and platforms for media and entertainment companies to create content and services. It aims to provide core services for storing, trading and distributing digital assets; and providing the infrastructure for the processing, management and delivery of digital entertainment content and services. An early focus will be on research and development and these efforts will be supported by a technology and resource centre that initially targets game developers and animation studios.

Healthcare
The master plan aims to accelerate the transformation of the healthcare sector through an ICT-enabled healthcare delivery system, to achieve high quality clinical care, service excellence, cost effectiveness and strong clinical research. The plan will help move the focus from the treating of diseases to its prevention, health promotion and wellness care. It will empower the public to keep closer tabs on their health through accessibility to personal health records and relevant health information. It will adopt an integrated and patient-centric system of healthcare, away from the current fragmented kind of care. It will strive towards the widespread usage of ICT systems that can analyse test results and quickly offer doctors the relevant medical information for treatment, based on widely-accepted guidelines. It will try to speed research to improve clinical care and outcomes by transforming biomedical research to healthcare delivery. It will help hospitals, clinics, patients and care providers to work together in an integrated and coordinated manner, enabling holistic care. Patients will be empowered to manage and monitor their health at home. Through remote monitoring solutions, patients with chronic diseases can stay connected to their healthcare provider and/or family members.

Supporting industry and logistics
The master plan also focuses on raising the operational competitiveness of the manufacturing and logistics companies in Singapore through innovative use of ICT. It strives to enhance efficiency of supply chain infrastructure, such as ports and an information exchange platform for international trade. By doing so it seeks to attract international companies' regional / global supply chain management operations to Singapore.

Companies can tap an *adaptive supply chain programme* to pilot new supply chain processes and technologies, and to develop local expertise in order to better reach their regional network. The programme also aims to provide better integration between them and their suppliers, service providers, customers and partners in Singapore. It also seeks to anchor global/regional supply chain management of manufacturers and logistics companies in the city. The *tradeXchange programme* aims to link up currently disparate national trade information systems into an integrated national platform, making the exchange of such information highly efficient and cost-effective. This will make it easier to carry out international trade from Singapore. Finally, an *Infocomm@Airport/Seaport programme* aims to give Singapore's sea- and air-ports, an advantage over their competitors through new

ICT-enabled services. For example, ICT will be used to enhance the security of cargo flow through Singapore and improve the information linkages between port operators and their users.

Financial Services

The digital master plan is also helping to develop Singapore into a trusted financial gateway to Asia by establishing Singapore as a centre for ICT innovation in financial services. I-wealth Management is a programme to strengthen Singapore as a wealth management hub of Asia. ICT will enable innovation and build new capabilities in front-end customer service and advisory services, middle office management and back office operations. Next Generation e-Payments is a programme to develop a nation-wide e-payments infrastructure to enable new payment solutions that allow greater convenience to users and open up opportunities in new market segments. Finally, corporate financial information exchange is another programme to smooth the flow of corporate information and create greater transparency. It will introduce new electronic standards in corporate reporting.

e-Government

The master plan will also increase the outreach and volume of e-government services, in particular by making them more accessible via mobile phones. A single SMS will be adopted for all Government services delivered through mobile phones. This will help gain insights into citizens' needs and preferences so that more pro-active, responsive and integrated e-services can be delivered. ICT is also being used to strengthen the Government-citizen relationship as citizens are increasingly engaged in the policy-making process. The Government Consultation Portal will be enhanced to better suit the needs of different user groups. Finally, efforts are being made to enhance Singapore's strength in e-government solutions. One of the ways is to work with local ICT companies to jointly develop and export such solutions. The relevant intellectual property rights of e-government solutions will be released to companies, where possible, for them to market these solutions abroad.

3.2 MUMBAI, INDIA -- E-GOVERNANCE

Around the world, local governments are successfully deploying public web portals providing e-government services that provide municipal information, applications, and service requests. Image credit: www.dit.mp.gov.in

The Municipal Corporation of Greater Mumbai (MCGM) instituted in 2007 a new information technology system serving its agencies and citizens. MCGM serves more than 12 million citizens, managing births and death registrations, waste, transportation, medical services, schools, medical colleges, disasters, taxes, town planning, city infrastructure, retail shops as well as social programmes.

Under the Jawaharlal Nehru National Urban Renewal Mission (JNNURM), the Indian state introduced e-governance to its municipalities to provide "single-window" city services to its citizens to increase efficiency and productivity of its cities, and to provide timely and reliable management information.[19] The system is available to the public at: http://www.mcgm.gov.in

Citizens can use the site to make applications, get service updates and lodge complaints related to solid waste management, drainage, storm water drains, roads & traffic, factories, licensing issues, water supply, pest control, and buildings.

Mumbai's e-governance system, which went live in 2007, required training of 500 employees as internal change agents as well as role-based training to 2000 employees with low IT knowledge. The single system manages operations and records for 16 water reservoirs and the city's water billing system, property taxes, human resources, fleet management, material management, 27 fire

[19] eGovernance@city: Integrated Solution for Mumbai City Management, Siemens Corporation, August 2007, also see City Portal Reference, Municipal Corporation of Greater Mumbai, Siemens Corporation: http://www.citylabs-live.com/Portal/ref/ref_mumbai.pdf

stations, 25 hospitals, five waste dumps, schools services, and other licenses and permitting.

An independent third-party study by the *Economic Times of India* was conducted to assess the state of e-governance and other related characteristics of India's 35 cities with million-plus population. In the category of "information" attributes, Greater Mumbai was the only city with a perfect score.

The survey examined whether information for building sanctions and drainage/water connections was online. It also ascertained if links exist to the Indian Right to Information Act (RTI). The survey also assessed public information system access to important locally-provided public services such as water supply, sanitation, sewerage, solid waste management, roads and street lighting, along with a map of the city and contacts for the city.

In the area of services, Mumbai was the only Indian city providing everything from a provision for online payment of property taxes, water charges, online registration of birth and death, online complaints registration, online feedback and whether provision existed for online tendering and auction.[20]

The Mumbai Municipal Government site also contained information about sustainability programmes and services, such as "Eco-housing applications," rainwater harvesting and provided participatory cultural services, such as an open source site for citizens to write about their reaction to a 2006 train bombing and the terrorist attacks of November 26th, 2008 that killed more than 150 people: http://www.mumbaivoices.com/

Lessons Learned

The portal used by Mumbai as an e-governance platform resulted from careful planning and integration across numerous city agencies, departments and customer (citizen) needs. Extensive training of employees included considerations for employees with low information technology awareness and experience, which likely served the city well in achieving better system usability with a citizen base that has anywhere from a great degree to very little information technology experience. Mumbai's information and communications technology subsequently has been recognized by an independent third party as an effective management and transactional aid as well as a cultural communications resource.

[20] "Are Our Cities ready for e-governance?," *The Economic Times of India*, 7 January, 2010: http://economictimes.indiatimes.com/news/politics/nation/Are-our-cities-ready-for-e-governance/articleshow/5418281.cms

3.3 E-LEARNING VISION OF LEEDS, UK

Computer-supported e-learning is one of the most promising innovations to improve teaching and learning with the help of modern information and communication technology.

Building Schools for the Future is the name of an ambitious UK Government investment programme in secondary school buildings. As part of that programme, the City of Leeds has developed an e-learning vision, known as "Entitlement for All". It states that through e-learning students are entitled to:

- an appropriate range of online educational services;
- 24 hour access to those services from any location;
- high quality, stimulating and challenging educational resources;
- a safe and supported ICT environment;

- technologies that free the user; and
- assurances that the e-learning programme will be continuously reviewed and improved.

These building blocks shaped the approach to engagement with all partners. The key partners in the e-learning programme are Education Leeds, RM Education PLC, E4L, Leeds City Council, students and staff. Education Leeds and RM have worked effectively with staff and students from the outset of the project to implement the entitlements in the programme.

Engaging stakeholders

In 2007 over 300 students and school staff took part in a Leeds Better Schools for the Future Design Festival. They spoke with ICT specialists, architects, interior designers and construction leaders to explain their vision and what they would like to see in their school. There was considerable experimentation with new technologies for learning such as games consoles and a range of mobile devices. This produced interesting results that showed that although students were attracted to and found useful applications for iPods, game consoles and video recorders, they mainly preferred laptop computers to support their schoolwork. Students and teachers were able to identify the positive impact of the various electronic devices on learning. It also allowed the schools and experts to make informed decisions when developing ICT solutions. The impact of student engagement in one project with young people with autism was instrumental in developing a different approach to the use of technology in their lessons, particularly in developing the ICT skills of the staff.

Training and professional development

Training for all users is essential to optimising the e-learning strategy and to ensuring that all are equipped with the skills necessary to make best use of the technology available. Innovative student training programmes enhance ICT capability and allow students to achieve accreditation for key ICT skills, thus enhancing employment opportunities. A comprehensive programme of continuing professional development for all educational staff has been built into the ICT programme. This allows educators to improve the quality of learning and to develop innovative approaches to teaching; it also enables staff to have the confidence to adapt to learners' needs.

ICT in action

The ICT solution for Leeds is actually a range of focused solutions tailored for each school. It utilizes the very latest technologies such as an electronic whiteboard which was still in development when it was selected. To make sure that students in Leeds had the opportunity to use this technology, partners worked together with the manufacturer even before the final specification was complete.

The ICT solutions employed by the schools focus on adaptable technologies that support the curricula in all subject areas and throughout the school. Students benefit from a range of technologies including Apple computers, Windows-based PCs, laptops, data loggers, voice recorders, cameras and anything that will promote effective teaching and learning.

The ICT programme is meant to ensure continuous innovation and exploratory use of ICT solutions to provide a more flexible education. Each school is evaluated annually to ensure that the ICT solutions are at the forefront of 21st century technology. All schools have adaptable learning areas with 'breakout spaces' and lightweight partitions. This 'anytime, anywhere' approach gives teachers the confidence to adopt a wide range of teaching styles to promote personalised and independent learning experiences for students.

LCD screens positioned around each school provide up to the minute communication systems and electronic timetabling to ensure flexible and efficient use of learning spaces. The 'show and tell' spaces at some schools have integrated electronic recording and transmission equipment. This challenges students to exploit the technology and work collaboratively to produce and record presentations of their work according to modern workplace standards.

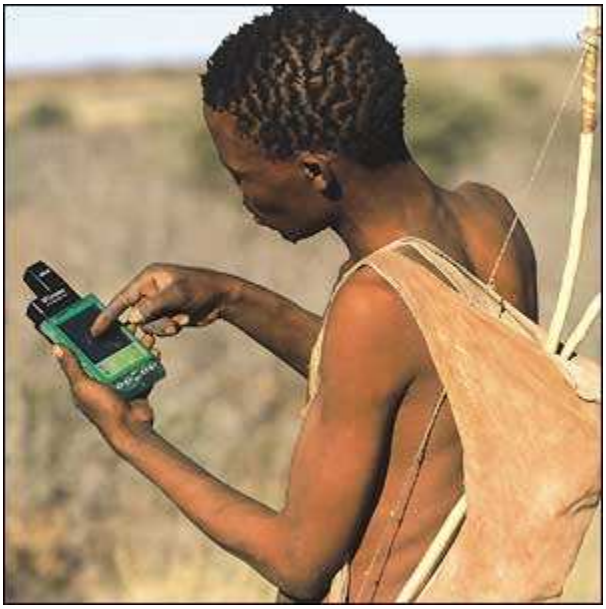
Lessons learned

Leeds' approach to ICT in education led partners to rapidly expand the programme from a few pilot schools to all schools in the City. Originally targeted to high schools, the programme has expanded to provide tailored solutions for primary schools, as well.

Staff and student satisfaction with the ICT solution is extremely important to the Leeds programme and a mechanism is in place to formally evaluate satisfaction twice a year. Online survey work is conducted with staff and students to test changes in attitude and satisfaction. Feedback to date has been highly positive.

A key factor in the Leeds success was the fact that the school system partnered with leading technology providers having active corporate social responsibility programmes that were committed to enhancing education in the city. Actively engaging the students and teachers in the selection and application of technologies ensured their strong interest in the programme. While the benefits of ICT to business are well known, its applications and innovations for education are only now starting to be realized.

3.4 MOBILE PHONES: BRIDGING THE DIGITAL DIVIDE IN AFRICA[21]



In Africa, mobile phones are used to access market information and to transfer money for those who don't have bank accounts.

The International Telecommunication Union (ITU) estimates that there are 3.3 billion mobile phone subscribers worldwide.[22] According to industry estimates, there are now more than 500 million mobile phone subscribers in Africa, up from 246 million in 2008.[23] In developing countries, mobile phones have revolutionised the lives of millions of urban and rural poor by connecting and involving them in viable economic activities. Mobile telephony is affordable, scalable, self-sustaining and empowering.

Mobile phones provide a wide range of services at a reasonably low cost. Handsets cost between US$40-50. Airtime is also affordable – this is why prepaid services are so popular in Africa. If one person in a village has a mobile phone, others can use it – a mobile phone is not necessarily confined just to one person.

[21] Summary of an article by Roxanna Samii, Manager, Web, Knowledge and Distribution Services, International Fund for Agricultural Development (IFAD)

[22] www.itu.int/ITU-D/ict/publications/world/world.html

[23] http://www.mobilemonday.net/reports/MobileAfrica_2011.pdf

Mobile telephony has contributed substantively to reducing the digital divide – something other ICTs such as computers did not manage to achieve. Mobile telephony is providing timely, localised and relevant access to information, which has helped reduce production and transaction costs. For example, poor rural people use mobile telephony to receive commodity price information via mobile phone text messages, or Short Message Service (SMS), to gather market intelligence so that they can make targeted trips and save on travel and transportation costs. Mobile phones are also being used to provide medical services such as using SMS to remind patients of medical appointments and vaccinations or to disseminate information about sexually transmitted diseases and to monitor patients.

Rural connectivity: a revolution within a revolution

A recent World Bank study states that 'there is a myth that the rural poor are not able or not willing to pay for mobile telecommunication services'.[24] Observations in the field are that mobile phone accessibility is helping to facilitate previously marginalised groups to take a more active part in the economic and social spheres of their communities and beyond; this includes women, landless workers, herders, fishers, small-scale farmers, indigenous peoples and illiterates with no access to basic services. Many poor rural households now spend 4–8 per cent of their income on mobile telephony.[25]

The liberalisation of the telecommunications sector supported by sound regulatory mechanisms can open the market to competition. This is taking place across Africa; it has encouraged private sector investment and increased competition among different operators. As a result, consumers are benefiting from better services at better rates.

Prepaid subscriptions, the 'pay as you use' business model, offers numerous advantages to poor people. Almost 90 per cent of African mobile phones use this option. There is no formal registration or waiting list. The user does not need to submit financial and physical data, and s/he can control costs, especially when savings and incomes are low. Most importantly there is no need to present a credit history.

Mobile phones and small businesses

Mobile phones have spearheaded a host of new and innovative income-generating activities for small businesses. These include recharging mobile phone batteries, selling prepaid cards, renting out phones and/or airtime and other services such as reading and sending SMS messages. In Africa and elsewhere, occasional labourers put up adverts in centres with a mobile phone number to offer services, or subscribe to receive job alerts via SMS from unemployment centres. Mobile phones can also minimise travel costs allowing people to move when there is a concrete

[24] Bhavnan, A., Won-Wai Chiu, R., Janakiram, S., Silarszky, P. (2008). *The role of mobile phones in sustainable rural poverty reduction*. World Bank.

[25] Hammond, A., Kramer, W J., Tran, J., Katz, R., and Walker, C. (2007). *The Next 4 Billion: Market Size and Business Strategy at the Base of the Pyramid*. World Resources Institute (WRI) and International Finance Corporation (IFC).

economic opportunity. A 2005 London Business School study found that 'for every additional 10 mobile phones per 100 people, a country's gross domestic product (GDP) rises 0.5 per cent.'[26] In many African countries, 85-95% of small businesses rely solely on mobile phones for telecommunications.

Mobile phones and access to market information

Small producers trading in rural areas in Africa face enormous challenges such as lack of access to reliable and up-to-date market information, poor transportation infrastructure and competition. Small producers are vulnerable to unscrupulous traders and middle-men giving them prices at below-market rates. Producers may be reluctant to diversify into different products for fear of not finding a profitable market for their output. The relatively affordable airtime of mobile phones has made transfer and exchange of information easier. Information dissemination happens either through structured services and subscriptions, such as Tradenet.biz and Zambia SMS Market Information Service, or through unstructured and informal use of mobile phones – and by blending formal and informal services.

Cellular banking: the bank of the urban poor

Mobile phones are now providing 'cellular banking' to 'unbankable' clients. For example, millions of poor rural people now use their mobile phones to send money home and to deliver micro credit loans where there are no banking facilities. According to the Consultative Group to Assist the Poor (CGAP), approximately 1.5 billion mobile users in developing countries have little or limited access to formal financial services.[27] With limited formal banking infrastructure there are fewer options to transfer money and access banking services. CGAP argues that the mobile phone can provide a low-cost alternative to banking via the Internet, cash machines or point-of-sale, cutting costs by up to 50 per cent. Micro credit and microfinance institutions have enough evidence to unleash the potential of cellular banking and start creating 'branchless banking channels using mobile phones.'

SMS Market Information Service, Zambia

The International Fund for Agricultural Development supports the Smallholder Enterprise and Marketing Programme (SHEMP) in Zambia. Working with the Zambia National Farmers Union (ZNFU), it identified the need to provide market intelligence to farmers. In August 2006, the programme introduced an innovative, simple and cost-effective way to access commodity prices, using an SMS Market Information Service. The service provides weather information, business news, up-to-date market prices, and lists buyers for 14 major commodities in a cost-effective, accessible and reliable manner. For those with Internet access, the system is also supported by a website.[28]

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[26] Waverman, L., Meschi, M. and Fuss, M. (2005). *The Impact of Telecoms on Economic Growth in Developing Countries*. London Business School: London

[27] www.cgap.org

[28] www.farmprices.co.zm

To obtain the best prices for a commodity, farmers simply send an SMS message containing the first four letters of the commodity name to 4455. Within seconds, they receive a text message with the best prices by buyer using abbreviated buyer codes. To get best prices in a specific district or province, farmers simply include the province/district code after the commodity code. The farmers then send a second SMS message with the selected buyer code to 4455. A text message is sent back with the buyer's contact name and phone number, the company name and address and simple directions for reaching both. Farmers can then call the contact and start trading. The farmers pay US$0.15 for each text message.

This popular market intelligence system is empowering farmers to negotiate deals by offering time-sensitive information and fostering transparency in pricing. SHEMP and ZNFU continuously update prices on a daily and weekly basis. To ensure sustainability the system is managed by local institutions. They also conduct public advocacy activities to attract corporate sponsorships. Over 100 traders and processors are now providing weekly price updates. Website visits and the number of SMS messages are continuously increasing. For example, in 2007 between February and June, 520 weekly SMS messages were exchanged. Between July and August that number increased to over 1220 weekly messages.

Lessons learned

It is now apparent to policy makers and development agencies that, of all ICTs, mobile phones have the best potential to stimulate growth in Africa – and that investing in mobile services can contribute to both economic and social development. Phone manufacturers and service providers now recognise that the poorest people have turned out to be one of their biggest markets.

Mobile telephony has not only helped bridge the digital divide but has been a catalyst to eradicate rural poverty and improve the livelihoods of the marginalised and poor. To truly make mobile telephony the first universal access ICT there is a need to:

• put in place sound ICT policy in collaboration with government, civil society, private sector actors and consumers;

• invest more in mobile infrastructures and services in rural and disadvantaged areas;

• strengthen the capacity of rural entrepreneurs and farmers' organisations to better exploit the potential of mobile phones;

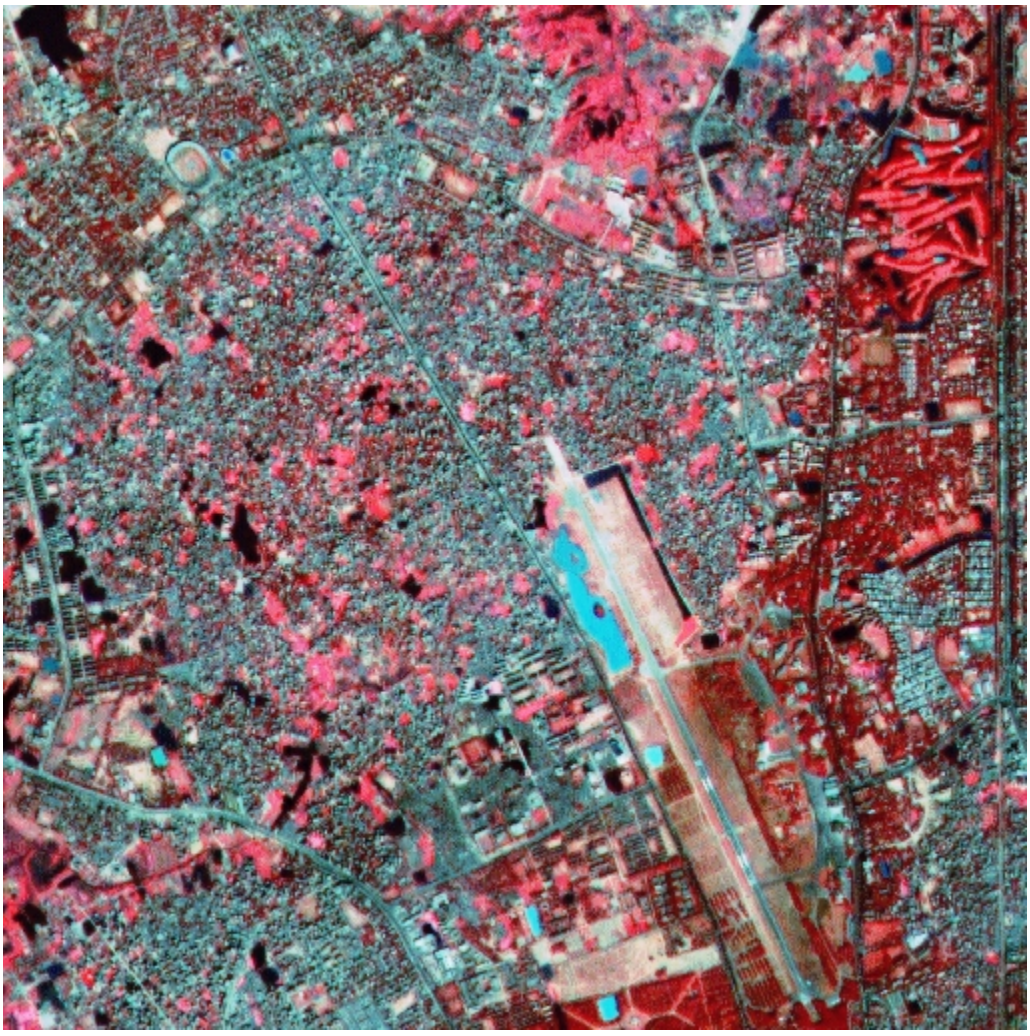
• deliver relevant and timely content and further develop peer-to-peer information systems;

• reduce both airtime and handset prices; and

• put in place better and enabling regulations to allow mobile services to thrive and expand.

The most successful systems are those offering two-way communication rather than the simple delivery of information, enabling farmers to sell products directly. Also important is the teaching component. Market information is only useful if farmers know how to use it.

3.5 DHAKA, BANGLADESH -- MONITORING LAND USE AND LAND COVER CHANGE USING REMOTE SENSING



With remote sensing and geographic information systems, planners can better map and manage natural resources and human activity related to land use such as illegal settlements, construction, and encroachment. Photo credit: www.nrsc.gov.in

In an increasingly urbanized world, monitoring and mapping urban growth, and its land-use and land-cover change impacts, are of growing importance in developing countries. Land use/cover changes due to human activities are often occurring rapidly in developing countries, and it has been projected that by the year 2015, most of the world's large cities will be in developing

countries.[29] Remote sensing can reveal growth trajectories of cities, which provide a better understanding of the impacts of urbanization on ecosystems and ecosystem services, as well as socio-economic risks from unregulated and unplanned settlements.

Urbanization is one of the most widespread man-made causes for the loss of arable land, habitat destruction and decline in natural vegetation cover. Though urban areas cover only about three per cent of the Earth's land surface, they have a significant impact on environmental conditions at both the local and global scales, including climate change.[30]

The mapping of urban areas remains one of the most challenging tasks of remote sensing data analysis. This case study[31] examines an approach to using digital imagery and communications technologies to monitor and measure Dhaka's recent urban growth. Dhaka was the fastest-growing large city in the world in 2007, with an annual growth rate of 3.3 per cent forecast from 2005 to 2010.[32]

The study examined maps and analyzed urban growth from multi-sensoral data for the Dhaka large city region between 1990 and 2006. The approach is widely applicable and could potentially facilitate regional urban growth maps in similar complex and dynamic environments. Dhaka's dense urban landscape, its river delta location and the highly dynamic monsoon-related climate call for a sophisticated analysis approach that is able to separate seasonal land-cover variations from urbanization.

Land-use and land-cover analysis is critical to addressing the environmental and socio-economic sustainability of Dhaka, as it has been negatively impacted by rapid growth resulting in widespread environmental and social challenges. Unplanned urbanization has been exacerbated by extensive poverty and substantial growth of urban slums, which has led to exploitation of natural resources and mismanagement of limited land resources, including arable land and wetlands. Meanwhile unplanned slum settlements in wetlands have been besieged by recurrent episodes of flooding that may become more common with the impacts of climate change.

Imagery from the Landsat series of satellites is a useful asset for such an analysis due to its comprehensive coverage of large urban areas as well as its unique historical archives. The study incorporated images over time for each monitoring year (1990, 2000, and 2006). The resulting

[29] "World population monitoring, focusing on population distribution, urbanization, internal migration and development," United Nations Economic and Social Council, January, 2008, pp. 12-13

[30] "Monitoring land use and land cover change using remote monitoring," Ashraf M. Dewan, Yasushi Yamaguchi *Applied Geography, Volume 29, Issue 3, July 2009, Pages 390-401*

[31] Ibid.

[32] "World population monitoring, focusing on population distribution, urbanization, internal migration and development," United Nations Economic and Social Council, January, 2008, p. 15

datasets reveal spatial-temporal patterns of urban land-use and land-cover changes. Derived land use/cover maps were further validated by using other high-resolution images and field data.

The study methodology successfully mapped relevant land-cover classes and resulted in overall accuracies better than 83 per cent for all years considered. Analysis of land-use and land-cover changes revealed a profound expansion of urban areas at the expense of prime agricultural areas and wetlands. During the 1990s, change was primarily characterized by a densification of urban settlements. More recent changes included vast in-filling of low lying land. The analysis revealed that substantial growth of built-up areas in Greater Dhaka over the study period resulted in a significant decrease in the area of water bodies, cultivated land, vegetation and wetlands. Urban land expansion has been largely driven by elevation, population growth and economic development. Rapid urban expansion through infilling of low-lying areas and clearing of vegetation resulted in a wide range of environmental impacts, including diminished habitat quality.

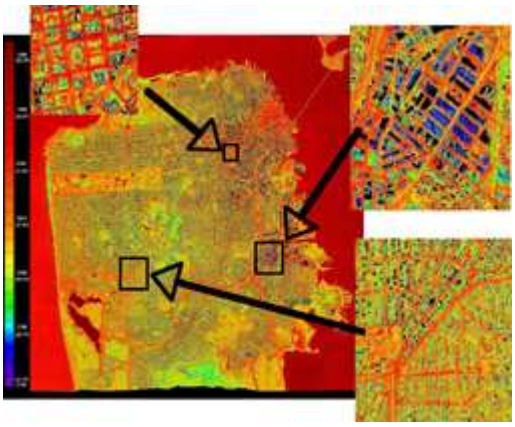
The maps showed that between 1960 and 2005 built-up areas increased approximately 15,924 hectares, while agricultural land decreased 7,614 hectares, vegetation decreased 2,336 ha, wetland/lowland decreased 6,385 hectares, and water bodies decreased about 864 hectares. The amount of urban land increased from 11 per cent in 1960 to 344 per cent by 2005. Similarly, the growth of landfill/bare soils category increased by 256 per cent in the same period.

The study's quantification of land use/cover changes over the 45 year period for the Dhaka Metropolitan area constitutes a valuable resource for urban planners and decision makers to devise sustainable land use and environmental plans in this fast-growing city. As reliable and current data were previously lacking for Bangladesh land use, the land use maps produced in the study could contribute to both the development of sustainable urban land use planning decisions and also for forecasting possible future changes in growth patterns. These data are useful in modelling risks associated with potential climate change impacts, such as flooding during monsoon season and rising sea levels.

Lessons Learned

As fast-growing large cities such as Dhaka face the increase of unplanned settlements of the poor, they will need to use ICT technologies such as time-based digital land form mapping to assess the impacts of such activities on natural resources, untitled land tenure, and community risks to natural disasters. Similarly digital mapping technologies will be a requirement for understanding how landforms and existing or historic natural resources can help guide standards, planning and management of new settlements in peri-urban areas. Finally digital mapping scenarios can help planners understand the consequences of potential climate change impacts in regard to risks such as flooding and wildfires.

3.6 ECO-MAPS IN AMSTERDAM AND SAN FRANCISCO



An urban eco-map is a tool that empowers individual citizens to make informed choices about their daily lives and their impact on their urban environment. Photo credit: www.nasa.gov

Amsterdam and San Francisco, California instituted in 2009 an interactive online Eco-Map (http://urbanecomap.org/), developed by an international business services corporation and other partners, which provides citizens with data and information related to greenhouse gas emissions by neighborhood and by different industry categories (transportation, electricity, waste).

Eco-Map data displays are also linked to city agency programmes aimed at reducing greenhouse gases, such as online destination transit system planning tools and maps of city and bicycle-coalition recommended bicycling routes. In San Francisco, the map is linked to a portal of real-time information on bus and tram scheduling and logistics, so users can see when the next bus or train is scheduled to come to their location, and when it is expected to actually arrive.

Citizens can view their neighbourhood data through visual displays summarizing greenhouse gas emission results from transportation, energy and waste categories. This information enables individuals or even neighbourhoods to set goals and take specific actions to reduce their climate change emissions using approaches such as alternative-fuel vehicle ownership, recycling, and reducing household energy use.

The Eco-Map provides estimates of carbon emission reduction results from such transportation-related activities as biking or walking to work, using public transit, car sharing and commuting outside peak traffic hours. Greenhouse gas reductions and energy savings in the home — customized from city utility data — are provided for actions such as turning off electronic devices, using energy-efficient appliances, turning down heating and cooling, and minimizing usage of clothes dryers.

Users can prioritize their personal efforts through approaches that are either low cost, low effort or high impact. The Eco-Map facilitates sharing of specific low-carbon actions that people have

taken through social networking capabilities, such as publicizing personal results through Facebook,[33] Twitter,[34] and Flickr.[35] Users can see profiles with photos, videos and other information from other users of the map.

The Urban Eco-Map pilot in Amsterdam is a cooperative initiative between the city of Amsterdam, Amsterdam Innovation Motor (AIM), Amsterdam Smart City, and the Swiss Federal Institute of Technology Zurich. In San Francisco, the Eco-Map is sponsored by the City and County of San Francisco, the San Francisco Department of the Environment, the National Aeronautics and Space Administration (NASA) and corporations from the private sector.[36]

Lessons Learned

The Eco-Maps developed by San Francisco and Amsterdam provide a way to engage citizens and other interested parties (journalists, subject matter experts, academics) in climate change mitigation on the familiar basis of city neighbourhoods as well as personal activities. Through the creation of linkages with related city services that help reduce carbon emissions, particularly public transportation schedules and route information, users are provided a practical and utilitarian context for how their own actions can impact climate change. Linkages from the Eco-Map to social media enable users to follow updates from other users, creating a shared community for citizens, business and government collaboration.

[33] http://www.facebook.com/group.php?gid=75025872489

[34] http://twitter.com/urban_ecomap

[35] http://www.flickr.com/photos/urban_ecomap/

[36] "Urban Eco-Map," accessed 20 August 2010: http://urbanecomap.org/

4. BETTER CITY, BETTER LIFE: SUMMARY OF POLICY OPTIONS FOR ICT FOR SMART CITIES

Strategy 1: Enable executive decision-making support	
Policy Option 1	Invest in integrated management information and decision support systems that can assist city authorities in managing the growth and changes within a city based upon key performance indicators related to areas such as traffic, environment, and finance.
Policy Option 2	Institute policies, programmes, and projects supporting ICT, such as high-speed internet access, use of digital storage and media, teleconferencing, and telecommuting.
Strategy 2: Shift toward e-governance	
Policy Option 3	Provide public access to city services, records, plans, departments and city government workers through a government web portal. The portal can also provide information on the city's laws, regulations, institutions and policies.
Policy Option 4	Enable e-planning approaches to complement physical urban planning meetings and feedback mechanisms in order to enhance public participation and social inclusion, wherever feasible.
Strategy 3: Support e-learning programmes	
Policy Option 5	Develop a collaborative programme for e-learning that engages students, educators, and local technology providers and that aims at providing challenging educational resources that are available to students 24 hours a day.
Strategy 4: Reduce the digital divide	
Policy Option 6	Reduce barriers to region-wide or city broadband internet and mobile telephony implementation, in order to provide an enabling environment for private sector investment in ICT infrastructure and to thereby bridge the "digital divide".

Policy Option 7	Adopt social equity as a planning and design criteria in the design, development and implementation of information and communications technologies. Provide appropriate access to ICT at lower cost for low-income citizens, the elderly, illiterate and disabled.
Strategy 5: Utilize ICT for transport management practices	
Policy Option 8	Adopt Intelligent Transportation Systems , such as electronic fare and road user charging systems, transport control centres, and real-time user information, when applicable.
Policy Option 9	Provide access to public transit system information, including service changes, schedules and maps. Provide alerts for outages, including mobile devices.
Policy Option 10	Develop online or mobile device payment access for public transportation, tolls, parking and metro congestion management systems.
Strategy 6: Use ICT to strengthen urban management, monitoring and emergency services	
Policy Option 11	Use ICT to establish an environmental monitoring system in order to monitor pollutant emissions and air quality, and to track hazardous materials.
Policy Option 12	Use ICT to enhance public safety and reduce response time to emergencies, such as fires, natural disasters and crowd control.
Policy Option 13	Adopt ICT digital land use monitoring (satellite technologies) and land use and zoning registration policies for economic development, urban planning and natural disaster risk management.

5. LINKS FOR FURTHER INFORMATION

http://www.slideshare.net/itsgowri/wwf-low-carboncities
"Reinventing the City: Three Prerequisites for Greening Urban Infrastructures" WWF International (in conjunction with Booz & Company), Gland, Switzerland, 2010

http://www.itm-power.com/cmsFiles/media/TimesRaconteur_010610.pdf

"Raconteur on Smarter Cities," Raconteur Media, London, 1 June, 2010

http://www.smart2020.org/
Website for The Climate Group, Metropolis and Cisco: "Smart 2020 Cities" initiative

http://ibm.com/smarterplanet/us/en/sustainable_cities/ideas/
"Smarter Cities": IBM website on city management in transportation, water, health care and other areas using information and communications technology.

http://www.cisco.com/web/CN/expo/en/index.html
http://www.cisco.com/web/strategy/docs/scc/Digital_Urban_Renewal.pdf

http://www.cisco.com/web/strategy/docs/Is_your_city_smart_enough-Ovum_Analyst_Insights.pdf

http://www.urenio.org/2010/07/02/crowdsourcing-public-data/
"Crowdsourcing public data," Urban and Regional Research and Innovation, July 2010

http://www.slideshare.net/connectedurbandev/connected-and-sustainable-ict-infrastructure-whitepaper-presentation
"Connected and Sustainable ICT Infrastructure," Wolfgang Wagener, paper written for Connected Urban Development Conference, Amsterdam, 2008

"ICT for City Management," Economic Intelligence Unit, 2010
http://www.businessresearch.eiu.com/sites/businessresearch.eiu.com/files/Siemens_Reports_2010_FINAL%20TO%20PRINT.pdf

www.istiee.org/te/papers/N41/41_3_abs_vanGeenhuizen.pdf
"ICT applications on the road to sustainable urban transport," Marina van Geenhuizen, European Transport, n. 41 (2009): 47-61, Delft University, 2008

Tradenet: www.tradenet.biz

Zambia Market Information System: www.farmprices.co.zm

Africa Connect: www.connectafrica.net

CHAPTER 9 – FOSTERING CULTURALLY RICH COMMUNITIES

To Foster an Open and Sharing Multicultural Society, Cities should endeavour to protect tangible and intangible cultural heritage and encourage the development of multicultural Society. Like the ocean that embraces all rivers, cities should keep an open spirit and actively engage in intercultural exchanges and interactions. Cities should pursue cultural innovation based on respect for cultural traditions and the preservation of cultural diversity, so as to generate lasting momentum for urban and human development.

Shanghai Declaration on Better Cities, Better Life

1. ISSUES AND CHALLENGES[1]

Every city has a distinctive feeling of its own. Urban culture is the unique attitude that each city expresses. This attitude results from the collage of history, people and interactions that occur in urban space. Urban culture is a process that takes place in daily life and in public spaces; it is shaped by the everyday interactions that happen in streets, stores, cafés, parks, theaters and the media. As a mayor or urban leader, you are in a position to powerfully influence the expression of culture within your city.

Culture can help build the bridges on which commitment, understanding and harmony advance. To be sure, urban culture is a multiplicity of dialogues that may also lead to misunderstanding and tension. People can come into conflict about what they want to express in public spaces. Urban culture is the outcome that emerges from this process of dialogue and mediation.

Heritage and diversity are powerful elements upon which cities can rely to build an urban culture of their own. Historical and architectural heritage as well as diversity of neighborhoods and people can help create a unique urban identity. The built environment is an expression of culture in material form. Visual icons such as museums, temples, palaces, opera houses or simply streets and neighborhoods can become symbols of local identity. Diversity of neighborhoods and people is an energetic facet that cities can mobilize to enrich their urban culture.

As Mayor, you may choose to invest in the quality of the public realm in order to foster cultural interactions. Such efforts are often investments in livability, investments in where people want to be. Cultural investments can contribute to sustainability by revitalizing deprived and abandoned

[1]This chapter was authored by Jose Monroy, with valuable input and contributions from Wu Jianzhong.

urban spaces. There are fascinating experiments in which completely derelict urban spaces such as warehouses and old industrial facilities have been brought back to life through the emergence of vibrant neighborhoods, sometimes in very creative ways. Most importantly, the unique urban environments that have appeared from these rehabilitation experiences have often given birth to a whole new set of economic activities. These economic activities have generally been linked to creative industries, which combine creativity and innovation with production and consumption of cultural products and contribute to income generation.

Of significance for local governments, urban culture can play an important role in enhancing democracy. Easy accessibility to a wide range of cultural activities and amenities can contribute to social inclusiveness, especially amongst low-income groups. In this, expressions of multiculturalism in a city can be of particular importance. The processes of international and urban-rural migration encouraged by globalization have presented a new challenge for cities -- how to integrate migrants in the micro politics of everyday urban life. This has to occur in both public spaces and private institutions. Migration is most visible at the local level, where the presence of newcomers is most felt. Policymakers have to open avenues for the integration of migrants into the structure of urban life.

As Mayor, you may wish to explore the potential that culture has for achieving sustainable local economic development. This chapter will help you by analyzing three core emerging issues which confront cities when they wish to foster a unique urban culture: creative industries, historic preservation and multicultural policies.

1.1. FOSTERING CREATIVE INDUSTRIES

1.1.1. What are the creative industries?

In today's knowledge economy, market and culture are inextricably linked. Culture can have tangible economic benefits, chiefly through cultural industries. These industries are estimated to account for as much as 7 per cent of the world GDP. In the United States, where the creative industries have a strong weight in the economy, they account for 7 – 8 per cent of GDP. However, their importance in developing countries must not be underestimated. In Latin America and the Caribbean for example, creative industries contribute to 3.5 – 4 per cent of GDP.[2]

[2] Quartesan. A., Romis M. & Lanzafame F. (2007) *Cultural Industries in Latin America and the Caribbean : Challenges and Opportunities*. Washington D.C. : Inter-American Development Bank.

Governments have dedicated considerable efforts to foster cultural industries and to create policies for the development of cultural industries. The UK government has been at the forefront through the establishment of the British Industries Task Force on creative industries. It has defined the creative industries as "those activities which have their origin in individual creativity, skill and talent and which have the potential for job creation through generation and exploitation of intellectual property".[3] The most salient feature of creative industries is their ability to engage in continuous innovation of products and processes. They profit from ideas. Although definitions and the economic sectors that are included in the creative industries vary, the creative industries commonly include:[4]

- Advertising
- Architecture
- Art and antiques
- Computer games
- Crafts
- Design
- Designer fashion
- Film and music
- Performing arts
- Publishing
- Software
- TV and radio

1.1.2. Cultural Industries and Cultural Identity

The ability to successfully attract creative industries can have significant positive effects on a city. These effects are visible in the urban economic structure, through the concentration and attraction of high-level jobs and activities. But the positive effects of creative industries also come in positive externalities visible in the quality of life of the area where they are located: creative industries can contribute to enhance the cultural identity, image and prestige of an urban space.

[3] Rogerson, C.M. (2006) *Creative Industries and Urban Tourism : South African Perspectives*. Urban Forum. 17 :2, 149 – 166.

[4] List by the Confederation of British Industry: creativeindustries.cbi.org.uk.

A creative city is one where the urban environment encourages the use of creativity to conceive new cultural products and processes. It is a city where ideas are imagined, produced, exchanged and marketed. Fostering creativity not only supposes that a city can launch new products in global markets, but it also implies that a city can quickly adapt to changing competition and demand. The idea behind this is that a pleasant urban environment and a vibrant cultural life can encourage creativity.

The growth of the cultural industries symbolizes a new trend in which culture and market forces have merged to create a mixed economy where leisure, culture, innovation and creativity are both produced and consumed. In the past, the role of local governments in cultural policy and planning consisted mainly in coordinating and providing cultural activities and services. The work of local government was mainly to work with the public arts sector in order to guarantee access to culture. Today, the role of government planners in cultural policy-making has become much more complex. Since cultural products are marketed and culture has become an asset that can be capitalized, policy-makers have to operate in a more comprehensive way.

Shanghai 's Creative Industries
The City of Shanghai has taken an innovative approach to fostering a creative city. Interest in creative industries rose sharply in the 1990s, leading in November 2004 to the establishment of the Shanghai Creative Industry Center, which supports and promotes creative industries. Its ambitious goal is to build up Shanghai as the most influential creative center of Asia. Shanghai currently has 80 creative industrial clusters, covering a total spatial area of over 2.5 million square meters, with over 6,000 enterprises and more than 120,000 employees from over 30 countries. The Center focuses its supporting efforts on five areas: research & development, architectural design, cultural media, creative consulting and planning, and fashion design. The results have been dramatic. In 2010, the output value of Shanghai's creative industries amounted to almost US$ 90 billion (553 billion yuan), which comprised 9.6 per cent of the overall GDP of the city. As a result in 2010, UNESCO designated Shanghai a "City of Design".

1.1.3. How do creative spaces come to be?

The use of culture in urban planning strategies is closely linked to urban marketing and city branding. Some industrial cities that were old, grey and grim based their regeneration on the creation of high-profile cultural facilities and activities. They hoped that these efforts would bring their cities back to life by catalyzing investment and attracting people. This often involved new governance mechanisms such as public-private partnerships to manage the projects. Although examples are numerous, perhaps one of the most well-known is the Spanish city of Bilbao and the Bilbao Guggenheim museum (see case study on Bilbao in Chapter 3 - Transforming the Urban Economy).

However, despite their popularity, urban revitalization strategies based on the construction of flagship cultural mega projects have often met with mixed results. Although they have significantly improved the built environment and physical aspect of cities, cultural mega projects have not always translated into the establishment of new urban economic structures. For this reason, many policy makers are now considering a shift in urban planning strategies towards the creation of cultural incubators.[5] As opposed to planning for cultural flagship mega projects that mainly concentrate on cultural consumption, cultural incubators attempt to bridge cultural consumption and cultural production. A cultural incubator is a space where the environment is meant to encourage the conception of new ideas.

It is important to keep in mind that some of the most famous and successful creative districts were never planned. This was the case of Montmartre in Paris and SoHo in New York. They appeared spontaneously. As places ignored by planning, they started attracting informal groups of cultural producers who found appeal in the uniqueness of the neglected urban environment. So there is some thought that the very act of planning itself may destroy the creativity of a district. Cultural producers may oppose being re-located in purposely created zones where they are not in contact with other segments of society. This is because cultural producers are frequently attracted by the authenticity of marginalized areas. The idea is that creativity needs space for spontaneity, mixing and diversity.

1.2. HISTORIC PRESERVATION -- CULTURAL HERITAGE AND CITIES

The world is experiencing accelerated urbanization rates, especially in developing countries. Accelerated urbanization is having strong impacts on urban heritage. As it is often uncontrolled, urbanization can deteriorate urban space and urban environmental quality. This is due to a wide range of elements including extreme building density, standardized and monotonous building designs, loss of public space, social isolation and lack of basic infrastructure.

The preservation and promotion of heritage culture has gained increasing popularity in urban policy. In cities where the built environment is closely linked to identity, historic preservation policies are often well established. This has been the case in a number of European cities where the preservation of the built environment and cultural traditions is seen as crucial for collective memory. The particular physical aspect of a city, as well as specific traditions present in urban settings, constitute intangible culture and cultural heritage.

[5] Mommaas, H. (2004) *Cultural Clusters and the Post-industrial City : Towards the Remapping of Urban Cultural Policy*. Urban Studies. 41 :3, 507 – 532.

In order to create a unique and vibrant urban environment, the past can truly be a powerful asset. Cultural heritage is a strong representation of the past and keeps it alive in the present. Cultural heritage supports cultural identity; it is what endows cultural identity with a unique meaning that cannot be copied or reproduced. Elements of physical heritage are concrete expressions of the diversity of peoples, cultures and beliefs that coexisted in the urban setting.

Managing cultural heritage is not only a technical activity, it is a social enterprise linked with and shaped by an immense number of social processes. Cultural heritage is a driving power for innovation, dialogue, social cohesion and ultimately peace.

As a policy-maker, your challenge is to define how the past and the built environment can be mobilized to express a city's unique character and identity. Historic preservation policies must reconcile past urban forms and usages that are essential to cultural identity, with present needs and the image that a city wants to project in the future.

UNESCO promotes this approach through its work on Historic Urban Landscapes. It encourages cities to look beyond mere historical buildings and adopt an integrated area-based approach including geographical and topographical setting and how physical forms interact with social structures. Policy-making in preservation should not only encompass historic structures but all the elements that contribute to the formation of a sense of place. A unique and distinctive sense of place is an emerging issue in sustainability. In order to be truly sustainable, cities have to be designed and planned in such a way that they promote human interaction, foster cultural uniqueness and creativity, and convey a distinctive character through their built environment.

In summary, historic preservation can lead to the emergence of a unique urban identity. Innovative public spaces and architecture can create a distinctive urban character and foster civic pride. City leaders should remember that the physical aspect of cities does matter. Allowing bold architectural projects that mix local and international talent could be a powerful asset in promoting urban identity and branding. Architecture and public spaces can be important elements of cultural capital, elements that cities can use to strengthen their cultural identity and distinctiveness.

HISTORIC PRESERVATION IN TAINAN, TAIWAN

The city of Tainan in Taiwan mobilized a successful area-based approach for historic preservation policies. The government delineated 6 cultural zones for the implementation of heritage conservation. Uniquely, the heritage conservation sites were integrated with the provision of open space and parks in the city. Historical and heritage buildings as well as old streets and open space are linked to the development of restaurants, museums, shops and cultural activities. This has been a powerful force for urban rehabilitation that fosters local

culture and the local arts scene. The approach strengthens the urban fabric and protects the spatial patterns and visual corridors of heritage, and results in enhanced cultural identity.
Public support and participation are key to the Tainan preservation strategy. Beyond government policies, the strong involvement of civil society has resulted in the formulation of a coherent preservation vision. In addition, a foundation was established in order to support the conservation and adaptive re-use of cultural heritage properties. The foundation has encouraged public education and academic research on cultural heritage.

1.2.1. Historic Preservation in Developing Countries

Conservation efforts are being increasingly employed in developing countries, as they are home to about one-half of the world's designated natural and cultural heritage sites. In the 1990s, conservation in developing countries was encouraged by the growth of Cultural Heritage Tourism, a concept promoted by UNESCO. Cities in the developing world started to invest in the preservation of their old historic buildings, hoping to tap into their cultural heritage. An interesting variation in these efforts has been the emphasis on the revival of traditional crafts. Some countries have focused beyond the mere physical aspect of buildings and have targeted policies to foster traditional crafts. This has followed a rationale designed to attract international tourism, trading on the uniqueness of traditional products and the preserved cultural heritage buildings.

Broader agendas for conservation have also emerged. Governments have reevaluated their vernacular building styles and materials as vehicles for identity and collective memory. This has been the case in Singapore, where the government established conservation policies in order to preserve "shophouses", a traditional urban form in the central area of the city. Singapore has experienced rapid urbanization and development in the last decades, which has disrupted its urban form, leading to a monotonous high-rise building environment. To counter that, in the late 1970s, there was a shift from redevelopment to preservation. In 1986 the Urban Redevelopment Authority established a Conservation Master plan. Under the Master plan, special attention was given to the shophouses, as they were regarded as the most significant building forms that embodied the history of Singapore. In this way, the government expected to maintain the human-scale environment of the island as well as it ethnic-based activities.

Pingyao, China -- a UNESCO World Cultural Heritage Site

The ancient city of Pingyao situated in Shanxi Province, China, still largely retains its original city layout and the historical appearance and features of the

14th-18th centuries. In 1997, it was listed by UNESCO as a World Cultural Heritage site.

For a long time, Pingyao had been underdeveloped economically, so that in the 1980s, the local government planned to dismantle the ancient city and build a new one in its place. However, recognizing the significance of the ancient architecture, the city government decided to preserve the ancient city and build a new city adjacent to it.

Cultural heritage sites were classified and categorized as to their historical value and preservation plans were developed accordingly. The government encouraged the general public to participate in the preservation of storefronts and courtyards which were occupied by residents and were deemed functional. To spur investment, the government adopted the preferential policy of rent exemption for two and a half years. This policy successfully encouraged the investment by antique dealers and other citizens in the historic renovation of more than 400 storefronts and courtyards in 68 different locations. The government also organized the modernization of infrastructure, including electrical wiring and road paving, by means of sectoral investment, government subsidy and government direct investment.

In the course of renovation of the ancient city, Pingyao has adopted different approaches to building preservation. For example, the overall layout of the ancient city, antique building ruins, and valuable historical relics are preserved completely in their existing states and are used as museums, tourist spots or exhibits for visitors to experience history. Other historical buildings are preserved by means of retaining their original functions and usages but adapting them to the requirements of modern society. Large numbers of original folk houses in historical street blocks have been converted into inns, tea houses, restaurants and other facilities to reproduce the historical environment and atmosphere. This allows tourists to experience the early way of life and culture of the ancient city, thereby integrating cultural protection with tourism, history and education.

1.3. MULTICULTURAL CHALLENGES

1.3.1. Cities, Globalization and Migration

A unique urban identity emerges not only from the character of the built environment, public spaces and urban amenities, but also from the diversity of people. Multicultural diversity is a challenging element that adds value to cities. Growing multiculturalism boosts the fabric of cities by bringing new ideas, diversity and cultural vibrancy.

Globalization has lead to waves of migration, both urban-rural and international. The opening of new markets and the increased exchange of information, goods and capital has also facilitated the

mobility of people. It is estimated that globalization has generated the movement of 175 million[6] international migrants. International migrants often leave their home countries in the hope to have a better life in the arrival country. They are attracted by higher wages and an increased quality of life. Although the common idea is that international migrants mostly leave developing countries and re-establish in first-world countries, there are also significant flows that occur between developing countries.

For example, San José, the capital of Costa Rica, holds a considerable Nicaraguan population. Through the efforts to keep their identity in the media and cultural activities, Nicaraguans participate in the development of an intercultural identity between Costa Rica and Nicaragua, realized in the "tico-nica" culture. Similar situations, of important immigrant communities in urban areas are also present in African countries.

In Abidjan, it is estimated that 38 per cent of the local urban population is not from Cote d'Ivoire. The city draws population from neighboring countries in West Africa. However, immigrants tend to settle in slums and face marginalization and stigmatization due to labor and housing instability. The Atelier d'Urbanisme d'Abidjan conducted a survey that revealed that for every ten residents of the slums of Abidjan four are Cote d'Ivoire nationals while the rest are from Burkina Faso (20 per cent), Mali (9 per cent), Ghana (12 per cent) and Togo and Benin (12 per cent). As for Johannesburg, the city sustains a considerable immigrant population in inner-city areas, where immigrants tend to concentrate in informal sector trade as a means of living.

Interestingly, in both developing and developed countries, it is in cities where immigrants tend to settle when they enter a new country. They are attracted to the job opportunities that are present in metropolitan areas. Immigrants come because there is a specific market niche to fill. However, usually earning low wages, immigrants often end up living in poor urban areas, with few basic services, unhealthy living conditions, insecure land tenure, overcrowding and social violence. If this is the situation in your city, one major challenge you face is to design policies and institutions that would address these issues and include immigrants in the life of the city, both in the public and private sphere.

1.3.2. The Emergence of Urban Ethnic Spaces

[6] UN HABITAT. (2004) *The State of the World's Cities 2004/2005 : Globalization and Urban Culture*. London :Earthscan.

Despite the hardships they go through, immigrants offer much to the city through the cultural fusion they can bring. Multiculturalism results in the diversification and enrichment of urban cultures, making them more vibrant.

Within cities, cultural diversification and enrichment takes place in the emergence of urban ethnic spaces. This may be in the growth of ethnic neighborhoods inhabited by a specific national or ethnic population. But urban ethnic spaces also appear in the form of culturally distinct non-residential spaces, such as shops, bars and restaurants. Their presence enhances the culture of the city by providing a unique and diverse choice of spaces where the city can be enjoyed and discovered.

1.3.3. Cities as a focal point of tolerance and conflict

If cities have historically been refuges of tolerance for unwanted populations, they have also been points of friction. Cities have been the sites where modern ethnic conflicts and violence have materialized. For example, the 1994 Watts riots in Los Angeles or the 2005 crisis in French banlieues are recent manifestations of ethnic or racial struggles that can occur in urban areas. Cities thus present a striking paradox: they are at the same time focal sites for tolerance and diversity and flashpoints of ethnic hostility.

Nonetheless, cities present both remarkable challenges and opportunities for managing diversity. As a city leader you should remember that differences are most felt at the local level. Many studies on migration have focused on the effects of mobility at the national and international level. However, it is at the city or community level that ethnic clashes emerge. It is also at the local level that action can be taken to manage conflict and misunderstanding. In this sense, cities offer great potential for the assimilation and integration of newcomers.

In 2004 UNESCO launched the International Coalition of Cities against Racism to build up a network of cities interested in sharing experiences to improve their policies to fight discrimination, xenophobia, racism and exclusion.[7]

If this is the case in your city, then you should be proactive. Multiculturalism can be considered a transformative ideal for policy making. Perhaps one of the first and most important steps to take is an education awareness campaign. The rationale is to transmit the idea amongst local populations, government officials and the business community that diversity is a powerful asset.

At the theme forum on Cultural Heritage and Urban Regeneration, Mr. Tu Wei-Ming of Beijing and Harvard Universities quoted the Chinese scholar Fei Xiaotong saying, “One’s self has its own

[7] http://www.unesco.org/new/en/social-and-human-sciences/themes/human-rights/fight-against-discrimination/coalition-of-cities

beauty, others have their own beauty, sharing in the beauty of self and others will bring harmony on earth". He concluded that if everyone takes part in the dialogue of civilizations with an attitude of humility and willingness to learn, then the pursuit of excellence will no longer be just an ideal.

2. MENU OF MEASURES FOR SUPPORTING CULTURALLY RICH COMMUNITIES

2.1. MEASURES FOR CREATIVE CLUSTERS

However hard it may be for public policy to plan for creative districts directly, local governments leaders can be proactive and take successful actions that encourage the creative field. These actions may include the following:

- Cities can nurture institutional and political instruments that facilitate innovation and creativity. This means promoting a local culture that supports experimentation, failure and recovery. If risk-taking is not part of the DNA of the local setting, the promotion of creative industries might encounter significant obstacles, as cultural products are often volatile. As a local leader, you can put education and information programmes in place in order to promote a risk-taking culture. This can also involve attracting capital that would be supportive of the risk-taking environment and that would be ready to finance projects.
- As a policy-maker, you may wish to establish policies that directly support local cultural producers at the street-level rather than concentrating on physical infrastructure investments that might leave them ignored. In this regard, there is a strong link between creative cultural production and the presence of affordable space that creative producers can use. Affordable space is a crucial element to attract and retain talent and to be able to run a business successfully. Affordable space is not only necessary for cultural producers to live and work, but also to display collective creativity. Here local governments have an essential and proactive role to play. As policy-makers, we can favor instruments that allow the presence of affordable space, and also acknowledge that non-market solutions might have to be employed.
- Local governments may wish to be proactive in organizing spaces and nurturing networks to facilitate the exchange of ideas and to foster innovation. Public policy can establish the conditions for the emergence of an open and decentralized infrastructure of working places. For example, local governments can establish policies to link arts and design schools with places of cultural consumption and presentation such as theatres, music halls and galleries.

The success of creative clusters strongly depends on the mix of spatial, professional and cultural qualities and their ability to attract cultural producers. This attraction has to occur both at the personal level, reflected in the lifestyle, as well as at the professional and business levels. Cities can be proactive in leading the way for a generalized creative tendency to emerge and also in the design and management of a creative cluster. As policy-makers, we can follow some overall guidelines for the conception and management of a creative cluster:

1. As a designer of public policy, you may wish to determine what importance to give to leisure and cultural consumption in the conception of the creative cluster. Leisure and cultural consumption can range from simply being an autonomous add-on to being an important economic and social feature.

2. Clusters may vary in terms of the financial structure required to support them. This often involves different forms of public-private collaboration. Most projects may involve a strong financial participation by the public sector, at least for a temporary initial stage. The projects may then shift to a more independent or privatized existence, which can involve a wide range of coalitions with private enterprises and investors.

3. Creative clusters can be identifiable spaces with a fixed identity based on strongly shared representations in the urban environment. Alternatively, they can be flexible sites, permanently adapting to transformations occurring in the broader cultural and urban fields. Projects need to balance these two elements. If the project is marked by strong openness, organizations might not feel involved or responsible for the cluster itself. This might put at risk the atmosphere and the very identity of the cluster. On the contrary, if the cluster is marked by a strongly fixed structure, there is a risk that the actors could become locked into their own cultural and physical space. This might then reduce the project's capacity to change and evolve.

MUSEUM QUARTER, ROTTERDAM

The Museum Quarter in the harbor city of Rotterdam, Holland is one of the first examples of a consciously developed cultural cluster in the Netherlands. It formed part of a deliberate effort of Rotterdam to build up its urban profile. With the establishment of the museum quarter in the 1990s, Rotterdam re-imagined its inner city and marketed it for tourism and cultural consumption. As a result, the Museum Quarter has a clearly defined identity as a cultural cluster. Some however are critical of the Quarter saying it lacks connections to the broader fabric of the city. This lack of synergy with the rest of the city has meant that the expected economic and social benefits of the cluster were not fully realized.

4. Clusters may also differ in terms of their developmental paths. Clusters planned according to top down planning strategies contrast to clusters emerging from local communities of artists. Consumption-oriented clusters tend to follow the top down strategy and are usually marked by a long-term involvement of local governments. Production-oriented clusters more frequently arise from community-based urban cultural interactions. In the two cases, one thing is clear however -- place, community and cultural economy are often vitally intertwined. As such, it becomes very difficult to plan for clusters from scratch. It is important to conceive a planning process that from the outset engages the cultural community that is already in place.

These overall ideas are meant to lead the conception, planning and management of creative clusters. But if one fact is clear, it is that clusters come in very different shapes and forms. Local circumstances may call for different combinations and priorities. As a policy-maker, you should strive to establish a vision for the creative cluster and to articulate that vision with the local conditions. Local circumstances call for choices to be made in cultural, political and strategic terms.

Equally important, it is essential to acknowledge that learning and improvising are inherent features of creative cluster planning strategies. Fixed models for creative cluster planning do not seem to exist. However, local governments shouldn't see this as an obstacle, but rather as an opportunity for innovation in planning and policy strategies. It is up to each city to imagine what type of cluster they want and how to combine the ingredients present in the local culture to achieve it.

The Creative Cities Network, launched by UNESCO in 2004,[8] was established to enhance the social, economic and creative potential of cities. The Network has seven thematic networks in which cities may choose to participate according to their preference for a creative industry sector: Literature, Cinema, Music, Crafts and Folk Art, Design, Media Arts and Gastronomy. The Creative Cities Network has the aim to bring civil society, public and private partners together to collaborate in the development of creative industries. Cities join the network because they wish to:

- present their cultural assets globally;
- make creativity an important element of local social and economic development;
- share knowledge across cultural clusters globally;

[8] http://portal.unesco.org/culture/en/ev.php-URL_ID=35257&URL_DO=DO_TOPIC&URL_SECTION=201.html

- strengthen local capacity and train local cultural agents in business skills;
- foster innovation through the exchange of expertise and experience;
- promote cultural products at national and international levels.

2.2. MEASURES FOR HISTORIC PRESERVATION

If city leaders are considering a policy to safeguard cultural heritage, there are several measures that they might wish to take into account in the conception, design and management of historic preservation policies.

- Building political support and leadership for preservation is essential. In this, public awareness campaigns directed to local communities can be a powerful asset. Awareness programmes are a means to help people realize the potential benefits of the work to be undertaken and the importance of cultural heritage for collective memory. Historic preservation is a continuous process. As a city planner, you should remember that it is essential to help local communities leverage the resources needed to achieve their goals.
- Assessing the importance of historical structures is essential. The assessment implies a dialogue with social values in order to map the structures to which society attaches intrinsic value. Community engagement tools that empower stakeholders and allow mediation between different groups can be essential in developing a vision of what the city wants to make of its cultural heritage.
- Laws and regulations regarding cultural heritage and development can emerge from this process of assessment, dialogue and awareness. Laws and regulations related to historic preservation help shape the vision and the use that society wants to make of its heritage. Cultural heritage policies can be incorporated in city planning documents through historic preservation master plans. These technical tools are essential to start, monitor and manage historic preservation policies. They can often involve financial mechanisms that trigger private investment at the local level.
- When conceptualizing historic preservation policies, it is important to pay close attention to finding an economically viable use for restored historic structures. City planners have to imagine ways to preserve the historic character of buildings while facilitating their usage for current needs. In this, historic preservation can intersect with land use, housing and commercial policies. Urban planners must determine the best usage of a building that would preserve its historic character. Stakeholder engagement is important to the success of this effort.

- In addition, historic preservation policies can be more effective when they are not only aimed at improving the physical aspect of certain buildings but when they are also combined with overall area improvement projects. In this regard, city planners should consider the larger picture beyond the simple improvement of building facades and look at the quality of public spaces and their usage, the presence of cultural activities (restaurants, bars…) and transportation linkages, as well as the economic vitality of the area. An area-based approach that comprises all these elements could prove more efficient than an approach merely concentrating on the refurbishment of buildings.

2.3. INSTITUTIONAL MEASURES FOR MULTICULTURAL CITIES

Local governments may opt to pursue a system in which differences in urban settings can be fully acknowledged, expressed and respected. This is essential if diversity and solidarity are to be maintained. The promotion and defense of diversity should be an important item of local political agendas.

In order to address the hardships that immigrants go through and the ethnic struggles that might arise, imagining new local institutional frameworks can be very valuable. This often implies transformations in urban management.

Institutional reforms in some cases have gone as far as creating entire municipal departments devoted to migration and multicultural issues. These new structures allow local governments to tackle directly the needs of migrant populations. By working with civil society, such as NGOs or community groups, the new structures can open channels for the political involvement of migrants in urban affairs. This new approach to urban management can facilitate intercultural dialogue and cohesion, which in turn would favor the integration of migrants. Of course, new institutional structures don't have to be designed for this to occur. To address migration issues, city leaders can use existing structures within urban government. It is left to every city to decide the best way to proceed.

3. CASE STUDIES

3.1. HISTORIC PRESERVATION IN QUITO, ECUADOR

The community of Old Quito is full of historical buildings with colonial architecture and is the principal tourist destination of this capitol city.

The historic core of Quito has a long history of preservation experiences. The first attempt of developing a preservation strategy dates back to 1967, when the Comisión del Centro Histórico and a city Master Plan were established. These efforts were enhanced in 1978 when Quito successfully achieved status as a UNESCO World Heritage Site. In 1980, the Municipality of Quito elaborated a comprehensive plan (Plan Quito 1980) where it stressed the necessity to identify and survey the areas and monuments that constituted the city's historic-cultural heritage. Early conservation policies mainly aimed at dealing with architectural blight and cosmetic renovation. The decision was made that the city centre should conform to an 18th and 19th century Spanish colonial vision even though many of the buildings were of contemporary design.

The political shift that occurred in the 1980s resulted in significant transformations in historic preservation policies in Latin American cities. In the 1990s, as redevelopment became a key element of the urban agenda, the historic core of Quito became the object of pioneering urban renewal efforts. Key to this was a market-based approach involving the creation of public-private partnerships for redevelopment, often in cooperation with international agencies. An integrated rehabilitation strategy was put in place that included social and economic issues, employment, commerce, transit and, most importantly, housing. This was a dramatic shift from previous policies that simply targeted monument restoration and preservation of the built environment.

Lessons Learned:

While market-based approaches frequently result in the improvement of the built environment and the appearance of new upscale consumption sites (restaurants, boutiques, hotels) fostering

tourism and cultural identity, they can also displace lower and middle-income populations, thus creating tensions. The perplexing challenge is how to design a preservation policy that helps lower- and middle-income populations to remain residents of the area while simultaneously triggering improvements to the built environment that may eventually result in the displacement of these populations? The matter remains unsolved. In Quito, the balance between economic development and social equilibrium in preservation policies is a work-in-progress. Despite the built environment improvements, Quito's historic core continues to house some of the worst housing and economic conditions.

3.2. MULTICULTURALISM IN FRANKFURT, GERMANY

A poster with a calendar of cultural events taking place in Frankfurt, Germany during May-June 2010.

Set up in 1989 by the Green Municipal Government, Frankfurt's Office of Multicultural Affairs provides an interesting and exciting example of governance shifts for dealing with multiculturalism in the city. As an international center of trade, finance and banking, Frankfurt attracts a great deal of immigrants. Frankfurt's economy is supported by a worldwide pool of labor, with immigrants coming from 150 countries. Immigrants are a visible component of the city's population, playing an important role in making Frankfurt cosmopolitan and contributing to the local economy through their work and taxes.

However, immigrants also have to cope with a national immigration policy often perceived as unwelcoming. German national politics have been marked by a fear of national identity being diluted by transnational cosmopolitanism. This resulted in the creation of barriers for the integration of immigrants into German life and politics. Although settled permanently in Frankfurt, some immigrant populations remained marginalized socially, economically and politically.

As a response to this, Frankfurt's Office for Multicultural Affairs (AMKA) was an experiment launched by the Green Party, a strong proponent of denationalized cosmopolitanism. AMKA is at the center of the debates on how a city can and should cope with immigration. In order to remove the underclass stigma attached to some immigrant populations, AMKA works at two levels. On the one hand, it works with all the agencies of the municipal government to promote the integration of foreign populations. On the other hand, it works directly in the public sphere, opening new channels of collaboration with civil society. Concretely, these new channels consist of three actions:

- Establishment of public hearings whereby immigrants can express their voice.
- Creation of a municipal advisory council for foreign residents.
- Preparation of a register of all the organizations run by immigrants in Frankfurt.

Lessons Learned:

AMKA's initiative led to a transformation of governance structures. Multicultural politics were at the core of the formulation of public policy. With the new channels of expression and communication open to immigrant populations, the municipal government started working closely with civil society and fostered the emergence of a society of foreigners embedded within the larger society of German Frankfurt. Because of the progress it implied and the challenge it signified for German national immigration politics, AMKA was highly controversial and

encountered considerable opposition. However, it remains an exemplary experiment of how a city attempts to cope with multiculturalism.

3.3. DEVELOPMENT OF A BENGALI BRITISH IDENTITY IN SPITALFIELDS, UK

Spice shops in Banglatown cater to the cuisine of the residents in this Bengali-British enclave. Photo credit: http://www.ladyadventurer.co.uk

The redevelopment of the community of Spitalfields presents an interesting case study on how local spatial planning can enable the rights to citizenship and belonging often denied to minorities in the wider political arena. Spitalfields had been the object of urban redevelopment policies since the 1970s. The rehabilitation policies attempted to exploit the architectural legacy of Spitalfields and restore the neighborhood as a monument to Georgian architectural heritage.

But this process of urban transformation and gentrification triggered politics of identity and place. Spitalfields is home to a large community of Bengalis and is a very deprived urban area. Its redevelopment initiated displacement struggles and mobilized opposite notions of what Spitalfields stood for as a neighborhood and what constituted Spitalfields as a community. This activated a politics of negotiation that resulted in a managed multicultural cohabitation.

In an attempt to influence redevelopment policy, the local Bengali population, most noticeably local businessmen, came together under the Community Development Group. The main goal of the Group was not to halt redevelopment but to orient it so that it would also address the Bengali community needs. A team of municipal planners worked closely with the Group to develop a community scheme for the site, emphasizing social housing and affordable workshop space. The plan was a realistic document that stipulated that some land control would be handed over to the community. It also recommended the development of Brick Lane as Banglatown, a vital and exciting core of commercial and cultural life.

Lessons Learned:

Two outcomes are very positive in this experience. On the one hand, there was a willingness on the part of developers and local planning authorities to engage in a process of dialogue with the local community to produce a win-win situation for all the parties involved. On the other hand, within this process of dialogue, the Bengali community formulated a vision of what it meant to be Bengali in the UK. It became an active partner in local economic development and innovatively mobilized to influence redevelopment along its own cultural lines. This allowed the Bengali community to effectively build a home in a new nation.

3.4. CREATIVE SPACES -- INTERNATIONAL STUDIES

In 2004, the municipal governments of London, UK and Toronto, Canada launched the Creative Spaces project. The project's methodology is based on an international comparative analysis of 6 cities: London, Berlin and Barcelona in Europe and Toronto, New York and San Francisco in North America. The project researches the policies in place in each city and the specific conditions that fostered creative industries in each urban area. The project identified a number of lessons that policy-makers can take into account when they formulate strategies for creative industries in 5 different categories – people, enterprise and innovation, space, vision and connectivity.

Lessons Learned:

<u>People</u>

1. The public education system plays a primary role in enabling and supporting talent and attitudes for creative industries. Local public education initiatives should encourage creativity and risk-taking in innovation.

2. Culture can be a strong instrument to engage local communities in renewal. Cultural and creativity-based community programmes directed at the neighborhood level can be a powerful asset in targeting social exclusion.

3. The grassroots level is often where talent and ideas emerge, experiments occur, and creative activities encounter fewer barriers from institutional bureaucracy and market mechanisms. Community level organizations understand better the context where they exist and operate. This allows them to facilitate innovation by better focusing and connecting community resources.

4. Successful projects are often realized through the leadership of exceptional individuals or small groups of artists. Such individuals and groups can constitute the basis for dynamic innovation and creativity that can result in economic and social benefits.

Enterprise and innovation

5. The support of creative business enterprises is key to the success of a city's creative economy. Creative businesses prosper and are most efficient when business support structures focus on their particular needs.

6. The creative sector has diverse needs that can be targeted through clustering. Establishing networks of creative practitioners having to cope with similar challenges enables them to overcome obstacles through information sharing and support.

Space

7. Access to affordable space for creative activity remains a persistent issue. Employing non-market solutions can be an important instrument in ensuring affordable space for creative activity. The most effective method to enable access to affordable creative space in the long run is through the promotion of building ownership, most notably by public or non-profit entities.

8. A city's creativity is expressed and fostered through the built sector, as well as public and natural spaces. The preservation of heritage buildings, the fostering of local cultural activities, and the establishment of public and natural spaces can support the creative identity of a city.

9. Mobilizing creative people and capital assets can encourage neighborhood regeneration. By transforming the social and built environment and attracting new people and

investments, creative industries can be a powerful instrument in facilitating the rehabilitation of depressed and marginalized neighborhoods.

Vision

10. In support of the creative economy, multi-level, multi-sector support is essential. Various departments within different levels of governments should be engaged in the process of policy-making for creative industries addressing relevant political, social and economic aspects.

Connectivity

11. Infrastructure, especially for communications and transport, is crucial for creative communities as they need to be well connected to wider urban areas.

3.5. CREATIVE INDUSTRIES IN JOHANNESBURG, SOUTH AFRICA

Efforts by the City of Johannesburg to foster creative industries are providing financial and technical support to creative producers

The idea of Cultural Industries has received increasing attention in South Africa. Interest grew out of a series of reports generated by the Cultural Strategy Group of the former Department of Arts, Culture, Science and Technology in the late 1990s. The reports advanced a Cultural Industries

Growth Strategy advocating the integration of arts and culture into all aspects of socio-economic development in South Africa. Several sectors were given particular attention, notably crafts, film, music and publishing industries. Termed Creative South Africa, the initiative aimed at raising awareness within government on the potential of cultural industries for increasing economic growth and social equity. The success of the initiative was the adoption of the cultural industries as a priority economic sector in the formulation of policies at the national level.

In Johannesburg, the municipal government promoted the potential of creative industries through its Economic Development Unit. The term "creative industries" was incorporated into planning documents produced by the city. Most importantly, creative industries were given a special place in attaining the goals of Joburg 2030, the city's economic development plan for the next 20 years. The creative sector in Johannesburg was characterized by small and micro-enterprises and the products were mainly targeted to local markets. The Economic Development Unit established a development strategy specifically for creative industries in 2005. The strategy translated into the following concrete actions aiming at providing financial and technical support to creative producers:

- The strategy created the Johannesburg Art Bank. Its mission is to complement Johannesburg artists' income through the creation of a market for their work.
- The city put in place the Creative Industries Seed Fund aiming at developing the business skills of creative producers.
- The Economic Development Unit provided office space and infrastructure to film producers.

The strategy was accompanied by three joint initiatives:

- The Art City Project, which focused on projecting Johannesburg's inner core as "the hub and cultural centre of Africa's world class city" and on promoting tourism in the city.
- The Newtown Cultural Precinct, a joint initiative between the Municipal Government and the Provincial Government, was launched. The project's objective is to develop a cluster of creative industries in order to promote tourism and showcase Johannesburg as the "creative capital of South Africa".
- A hub for fashion design was created for goods of African design that are not mass produced. This project is supported by the Johannesburg Development Agency.

Lessons Learned:

South Africa and Johannesburg are good illustrations of how political will and education awareness raised attention to the creative industries. They present a case in which resources and knowledge were mobilized to truly develop a long term policy strategy for the creative industries in a developing country. It is essential to note that different levels of government were involved: the national level as well as the provincial and the municipal levels. This multi-level support strongly facilitated development of the cultural sector.

3.6. BOLOGNA – FROM CULTURAL CITY TO CREATIVE CITY[9]

Bologna brands itself as a cultural city. It follows a strategy that focuses on increasing its cultural resources and further developing its designation as a European Capitol of Culture in 2000 and a UNESCO City of Music in 2006.

The city has a wealth of historic, artistic and cultural heritage. It has one of the best preserved historic city centres in Europe with more than 40 km of architectural porticoes that give the city a special ambience.

[9] Summarized from the presentation by Prof. Roberto Grandi at the 2010 Shanghai Expo Theme Forum on Cultural Heritage and Urban Regeneration, 12-13 June 2010, Suzhou, China

Bologna, Italy was acknowledged as a European Capitol of Culture but, rather than sitting on its laurels, it is striving to burnish its image with new creative industries.

As a UNESCO Creative City of Music, the city boasts a vibrant musical tradition and a serious commitment to promoting music as a means of economic development and social inclusion. In addition to having a number of musical production companies, music schools and performance spaces, the city has 320 associations and local cultural centres that organize music-related activities. More than 2.1 million people attended musical events in Bologna in 2007. The diffusion of musical culture has been aided by the growth of the local music industry that specializes in services for performances and recording studios. These production industries have expanded to include audiovisual arts, cinema, digital media, music and performing arts, entertainment and cultural services. The high level of cultural consumption fosters social equity and cohesion.

Bologna wishes to transition from a cultural city to a creative city and, to do so, it is pursuing the following strategy:

- While maintaining the historic centre as a vibrant space for culture and education, the city is pursuing polycentric development to identify new spaces for innovative cultural and creative activities, especially in areas where urban regeneration is needed.
- It seeks to attract a talent pool with those skills, knowledge and talents that constitute the creative class. It accomplishes this through planning initiatives and financial incentives that target small businesses working in the knowledge and culture sectors who may want to upgrade businesses and compete in advanced creative markets. One goal is to keep the best talents from the University of Bologna in the city.
- Bologna seeks to open itself to external influences in order to promote multiculturalism, intercultural dialogues and diversity as tools for growth and sustainable development. Bologna is also a member of the UNESCO International Coalition of Cities against Racism.
- The city is increasing the participation of citizens in the process that is redefining Bologna's future identity through a series of informational meetings, outreach to networks, and other social inclusion initiatives. The aim is to achieve a balance between the development of new forms of creativity suited to today's knowledge economy and the existing characteristics of livability and social cohesion that are the result of the city's heritage. This concept of the city is then portrayed through "stories" that help increase citizens' identification with the city and support its international recognition by others.

- Creativity, which is fundamental to artistic production, is being extended from cultural industries to the broader social, political and economic life of the city. In other words they are developing a cultural approach to urban planning and policy. This creativity will also help in resolving future challenges in the economic and social spheres.
- Finally, the city is trying to foster a sense of civic creativity that is shared by all stakeholders, namely the citizens, civil society, private sector and public institutions. This will embed creativity across the city leading to a strong and identifying urban character that is clearly recognized both within and outside the city.

Lessons Learned:

The city of Bologna recognized that, while it had achieved significant status as a European Capitol of Culture, in order to progress and grow it needed to focus on becoming a creative city. Only creativity would ensure that their cultural resources would be continually renewed and would allow them to compete with other culturally advanced cities at an international level.

4. Better City, Better Life – Summary of Policy Options for the Culture Sector

Culture is an asset that city leaders can mobilize at the local level in order to promote sustainability. In the cultural sense, a sustainable city is a city that fosters a sense of place through its unique urban identity, particular built environment and social interactions that occur in public spaces. It is also a city that fosters creativity, promotes diversity and inclusion and protects its unique legacy. As a Mayor wishing to use culture and creative industries as a tool for urban regeneration, you can be truly proactive in your efforts and design a policy framework by selecting appropriate policies from the list below.

Strategy 1: Foster creativity and support the urban creative industries through cultural incubators linking cultural production and consumption.

POLICY OPTIONS	
option 1	Encourage a local culture of creativity, innovation and risk-taking through education and information programmes.
option 2	Establish policies supporting local producers at the street-level. There is a strong link between creative production and the presence of affordable space that creative users can use. Policy-makers need to acknowledge that non-market solutions might be

	needed.
option 3	Nurture networks to facilitate the exchange of ideas and people and foster innovation.
option 4	Define a strategy for the cluster adapted to local circumstances and a locally defined vision. This strategy might incorporate 5 elements: the place that leisure and consumption will have in the cluster, the organizational framework that will manage the cluster, the financial structure that will support it, the level of closeness/openness of the cluster to the rest of the city, and the approach for development of the cluster (top-down or bottom-up). Policy-makers must remember that a close involvement and engagement with the local community in the planning process is essential.

Strategy 2: Protect the city's unique cultural and historical legacy.

	POLICY OPTIONS
option 1	Concentrate on the quality of the public realm: the interactions and dialogue that occur in urban space give birth to a unique urban culture and vibe.
option 2	Build political support and leadership for preservation: public education campaigns among local populations as well as policy-makers are essential for public awareness and to rally support.
option 3	Initiate a dialogue using community engagement tools to determine which structures society feels especially attached to and which have particular historic or symbolic meaning.
option 4	Develop laws, regulations and master plans that embody results from the stakeholder dialogue process and embody the vision that society wants to create for historical structures in the future.
option 5	Find economically viable uses for structures to be preserved. Linking preservation strategies with land use, housing and commercial development policies can be crucial.
option 6	Historic preservation policies should follow an area-based approach rather than merely focusing on the improvement of building facades. This implies looking at the quality of public space and how people use it, the presence of cultural activities, transportation linkages as well as the economic vitality of the area.

Strategy 2: Promote ethnic diversity through multiculturalism.

POLICY OPTIONS	
option 1	It is at the local level that ethnic conflicts occur, but it is also at the local level that actions can be taken for the integration of migrant populations. Multiculturalism policies should be integrated as a transformative ideal, recognising that diversity adds value to a city. Education campaigns should be launched amongst local communities in order to transmit the idea that diversity is a powerful asset.
option 2	Create/adapt local institutional frameworks to allow new interactions with civil society and to empower immigrant populations in order to create a more inclusive society.

5. LINKS FOR FURTHER INFORMATION

- The State of the World's Cities 2004/2005, UN Habitat, 2004
- Sustainable Sydney 2030: The Vision, City of Sydney, 2009
- World Heritage Papers 9: Partnerships for World Heritage Cities – Culture as a Vector for Sustainable Urban Development (2002) (Includes many case studies)
- From Istanbul 1996 to Venice 2002 Socially Sustainable Revitalization of Historical Districts. Architects Speak out (2004)
- http://www.unesco.org/new/en/social-and-human-sciences/themes/social-transformations/urban-development/

Migration

- **Metropolis Canada:** international network for comparative research and public policy development on migration, diversity and immigrant integration in cities in Canada and around the world.

  http://canada.metropolis.net/

- **Migration Policy Institute:** http://www.migrationpolicy.org/
- **UNESCO International Migration Programme**

  http://www.unesco.org/new/en/social-and-human-sciences/themes/social-transformations/international-migration/

- UNESCO International Coalition of Cities against Racism: http://www.unesco.org/new/en/social-and-human-sciences/themes/human-rights/fight-against-discrimination/coalition-of-cities

Creative Cities

- **UNESCO Creative Cities Network:**

  http://portal.unesco.org/culture/en/ev.php-URL_ID=35257&URL_DO=DO_TOPIC&URL_SECTION=201.html

- **Creative London**

  http://www.creativelondon.org.uk/

- **Hot Jobs, Cool Communities**. Next Generation Consulting, 2002

- **RCCIL: Researching Cultural and Creative Industries in London**

  http://www.rccil.org.uk/

- **UNESCO Global Alliance for Cultural Diversity**

  http://portal.unesco.org/culture/en/ev.phpURL_ID=24468&URL_DO=DO_TOPIC&URL_SECTION=201.html

- **OCPA: Observatory of Cultural Policies in Africa**

  http://www.ocpanet.org/

Further 'Good-practice examples' can be found at following websites:

- http://www.histurban.net/downloads/publications.html
- http://www.inheritproject.net/downloads.asp
- http://urbact.eu/projects/cultural-activities/news.html
- http://www.eukn.org/eukn/
- http://www.coe.int/t/dg4/cultureheritage/Resources/default_en.asp
- http://www.ehtf.org.uk/
- http://urbo.ovpm.org/index.php?module=ovpm&func=casestudies&sorte=theme

CHAPTER 10 - MEGA-EVENTS AS CATALYSTS FOR URBAN TRANSFORMATION

> *The Shanghai Expo responded to the times by selecting cities as its theme. It also introduced the first-ever Urban Best Practices Area and Virtual Expo to pursue a ground-breaking exploration of the possible solutions to the common dilemmas faced by humankind. Today, as this grand gathering comes to a close, we sing high praise for the important value of the World Expo as a platform to confront these challenges and as a vehicle for dynamic exchange and interaction between civilizations. We enthusiastically issue this Shanghai Declaration as a summary of the substantive achievements of the Shanghai Expo and an expression of the shared aspirations of people around the world for a "Better City, Better Life."*
>
> Shanghai Declaration on Better Cities, Better Life

1. ISSUES AND CHALLENGES[1]

Large international events work as triggers for local development and bring tangible advantages to the host city and country. Amongst their tangible benefits, mega-events are catalysts for economic transformation, help upgrade urban infrastructure, strengthen the international image of the city and accelerate the implementation of desired urban policies.

By gaining an understanding of the breadth and depth of the opportunities and potential benefits from hosting such events, city leaders and managers become equipped with yet another powerful instrument for urban transformation. An instrument, however, that requires critical initial decisions.

As a city manager you may ask yourself -- Is it relevant or appropriate to engage in the organization of a mega-event? Which event would be the most appropriate to meet the needs of your city? How can you mobilize the necessary assets, resources and public support? How will the event fit in with present plans and help create a new image for the future?

The objective of this chapter is to provide you with definitions, best practices and experiences of cities that have hosted mega-events and fulfilled their aspirations.

1.1. IMPLEMENTING CITY-WIDE CHANGE: URBAN-LEADERS AS PUBLIC ENTREPRENEURS

[1] This chapter was authored by Federica Busa, with valuable input and contributions from Zhang Min, Wu Jianzhong, Vicente González Loscertales, Cheng Jian and Tiziana Bertone.

While the challenges faced by urban managers in different parts of the world are profoundly different based on the city's context, level of development, overall government structure, etc., they are also part of a global context that places common expectations on city leaders.

Two elements in particular stand out. The first is that cities are now recognized as key international players carrying an important responsibility to implement policies and solutions that bear directly on the national economy and on the urban quality of life: environmental, economic, social, cultural, etc. The second is the recognition that problems connected with sustainability, poverty and environmental degradation, amongst others, can only be solved through concerted efforts that simultaneously engage the efforts of governments, the private sector and citizens.

As cities become more and more influential in creating and implementing frameworks to address these challenges, they find themselves at a crossroads where local, national and global efforts must be coordinated to enhance urban quality of life. To respond to this new role, urban leaders are confronted with the equally big challenge of finding critical resources such as talents, funds and public support to implement the necessary changes in management, policies and objectives. Mega-events provide important tools to develop and deploy these resources towards urban development.

To explain how a mega-event can be a catalyst of urban transformation, we can use a simple analogy from the business world. In the market economy, companies wishing to accelerate their growth can pursue a variety of different strategies: they can merge with other companies, build new partnerships or acquire new technologies. These options help them gain quicker access to existing or new markets, achieve economies of scale or transform their processes and operations.

What if a city wants to increase tourism or foreign investment opportunities in a given sector? What if a city wants to optimize its logistics or reduce costs for water and energy services? What if it wants to start a major training programme for unemployed workforce or undertake trade promotion activities? What if it wants to build new infrastructure, improve its transportation system, or redevelop an entire city neighborhood?

When city managers look for solutions to implement change to enhance long-term competitiveness, they do not have the same flexibility and diversity of options. Cities will generally undertake an often painful growth process and struggle to find the local financial resources and public support which are necessary to implement change to the desired degree.

In this context, the most successful cities are those where the leaders act entrepreneurially in the public domain: they launch innovative projects and initiatives that can create and capture

significant amounts of public value in the different domains of city life and thereby increase the level and quality of public goods for citizens, i.e. education, safety, health, peace, etc.[2]

A mega-event is one such initiative. The successful hosting of a mega-event can enable a city to rely on talents, international efforts and investments that would not be otherwise available on a similar scale for the same objectives.

1.2. SCOPE AND OPPORTUNITIES LINKED TO MEGA-EVENTS

While it is well known that World Expos, Olympic Games, FIFA Cup, etc. fall into the category of mega-events, it is hard to find a common definition that captures their key characteristics and explains their transformational impact on host cities and countries.

In this chapter we will clarify what types of events are relevant, ruling out, in particular, the multitude of small and large commercial events that take place around the world all the time. Although many of these events support a dynamic atmosphere, they are essentially "business as usual" type of activities that connect to existing sectors, be they commercial or cultural.

Here we are concerned with events that are out of the ordinary, that stretch and challenge a city's comfort zone to the point of creating an historical milestone in the life of the city. The distinguishing criteria of these events that we recognize include:

- a fundamental commitment to significantly expand the quality and quantity of public goods (events of a non-commercial nature but with high economic benefits)
- an international multi-stakeholder involvement (public and private organizations as well as citizens)
- a complex long-term planning process

The combination of these three factors is responsible for the transformational impact of these events on the host city. A general definition can thus be given as follows:

> *A mega-event is large-scale, internationally sponsored, public entrepreneurship activity engaging a long-term multi-sector organization within the host city and nation with the double goal of supporting overall local and regional development and advancing universal values and principles to meet global challenges.*

[2] Ostrom, Elinor. *Unlocking Public Entrepreneurship and Public Economies*. Helsinki, Finland: EGD

This definition does not specify differences in size, duration, budget or form of public participation. Although quantitative aspects are important, the impact and organizational requirements of mega-events are the essential distinguishing features. Mega-events are:

1. Place-making activities that help to redefine and reposition a city
2. Assigned by international bodies to a "deserving" city after a bidding process
3. A local and a global mandate to cooperate on key challenges and urban improvement

These combined elements are essential to explain their "transformational" capabilities: mega-events bring an injection of new international investments often concentrated in a very short period of time. At the same time they force a city to develop new activities that contribute to re-shape and strengthen its identity from many perspectives, including: cultural, social, economic, sporting, political, etc.

Today, alongside World Expos, Olympic Games, European Capital of Culture, etc., recent experiences show that this definition can also encompass major global conferences held with the goal to advance international cooperation and understanding. For instance, the United Nations Rio+20 Conference, the World Urban Forum, and the meetings of the UN Framework Convention on Climate Change, etc. have had, and continue to have, a major positive impact on host cities.

1.3. CONCLUSION

In a global context, where cities are emerging as strong players, there is an increased demand on urban leaders to design and implement new management practices, policies and infrastructure that help raise the profile of the city, nationally and internationally, and make it an engine for local and regional growth. Implementing change is hard, so to be successful, city managers have to focus on a limited menu of activities that require major investments and public support.

Mega-events, however, can offer an accelerated route of growth leveraging powerful national and international partnerships of both a public and private nature. Through the involvement of new actors, the development of non-conventional partnerships, the convergence of innovative ideas and international resources, mega-events bring new tools for the transformation of urban areas, with an impact on city life that extends well-beyond the location and the duration of the event. Mega-events engage all sectors of a city's life and administration, thus bringing benefits across all sectors: infrastructure, services, culture, environment, education, economy, etc.

In other words, mega-events not only support the objective of differentiating a city amongst its peers, but also give city managers the option to effectively support and accompany many of the objectives and processes described in the rest of this manual. They facilitate the

implementation of urban transformations by enabling cities' administrations to obtain public support and to mobilize resources that would otherwise be difficult, if not impossible, to get.

2. MENU OF OPTIONS: MEGA-EVENTS AS URBAN DEVELOPMENT ASSETS

When looking at the opportunities offered by mega-events, three sets of options should be considered:

1. areas of urban life where the mega-event can have a significant impact;
2. selection of the most appropriate event based on the characteristics of the city;
3. level of readiness of the city, i.e., vision, operational capacity, etc..

2.1. ASPECTS OF URBAN LIFE AFFECTED BY MEGA-EVENTS

In this section we will explore in detail the different aspects of city life that are touched by the organization of a mega-event. These include: economic development and new business opportunities, infrastructure and service improvement, introduction of new environmental practices and education for sustainable development, branding and internationalization, fostering new types of public-private alliances, enhancing the technological and innovation capacity of the city.

It is worth noting that a mega-event can support and even accelerate the urban transformation initiatives described in the previous chapters, notably through a widespread educational campaign involving citizens and local leaders, the improvement of managerial skills within the city's administration and the enhancement of the innovation and business context.

2.1.1. Economic development and new business opportunities

> *Urban managers are aware that cities represent the most powerful economic engines in the world. The transformation of large cities to sustainable economic development will be critical to the 21st century global state of affairs.*
>
> Chapter 3 -- Transforming the Urban Economy

Mega-events represent one of the options for boosting and enhancing existing economic activities. They support the creation of new opportunities through additional investments from the city itself as well as from the national government and the foreign participants.

A 2009 report by the National Bureau of Economic Research found that hosting a mega-event like the Olympics or the FIFA World Cup permanently boosts trade by 30 per cent.[3] Their

[3] Andrew K. Rose, Mark M. Spiegel, "The Olympic Effect," NBER Working Paper No. 14854, April 2009.

study of 196 countries' economic performance between 1950 and 2006 found that the "Olympic effect" derives from host countries signaling their intention of moving toward a more open trade policy. Since 1984 there is strong evidence to suggest that the Olympics can have a major impact on the GDP of the host country. Also, calling Expo Shanghai 2010 the "Economic Olympics" was not simply a tongue and cheek expression, but a meaningful reference to an endeavor that would accelerate infrastructure development and economic growth of the city by decades.

Economic benefits include:

NEW INVESTMENTS	▪ New injection of national and international investments ▪ New public-private partnerships in investment
NEW BUSINESS	▪ Repositioning of existing industries ▪ Development and launch of new business sectors ▪ New opportunities from face to face international business meetings connected to participants, sponsors and suppliers
NEW REVENUE	▪ Additional tax revenue for the city: national tax revenues that come back to the city ▪ Higher-value real estate and new business and/or residential districts
NEW TALENT	▪ Additional employment options ▪ New training opportunities in different domains that help develop human capital and foster a new professional cultures at all levels of society through the experience of working within an international event ▪ Development of new entrepreneurial skills in city management

The organizational experience and the generation of new talent generally enable the city hosting the event to support other cities within the country in the bidding for future events, be they national or international. Often the successful hosting of an event is the beginning of a process of regular bidding on other mega-events: it helps maximize the investments already made, and leverage the international credibility at the national level that other cities can benefit from.

2.1.2 Infrastructure and service improvement

> *Urban leaders understand that effective management is crucial to the successful implementation of an urban development plan. As mayor, one of your first steps might be to assess if the management systems currently in place are adequate for implementing, monitoring and evaluating the implementation of the plan and the provision of related public services.*
>
> Chapter 2 -- Delivering Effective Urban Management: Planning for the Future

Mega-events help accelerate the development of new infrastructure or the improvement of the existing built environment. As a result they challenge the managerial and coordination skills of urban leaders, thus helping to enhance the quality of the related public services.

Event specific infrastructure includes elements built for running the event as well as infrastructure that enables services, such as local, regional or international access to the event and varies with the type of event. For international sporting events, the infrastructure is generally distributed across a city and is mostly in the form of sports facilities. For Expos, the event-connected infrastructure is related to the development of the site. In all cases, other facilities include housing for event participants, offices, and transport solutions.

Additional city-wide infrastructure and services include those that are essential to access the event, to ensure security, to provide alternative activities for the public during the event and to accompany the overall process of upgrading the city. These include:

NEW INFRASTRUCTURE	▪ New transport links and services to improve city connectivity ▪ New facilities for energy supply and distribution
NEW FACILITIES	▪ Buildings and public spaces hosting a wealth of different activities to be used during the event and to remain as future legacy (i.e. business parks, conference centres, museums, hotels, etc.)
IMPROVED SERVICE	▪ Improved public service delivery in the city during and after the event
IMPROVED MANAGEMENT	▪ Improved ability of the public administration to deliver and coordinate services

Infrastructure and service development help strengthen the city's ties with its region and improve services and social and cultural offerings for both residents and visitors.

This coordination exercise is a distinctive feature of mega-events and an important legacy in terms of developing organizational and managerial talent. Through the experience of designing and managing a mega-event, city managers will be encouraged to rethink many planning and coordination aspects of the city and its infrastructure around a new shared ideal.

2.1.3. Fostering an innovation-minded environment

> *As local leaders, it is important to understand that cities that are innovative can achieve advantages in globalization. The success of cities and their inclusion in globalization can be measured by the capacity they have to bring out new ideas and spread them.*
>
> Chapter 7 -- Embracing Scientific and Technological Change

Innovation is both a driver and a major outcome of mega-events. Hosting a mega-event requires an innovation-driven mentality that must be already present in the city. Through the development of new infrastructure, green buildings, energy systems and new types of transport, each mega-event offers an opportunity to the city to test innovations in science and technology, but also in other domains, including culture, education, etc.

A mega-event fosters innovation in three key ways, by introducing:

- novel opportunities in the business and market environment
- a platform (site, venues, etc.) to experiment with innovative solutions in the design, operations and infrastructure
- a communication space for the general public to understand the nature, the impact and even the application of new technologies.

Each event helps strengthen the innovation capabilities of the industries involved. Whether the event is a general one like Expos, a sporting event or a cultural event, the city and the enterprises are affected by knowledge spillovers from which they can gain a lot of experience. Opportunities for new and existing businesses emerge from both the operational requirements prior to and during the events as well as from sponsorship activities. From the time of the bid, different sectors begin to respond to new opportunities created by a new dynamic environment promoting entrepreneurship. These include: construction, hospitality, tourism, environment, information technology, marketing, transportation, etc. The Expos' mandate[4] explicitly states that they shall help the general public understand the impact of innovation on quality of life at both the local and the global level. This is achieved by showcasing innovation through the pavilions, thus drawing attention to new technologies.

Today, many mega-events contribute to the education of the public about technological change through the design and presentation of venues and event management.[5]

2.1.4. Environmental practices and education for sustainable development

Political will and strong leadership at the top levels of city government are needed if we are to transform the built sector. To encourage such leadership we may sometimes need to educate city leaders to strengthen their conceptual understanding about sustainability and its long-term, systemic benefits to the economic vitality of a city. Strong executive leadership has been the key driver for the successful transition to green building and sustainable development.

[4] *An exhibition is a display which, whatever its title, has as its principal purpose the education of the public: it may exhibit the means at man's disposal for meeting the needs of civilisation, or demonstrate the progress achieved in one or more branches of human endeavour, or show prospects for the future*. Art. 1, BIE Convention, Paris 1928.

[5] In the case of China for instance, Olympics and Expo helped set up laws and policies that support innovation, including the protection of intellectual property rights.

Recognizing that mega-events can leave major environmental footprints, in recent years oversight organizations such as the BIE and the IOC have developed requirements to create greener events and contribute to education on sustainable development. It is fair to say that today environmental protection and education have become hallmarks of mega-events such as Expos and Olympics.

In the case of Expos, for instance, as early as 1994, the BIE approved a milestone resolution stating that future exhibitions have "a commitment to the supreme importance for Humanity of due respect for Nature and the environment." With this resolution the BIE established the future direction of the 21st century Expos as forums for resolving global issues. This is partly achieved by connecting the theme to concerns that reflect the global efforts toward the environment and sustainable development.[6]

By providing a stage where global actors can showcase their visions and solutions to climate and environmental challenges, mega-events can make a key contribution to cooperation and education for sustainable development.

Mega-events reflect this trend in a variety of ways, including:

- Implementing environmental practices in event operations and infrastructure.
- Promoting an understanding of environmental issues through the theme.
- Making the site a living example of environmentally sound practices.

At the same time, new forms of exhibitions presenting best practices enable visitors to see real-life examples of sustainable concepts, such as in urban development. The site therefore becomes a laboratory for environmental and sustainable solutions that can later be applied at the wider city-scale.

The preparation period for a mega-event is an opportunity for city managers to create expectations and to establish a more environmentally-oriented mindset in the citizens that will

[6] Since the year 2000, the main UN agendas have guided the selection of Expo themes. Agenda 21 of the 1992 UN Conference on Environment and Development in Rio de Janeiro inspired the themes of Hannover 2000, Humankind, Nature and Technology: A New World Arising, Aichi 2005 Nature's Wisdom, Zaragoza 2008 Water and Sustainable Development and Shanghai 2010 Better city, Better Life. Following the United Nations Framework Convention on Climate Change (UNFCCC), the future Expo of Yeosu 2012, with its theme The Living Ocean and Coast, will focus on harmonizing the development and environmental preservation of maritime resources with a special emphasis on climate change. Finally, Milan 2015, through its theme Feeding the Planet, Energy for Life, has committed to promote the UN campaign to achieve the Millennium Development Goals.

facilitate acceptance of future policies; it also is an opportunity for urban leaders to learn more themselves. Thus, the educational impact of the event is not limited to the public but touches also local and national leaders.

The importance of the environmental impact of mega-events is reflected in the fact that they are now currently delivering environmental reports that reinforce this commitment to implementing environmentally sound and green events.

ZARAGOZA 2008: AN ENVIRNOMENTALLY-FOCUSSED EXPO

Zaragoza 2008 was held from 14 June to 14 September 2008. The Expo was a successful example of how to bridge a strongly environmental theme with site operations, event management and legacy of the Expo. Building on its longstanding tradition in water conservation and management, the city of Zaragoza selected the theme Water and Sustainable Development, which was also consistent with the city's objective to reclaim the banks of the river Ebro and to create high quality business and recreational spaces through the Expo. Following the environmental practices of Aichi 2005, the management and operation of the 25 hectare Zaragoza Expo site along the river Ebro promoted a number of experimental and environmentally-friendly technologies, such as:

- renewable energy powering 100 per cent of the site and facilities
- hydrogen powered vehicles
- bioclimatic architecture
- maximum use of recyclable materials for promotional activities
- techniques for irrigation and watering "vegetal walls" by using water from the river
- million trees planted by volunteers in the region of Aragon

An important aspect of the legacy of the theme is the designation of Zaragoza as the location for the headquarters of the United Nations Office to Support the International Decade for Action 'Water for Life' 2005-2015, UN Secretariat for the Water Decade for Action (2005-2015), which is allowing the city to continue the work undertaken with the Expo 2008.

2.1.5 Leveraging branding and internationalization opportunities

> *The use of culture in urban planning strategies is closely linked to urban marketing and city branding. Some industrial cities that were old, grey and grim based their regeneration on the creation of high-profile cultural facilities and activities.*
>
> Chapter 9 -- Fostering Culturally Rich Communities

In the global competitive environment, urban managers must find ways of making their cities known, establishing elements of differentiation and value that would attract foreign visitors as well as investments. Branding has become today an essential component in the life of a city to support tourism, attract foreign investments, and create an image of stability and trust.

Mega-events offer unsurpassed promotional opportunities as they are a world stage where organizers and participants can display their achievements and domains of excellence. Thus,

they are themselves a communication platform that a city can use to support a branding campaign and launch an internationalization effort.

From a global visibility perspective, the recent experience of China with the Olympics and Expos is very telling. The 2008 Beijing Olympics reached the largest global television audience on record with more than 4 billion people worldwide in a few weeks, and the 2010 Shanghai World Expo had a record number of visitors (over 70 million on site). Each event was an opportunity to take center stage and to reinforce a global image of the city and of the country.

A key objective of branding and internationalization efforts is to attract tourists while creating a welcoming mindset in the local culture that makes it more open to the world. In this sense, mega-events also help trigger a genuine interest in local citizens to learn foreign languages, travel and build relationships abroad.

The expansion of tourism not only benefits the host city, but also the overall region and country, provided that the organization is open and inclusive. Event visitors do not stop only in the host city but also explore other regions in the host country; vice versa, the event represents an additional attraction for the tourists that are already planning to visit the country.

Because mega-events carry content and enjoy international backing, they amplify the impact of any branding campaign and help move well beyond standard advertising practices. In addition to showcasing local and national culture, society, and economy to the world they can help the host city take a leading role in catalyzing global attention on a key issue for humanity. Thus, through a mega-event, the city can enrich a branding campaign with content that is meaningful globally and goes beyond traditional commercial techniques.

In other words, mega-events tie together city branding and public diplomacy. For example, Expo Shanghai represented a novel form of diplomacy built around an important international event. Expo Shanghai supported major activities in political diplomacy, economic and science/technology diplomacy, public diplomacy and cultural diplomacy. For China, Expo diplomacy will exert far-reaching significance."[7]

All types of media play a critical role not only in promoting the events themselves but also in building the public consensus that will ultimately help advance an enhanced perception of the host city. The extraordinary media exposure related to a mega-event helps convey internationally the image of the country. While reporting on different competitions, events or

[7] Yang Jiemian. *China's Expo Diplomacy: Theory and Practice*. Shi Shi Publishing House, April 2011.

aspects of the mega-event, the global media also report extensively on other aspects of the host nation: its geography, its economic potential, its social and cultural transformations, etc.

The branding opportunities for international participants should not be underestimated. On the contrary, their interest in participating will be proportional to the ability of the host city to provide a highly visible platform both nationally and internationally.

2.1.6 Multi-level public-private alliances

> *Scalable sustainable urban development uses integrated strategy and management techniques that span traditional departmental "silos," creating cross-discipline collaboration and efficiencies. [...] In addition to using integrated sustainability approaches across city functions, the complexities of challenges faced by large cities require that city management areas and agencies also use integrated strategies within functions and departments.*
>
> Chapter 1 -- Envisioning a Harmonious City with Sustainable Communities

The ability of all mega-events to make a strong impact is also due to the nature of the stakeholders. The different partnerships established can be very beneficial for the host city and region, and include:

- Public and private organizations: (local and regional administrations, governments, global corporations, international organizations, etc.)
- Relations with oversight organizations that assign and oversee the events
- Relations with international participants and organizations

As shown elsewhere in this publication, the partnerships between public and private organizations are becoming important tools for both the financing of and the delivery of city services. Mega-events are a way for cities and governments to engage together in a global project that can generate major local and international benefits. Hosting a mega-event offers a variety of advantages for all the different actors and stakeholders involved.

Although this manual is focused on cities, it is important to understand how the impact of a mega-event goes beyond the urban and regional boundaries. The international dimension of the event brings into focus the role of the national government and requires a synergy of vision and intent between all public institutions. Indeed, only if the host city and the government have a shared understanding of the mutual benefits they can gain from the mega-event, will the expected results be achieved.

Cooperation between public and private organizations. A mega-event is an opportunity to support the development of these highly beneficial alliances. Indeed, the most successful mega-events derive from a close collaboration between the public and private sectors. The

importance of managing private and public participation is extremely important at the infrastructure level, especially given the size of the investments required. Mega-events require very significant investments and therefore many cities and governments shy away from them. The development of large-scale infrastructure with ongoing maintenance requirements (e.g., transportation) often requires public-private partnerships that can help secure additional financing, offer specialized expertise, and better manage risk.

The involvement of private companies is extremely important as they contribute funding and innovation capabilities. According to a report from PriceWaterhouseCoopers: "Private partners have complemented public-sector know-how with additional funding, expertise, and oversight [....] In fact, the costs and benefits associated with mega-events present ideal opportunities for public-private investment partnerships that serve wider urban development goals. Deals that are structured to be mutually beneficial to both the public and private partners are most likely to succeed because each partner becomes an active stakeholder. Depending on the particular deal or type of infrastructure investment, private partners sometimes become long-term stakeholders. As cities encourage more private-sector participation, they can realize the twin benefits of improved access to capital and greater budgetary certainty; well-structured contracts can allocate risks—related to cost overrun, delay, and quality—to the private sector." [8]

Cooperation with International Oversight Bodies - All mega-events have some central organizing authority that enforces rules, regulations and best practices. The very natures of the international organizing bodies demonstrate the relevance and importance of the global involvement in support of each event. The Bureau International des Exposition (BIE) in charge of Expos represents 157 member states, while the International Olympic Committee has around 205 national Olympic committees, and FIFA has about 203 football associations. Although the members are quite different in each organization, their number reflects the voice of a very significant majority of the world community in their respective areas of human endeavor.

Thus, when a mega-event is assigned to a city, it brings a strong international legitimacy to the host and, at the same time, it establishes a very high degree of public accountability. However, the important role of the international bodies does not end there. In fact, the involvement of these oversight organizations ensures the following benefits:

- *Transferring best practices* - each mega-event is a novel experience for a city, which can rely on the oversight body for strategic and organizational support.

[8] *Game on: Mega-event infrastructure opportunities*, PriceWaterhouseCoopers Report, April 2011.

- *Enabling and facilitating international communication* - the oversight bodies will be the natural catalysts to facilitate international engagement thanks to their existing network and their mandate to ensure involvement under the best possible conditions.
- *Leveraging the values and brand of mega-events* - as mentioned above.

Cooperation with international participants and organizations - Table 10.1 below shows the level and type of international participation; participants are entities that are actively engaged in the preparation and the operation of the event.

Table 10.1 Level and type of participants at selected mega-events

	Event Participants	
	National Olympic Committees	**Athletes**
Summer Olympics		
Sydney 2000	199	10,651
Athens 2004	201	10,625
Beijing 2008	204	10,942
Winter Olympics		
Torino 2006	80	2,508
Vancouver 2010	82	2566
	Official Expo Participants[9]	
World Expo		
Seville 1992	112	
Hannover 2000	155	
Aichi 2005	121	
Shanghai 2010	246	
International Expo		
Taejon 1993	141	
Lisbon 1998	155	
Zaragoza 2008	107	

Involvement of participants is essential. In fact, through both direct and indirect investments – money, services in kind, tax payments, provision of volunteers, promotional activities at home, etc. – they all have major stakes in the outcome and the success of the event. To them, the event is an equally important opportunity to showcase excellence and develop new cooperation relations. Because of the key role played by international participants in the successful preparation of the event, coordination with them is extremely important, and this will help establish long-term relationships of extremely high-value for the city.

[9] The term *Official Participant* refers to participating countries and international organizations. It does not include the participation of companies and civil society organizations which are also key actors.

2.2. CHOOSING THE RIGHT EVENT FOR YOUR CITY

Although mega-events have many common benefits, not all events are the same and each city will have to understand which event best fits its objectives, resources and identity. To explain the difference between types of mega-events we can identify two important criteria.[10] The first is a distinction between the scale and the scope of the event - which reflects the level of organizational complexity and the potential impacts and benefits. The second criteria is the strategy of outreach to the general public.

The *scale* of the event defines the capacity to involve, attract and mobilize international participation. The *scope* of the event defines the diversity of content and themes, which translates into a greater diversity of resources that should be mobilized locally and internationally for operational, communication and content development. It indicates the extent to which some of these organizational aspects can be standardized.

Figure 10.1 Distinction between scale and scope of selected mega-events

The distinction between scale and scope also reflects the extent to which different mega-events engage higher levels of creativity and entrepreneurship within a city. If we look at the extremes of this matrix, the larger the scope the greater the innovation input from the city should be. Breadth of scope entails a greater degree of thematic diversity, richness of content and display innovation. The larger the scale, the greater the operational demands to coordinate the event on a global scale.

[10] Bureau International des Expositions: *Internal Report, 2008.* Paris, France.

These criteria point out one of the fundamental differences between Olympics and Expos in terms of organization requirements. Although they both have the greatest scope in terms of diversity and levels of participation, they differ in the degree of complexity linked to the design and implementation level.

In the case of Olympics and other sporting events, there is a much higher degree of standardization based on the technical requirements for each sport venue. However, in relation to the FIFA World Cup, the Olympics are much broader as they continue to introduce new types of sports and they involve events and infrastructures that relate to the cultural and environmental dimensions of the city. Because of the well-tested venue organization, the Olympic organizers can rely on a significant set of core specifications already available to them that will greatly support the organization and operations phase.

Each Expo has a new theme requiring a greater level of diversity in the content and the infrastructure. Although there are core specifications available to the organizers these are more limited, thus requiring a greater degree of internal coordination and entrepreneurial creativity from the organizer.

Looking at a different type of mega-event, i.e., international conferences, there will be a strong focus on operational capacity, relevance of the host city and security requirements.

While there is a major difference between different types of events, international bodies have also allowed for events of different size to accommodate the needs of different cities. For instance, the BIE distinguishes between World and International Expos[11] and the IOC between Summer and Winter Olympics.[12] In both cases the level of international participants (exhibitions or athletes), the number of visitors and public and the amount of investments differ very significantly.

The second distinction between mega-events is in the form of outreach to the general public. Expos and European Capitals of Culture, for instance, rely on public visitors to the site and to the city. Sporting events, although they attract a large attendance to the venues, rely more on media and global television viewers. This distinction is connected with the nature of the venues and offerings which lend themselves more naturally to different types of presentation and communication. These will ultimately determine the success criteria.

[11] The terms “World Expo” and “International Expo” are used for general communication; “International Registered Exhibition” and “International Recognized Exhibition” are the corresponding ones from BIE Regulations.

[12] The terms Summer and Winter Games are part of common usage. However, the Olympic Charter states that “The Olympic Games consist of the Games of the Olympiad and the Olympic Winter Games”.

Figure 10.2 Relation between visitors' presence and media exposure

The impact and role of the media is directly related to the duration of the event. The nature and relatively brief time period of sporting events makes them significantly more "newsworthy". On the contrary, because an Expo lasts 3 to 6 months, it is hard to maintain the interest of the press and therefore the organizers often focus on more targeted events.

The global reach of the Olympics through media exposure remains extraordinary. The Games have made their opening ceremony a major part of their culture and a very important "institutional" moment that is followed by everyone. For instance, 3 billion people watched the opening ceremony of the Beijing Olympics.[13]

Table 10.2 Visitor information at selected mega-events

		Expo			European Capital of Culture			
year	City	Visitors (million)	Duration	Population	City	Visitors (million)	Duration	Population
1998	***Lisbon***	**10**	4 months	564,657				
2000	***Hannover***	**18**	6 months	> 500.000				
2002					***Bruges***	**1.6**	≈ 1 year	116.836
2003					***Graz***	**2.7**	≈ 1 year	226.244
2004					***Lille***	**9**	≈ 1 year	180.000
2005	***Aichi***	**22**	6 months	7,4 million (prefecture)				
2007					***Luxemburg***	**3.3**	≈ 1 year	77.000
2008	***Zaragoza***	**5.6**	3 months	638,799				

[13] The BBC reported five million viewers in the United Kingdom, the Seven Network had 7.8 million viewers in Australia, The Hollywood Reporter said 4.4 million in France watched the ceremony, the ARD estimated 7.72 million viewers in Germany, while in Italy, RAI had 5.5 million viewers, and in Spain, TVE obtained 4 million viewers. In the United States it managed to capture a total of 69.9 million.

2010	***Shanghai***	**70**	6 months	23 million				

Table 10.3 Participation of various groups at Olympic events

	National Olympic Committees	Athletes	Volunteers	Media	TV Viewers
Summer Olympics					
Sydney 2000	199	10,651	46,967	16,033	
Athens 2004	201	10,625	45,000	21,500	
Beijing 2008	204	10,942	100,000	24,562	
Winter Olympics					
Torino 2006	80	2,508	18,000	9,408	
Vancouver 2010	82	2566		10,000	4 billion

Once a city has selected the mega-event that best fits its objectives and aspirations, it will engage with the country in a long-term partnership to win the right to host the event and then to implement the project.

2.3. PREPARING FOR THE EVENT

2.3.1 Developing the Vision before and during the Bid

Reaching the decision to bid is a significant task in itself. It requires advance planning to integrate the future vision of the city and the contribution of the mega-event. A decision to bid is therefore generally taken well before the beginning of an official bidding process and is generally associated with the development of the supporting infrastructure and image for the city.

The bidding process is a self-contained project which tests the public entrepreneurial capacity of the city and its ability to manage a campaign to gain support internally and internationally. For a 12-24 months period, the city will try to answer important questions such as: Does the investment in the mega-event support the region's long-term needs and objectives? Which financing models should be applied? What role will sustainability play? What kind of governance is best suited for the project? What will be the legacy for the city? How attractive is an event in our city for international participants and sponsors?

2.3.2 Operational Readiness

Receiving adequate support from the government authority is necessary during the bidding phase. However, coordination and communication between the city, the organizing committee, government and community entities during the planning and operation phases are essential to the success of staging a mega-event.

The size and complexity of a mega-event require the organizing committee to directly interact with local and national Government entities in many programmes during the planning phase, such as, for instance:

- construction of the site or of specific venues or renovation;
- accreditation of participants, which is often managed in cooperation with the national government body which is responsible for border control;
- organization of joint events (i.e., conferences, forums, shows, etc.);
- protocol aspects, which are managed in cooperation with the Foreign Ministry;
- transportation systems, i.e., the urban mobility plan and urban signage system.

During the event, the cooperation becomes stronger and requires an efficient system of command, control and communication. The many factors that may influence this structure are outlined in Table 10.4:

Table 10.4 Factors that influence mega-event institutional structures

Relationships between Government bodies and the Organizing Committee	– Is there a single coordination authority or multiple agencies? – What are the respective responsibilities of the city government and the organizing committee? – What are the respective services to be provided by the city government and the organizing committee, who pays for what?
Legal factors	– What national laws relate to events? – What are the obligations defined by the BIE, the IOC or FIFA?
National culture	– What is the decision making approach? – Does the country have centralized or decentralized structures? – Are staff ready and prepared to be empowered? – Is there a culture of volunteerism?
Decision making process	– Who will take the final responsibility for analyzing information, making decisions and defining actions during events operations? – Who is responsible and who will take action in case of emergency or crisis? – In highly shared programmes, such as Medical assistance, Security, Transport, City Operations, who is the leader? – Who decides what will be reported to the Media?

In the case of the Olympics, the Organizing Committee is recommended to organize a Main Operations Centre, which provides a centralized system to manage the Games effectively in terms of information, coordination, reporting and decision-making. The Main Operations Centre should be comprised of the Organizing Committee executives, the representatives of

the city and the Government involved in the events operations. This programme was applied by several Organizing Committees with different results, due to the factors previously analyzed. Nevertheless, it proved to be a good working framework.

2.3.3 Post-event Management

The legacy of a mega-event in a city can be rich and diverse. The term 'legacy', however, is somewhat misleading as it should not be thought of only as a "post-event" issue to be dealt with in the future. The legacy must be part of the vision to begin with and should be translated into a plan, which is the event itself.

When either planning or evaluating the legacy of the World Expo, the focus is generally on the impact on the infrastructure, the economy, the brand image, etc. But there should also be a vision for how to carry forward the intangible and cultural legacy of a mega-event and translate it into effective and concrete initiatives relevant for the participants, and the general public.

Generally speaking four main legacies for mega-events should be planned:[14]

- The **informational legacy** embodies the know-how of organizers as the result of the compilation and preservation of all the records of the event (data, activities, events, etc.). These records are the knowledge base that will be invaluable for future organizers and researchers.
- The **transformational legacy** includes the wealth of different individual and joint projects with lasting impact on the economy, the public services, the city landscape, the culture, the environment, society, politics, etc.
- The **theme legacy** includes the projects and initiatives that are the result of the mega-event's focus on the theme.
- The **cultural legacy** includes the projects and initiatives that help foster the education of citizens in the history, the values and the future of the relevant mega-event.

Legacy management is generally a challenge as the dedicated event organization is dissolved after the conclusion of the mega-event and the staff move on to different positions (new jobs or return to previous jobs after having been seconded to the event). In this case, relevant public organizations should be identified where key personnel can continue to carry on specific legacy-related projects.

[14] *The Legacies of Expo 2010 Shanghai China: a BIE perspective*. BIE Report, 2010.

3. CASE STUDIES

3.1. EXPO SHANGHAI 2010, A GLOBAL PLATFORM FOR FUTURE URBAN DEVELOPMENT

Between May 1st and October 31st 2010 the city of Shanghai hosted the World Expo 2010. This event became one of the most successful Expos for a number of reasons: the timing, the place, the contents and the ability to foster models for future urban development.

From a purely quantitative perspective, Expo 2010 featured the largest site, a record number of participants and visitors and an unprecedented events and forums programme. The 5.28 square kilometres site, located at the heart of the city and stretching along the banks of the Huangpu River, was a massive urban regeneration project aimed at developing new business, cultural venues and green spaces.

Shanghai 2010 experienced an unprecedented breadth and depth of participation. Participants included 192 countries, 50 international organizations, as well as corporations and NGOs which were present through individual or joint pavilions. Shanghai 2010 also reached a very wide public: over 70 million people visited the site in the course of 6 months and over 150,000 volunteers were involved in the organization and operations of the Expo. The event and cultural programme included shows, activities and publications in the tens of thousands.

An influential and diverse group of global players viewed Shanghai 2010 as a privileged meeting place. Alongside the opportunities that an Expo offers to build new relationships – be they political, diplomatic, commercial, etc. – or cement existing ones through its theme, Shanghai 2010 demonstrated how an Expo can support the public policy and communication efforts of all those that were present as official (governments) and non-official participants (international organizations, NGOs, corporations).

For participating countries, Expo 2010 was a natural platform to promote their identity and presence in China, as well as those of their regions and cities. For international organizations, the theme of Expo 2010 made it an ideal vehicle to advance the issues critical to their mandates, especially as they pertain to the wide-range of subjects concerning urban development and quality of life. Cities participated in an Expo for the first time in their own right; Shanghai 2010 was an opportunity to advance cities' international role through a strategy that involved high-quality content-driven presence.

Private corporations participated either through national pavilions or with their own pavilions. In both cases, as they contributed the bulk of innovation to the Expo, they significantly reinforced their presence and brand in China.

Choosing the right theme for the Expo - The choice of the theme was particularly important for two reasons. The first was of a practical nature, given the importance that the global community is placing on the growth and transformation of cities. As much of the world

experiences rapid urbanization, social, economic and environmental pressures often negatively affect quality of life; these can often be improved by joint international cooperation, such as sharing of best practices.

The second was strategic for both China and the BIE. With the assignment of Expo 2010 to China the BIE member states acknowledged a solid Expo project and a key political role for the country in the future of sustainable development. After successfully staging the 2008 Olympics, China was ready to take up another major event of great complexity. Through the choice of the theme, Shanghai 2010 not only reflected an important need of society but highlighted one of the raisons d'être of Expos, namely building more dynamic and livable cities through global cooperation.

Shanghai was a highly credible place to host an Expo on "Better City, Better Life" for two reasons. Firstly, because of the combination of its size and its rapid development, Shanghai embodied the different challenges faced by a majority of cities in the developing world. Secondly, as the first Expo to take place in the developing world, Shanghai was a well suited venue to bring together diverse experiences and build the bridges that would help improve the cities of tomorrow. As the global community looks to connect the developed and developing worlds, East and West, North and South, rich and poor, urban and rural environments, past and future, Shanghai was perceived as a city that was at the cross-roads of this effort.

Engaging Key Institutional Stakeholders - The Key Role of the Shanghai Library - The role played by the Shanghai Library in the development and sharing of knowledge resources within the Expo deserves to be mentioned as a best practice in itself.

After the successful bid to host Expo 2010, the Shanghai Library established an information center and began a systematic effort to collect research material related to Expos and to support the Expo Bureau, in charge of the organization, in all of their education, promotion and dissemination efforts. Throughout the preparation phase, the Library has undertaken many new initiatives to serve and support Shanghai 2010. These include

- Research teams were established to undertake many projects for the Expo Bureau. By 2010 they had published 10 volumes on the Expo.
- World Expo Information Center was established to support research and knowledge sharing for the Bureau and the World Expo and has become today a leading information center on the Expo in China. The Center launched an initiative to record and collect everything starting from Expo 1851. They continue to develop and expand their collections, including everything that is produced/published by the BIE.
- Library Services to the World Expo. Since 2005 the library has worked with the Expo Bureau to provide support for the Communication and Promotion Services of the Expo by:

- Organizing a library in the Media Center on the Expo site
- Producing videos for the China Pavilion to entertain people while queuing
- Providing clipping services for customized usage
- Organizing a lecture series about Expos (by 2010 the library had organized 95 Expo-related lectures reaching about 45,000 people)
- Providing solid academic research support to exhibitions and other promotional activities
- Carrying out survey services including monthly media coverage and media monitoring of sensitive issues

Engaging partners beyond the host-city itself - Through Expo 2010, China successfully engaged the whole country not only through the nation-wide promotion of the theme but by mobilizing and engaging all of its provinces, municipalities and cities in different activities in preparation of the Expo.

In the case of neighboring cities, Expo 2010 organized international thematic forums, positioned as high-profile events, outside of Shanghai. Each forum took place in one of six important cities of the Yangtze River Delta, each one known for its active engagement in a specific theme of the Forum. While providing design and organizational support in one important aspect of the Expo, each city had an opportunity to gain benefits, such as enhancing their international identity, reinforcing their image nationally and launching innovative new initiatives.

Shanghai 2010 also created opportunities for other international cities by introducing the concept of an exhibition area fully dedicated to urban best practices, where cities could display and share their achievements. The Urban Best Practices Area (UBPA) was a dedicated 15 hectares zone at the heart of the Expo site where selected cities from around the world displayed their real-size, real-life solutions to enhance their quality of life, often through green buildings.

Urban Regeneration and Environmental Transformations - The Expo designed and applied environmental innovation at a larger scale than any Expo before. It fulfilled its promise to be a green and low-carbon Expo. It is fair to say that part of the environmental legacy of the 2008 Beijing Olympics (see section 3.4. below) was to create an example for Shanghai 2010 to follow and to surpass.

As the pictures below show, the image of Shanghai changed radically as the result of the same types of improvements that were planned and implemented in Beijing, including improvement of air quality, policies for emission reductions, and relocation of highly polluting factories previously located in the center of the city.

View of the city and of the site hosting the Shanghai Expo in 2004 and in 2009.

The heart of the city along the river has gained new facilities that will be dedicated to cultural and business activities. These include renovation of previously polluting sources that are now being re-utilized as modern museums:

- Nanshi Power Plant, which used to be the biggest air pollution source in the area, will become a museum of Modern Art
- Jiangnan Shipyard, another major source of pollution in the past has been retrofitted into the China Shipping Pavilion, to become a permanent shipping Museum.

Within the Expo site, additional old buildings were classified and preserved as "Outstanding Early Modern Architecture". These are now restored architectural heritage venues used for exhibitions, cultural exchange and recreational functions.

The city gained overall as many neighborhoods were refurbished and brought back to life. This includes a general renovation of the Bund Area.

Enhancement of transportation capacity and services includes:

- Expansion of existing airports to reach a capacity of 94 million passengers per year;
- Expanded metro line reaching 420 Km with 13 lines, ranking second in the world after London.
- Expansion of water transportation including the building of 3 shipyards, each with 80000-ton capacity and 66 international cruise ships expected to berth

Lessons Learned:

There are many reasons for the success of Shanghai, as outlined above. These can be briefly summarized in the ability of the organizers to create as much synergy as possible between

very different public institutions, which were often open - as in the case of the Shanghai Library - to undertake innovative activities in addition to their current ones. The strong planning and coordination system in China was certainly a strong asset in establishing a synergy and opening communication channels between different organizations.

3.2. NINGBO: LEVERAGING EXPO 2010 TO BOOST THE CITY'S TRANSFORMATION

The city of Ningbo is located in the Yangtze River Delta, less than 200 km from Shanghai and has a population of 2.2 million.

Ningbo became heavily involved in Expo Shanghai 2010, which it saw as an opportunity to advance its positioning as a center for information technology innovation. Indeed, Ningbo has given priority to the development of the software and information service industry, which in recent years achieved an average annual growth of 40 per cent.

In May of 2010, the first high-level international theme forum of the Shanghai World Expo was held in Ningbo and was dedicated to "Information and Communication Technology and Urban Development". The forum explored the future of cities through the development of information and communication technologies, focusing on issues of urban management, urban life and integration into the global economic framework.

The concept of a "smart city" was explored in the Forum as a central idea for urban development. It is also one of the key goals of the Ningbo municipal government that is planning a stepwise implementation of a smart city through the identification of key issues and the application of ICT solutions. On 24 September 2010, the Ningbo Municipal Government issued a decision to develop the framework of a "Smart Ningbo." Ningbo has thus become the first city in China to systematically map out the construction of a smart city, and the first city to make this a core principle of its urban development strategy.

Ningbo will align the development of the smart city concept with its international port, thus creating a city that can lead by combining the ICT industry with important trade facilities. Ningbo will pilot some projects in the Hangzhou Bay New Zone, and then promote successful experiences to the whole city.

With impetus from the Shanghai Expo Forum, Ningbo is implementing its smart city strategy based on the rationale that information and communication technology helps:

1. to disseminate government information and increase efficiency;
2. to provide better services to citizens;
3. to improve the competitiveness of business enterprises;
4. to allow farmers and the agriculture sector better access to market information.

Based on this rationale, Ningbo has launched 120 projects, one of which is a community service platform called "81890," which was described during the Expo Theme Forum. Citizens can dial 81890 to access any type of information. The service has less than 200 employees, and has built partnerships with over 700 enterprises. Sponsored by the government, it adopts market operations and serves the public.

In addition, recognizing that digitalization promotes urban development, the city has implemented a solution for eliminating digital gaps and promoting ICT in rural areas. Nine hundred out of the 2600 rural communities around Ningbo benefit from an information access platform. In a given community there is a fixed place equipped with computers, professional information service staff, a management mechanism and an incentive mechanism.

Inspired by the Expo 2010 Forum, the Ningbo Municipal Government launched the organization of an Exhibition on Smart Cities, with the first exhibit held from 2-4 September 2011. Mr. Mao Guanglie, Mayor of Ningbo, announced that Ningbo Municipal Government will allocate 1 billion RMB per year to develop a smart city and to train citizens in relevant ICT fields. Foundation grants and private sector investment are also being sought to support the smart industries. By 2020, with the improvements of smart technology and new infrastructure, Ningbo is expected to become a premier smart city of the planet.

Lessons Learned:

A mega-event is not only an opportunity for the host city but also for other neighboring cities that can contribute organizationally in areas that are best suited to their future goals.

3.3. AICHI 2005: THE FIRST ECO-EXPO

Aichi 2005 was held from 25 March to 25 September 2005 in Nagoya, Aichi Prefecture of Japan attracting about 22 million visitors. The organizers had set out three key objectives to assess the success of their Expo:[15]

1. Expo performance as a project. The metrics were comfort and safety, visitors' satisfaction, and reaching a target number of visitors.
2. Sustainability as a model for Expos. To influence the resolution of global issues by drawing international attention to the development of the Expo theme "Nature's Wisdom" through high quality presentations.
3. Theme development to encourage new social behavior.

[15] Nakamura, Toshio. *Aichi 2005 World Exposition Results and Evaluation*, Report, September 2005.

With its theme "Nature's Wisdom," Aichi 2005 aimed to emphasize the links between humanity and nature in the 21st century. It aimed to give visitors first-hand experience in cutting edge technologies, new social systems and future lifestyles that can offer solutions to the many challenges facing the world.

Although Hannover 2000 had already embraced the 1994 BIE resolution stating the commitment of Expo to support sustainable development, Expo Aichi 2005 established a direct connection between its theme *Nature's Wisdom* and the design, development and management of the site. Aichi 2005 encouraged exhibitors to share wisdom and cooperate with a common goal of resolving global issues. Amongst exhibitors it included the participation of many developing countries, international organizations (such as the UN, International Tropical Timber Organization, OECD, and the International Red Cross and Red Crescent Movement) as well as citizens groups.

Its vision also reflected the BIE requirements that "each exhibition must have a modern theme corresponding to the expectations of contemporary society" and that the theme "should give ample scope for a presentation of state-of-the-art scientific, technological and economical progress made in the area chosen, while giving due consideration to the dichotomy existing between human and social aspirations on the one hand and the necessary protection of the natural environment on the other."

Aichi's vision was put to test very early on. Soon after winning the bid there were very strong complaints from the citizens about potential environmental damage that might occur at the site originally chosen. To respond to the strong criticism, the municipality launched a series of meetings with the local population to identify the best alternative option. This was submitted to the BIE for modification and it was accepted.

The New Energy Plant at EXPO 2005

The organizers maintained a similar attitude all along, building a site that gave environmental considerations high priority. Amongst the major achievements in the area of the theme, Aichi presented concrete solutions for the global issue of environmental conservation.

Measures to reduce a negative impact on the environment were adopted across the operations of the whole site.

Alongside the standard practice of purchasing electricity from power companies, Aichi 2005 introduced experimental facilities that demonstrated the potential for regional power grids using new and alternative sources of energy. The project established a small-scale electricity network that tapped new power sources (such as fuel-cells and solar power). This energy was used to power pavilions like the Japan Pavilion Nagakute. This iconic pavilion also illustrated the usage of bamboo. It was covered with a cage made from approximately 23,000 bamboo trunks which allowed the building to breathe while blocking solar radiation. The effective use of bamboo to reduce air conditioning load was promoted because it also solved the problem in Japan of damage caused from excessively spreading bamboo trees.

Visitors experienced new, environmentally-conscious social behavior (separation of trash into nine types)

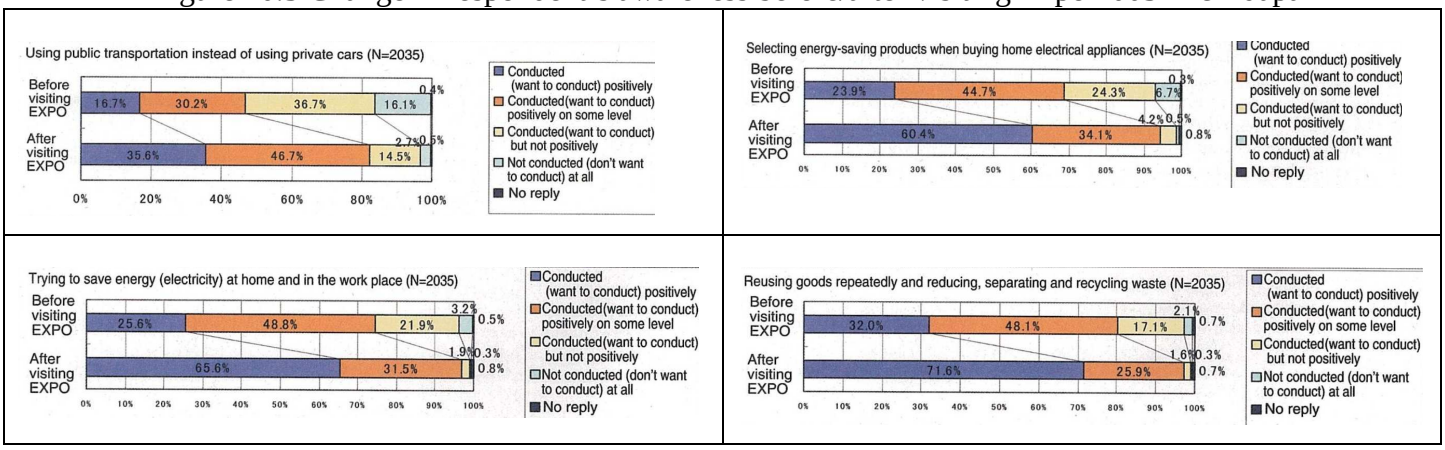
Visitors experienced some of the most advanced environmental technologies in the world, which were being tested at the Expo site. These included: biodegradable-plastic eating utensils used everywhere on the site at food concessions; a world-class greening wall (bio-lung) for suppressing the heat-island effect seen in urban areas; the intelligent multimode transit system (IMTS), which moved visitors within the Nagakute Area, and the fuel cell hybrid bus that linked the perimeter of the site.

Aichi 2005 put major efforts towards encouraging new social behaviour and systems, especially recycling. The venue was litter-free, volunteers were trained to separate trash into nine different categories and many people donated towards environmental causes.

Aichi 2005 spearheaded a major effort of engagement and training of volunteers. The programmes were so successful that a joint training programme was later developed to support volunteer coordination in Zaragoza 2008 and Shanghai 2010.

Additional projects supported environmental education, including the innovative idea of Expo Eco-money EXPO Eco-Money was given to environmentally conscious behaviour off site. For instance, about 2,400 shops across the country gave Eco-Money points for the non-use of shopping bags. Accumulation of Eco-Money could be later exchanged for Eco-goods according to number of points or as contribution to reforestation activities.

Figure 10.3 Change in respondent's awareness before/after visiting Expo 2005 Aichi Japan[16]



Lessons Learned:

By referring consistently to its environmental theme in the design and in the operations of the Expo, Aichi 2005 was able to greatly increase the impact of its message. Significant efforts were made to make citizens active drivers and supporters of new environmental behaviour and policy implementation. This was achieved by engaging society within the site and beyond through specific programmes and educational campaigns.

3.4. CASE STUDY: BEIJING OLYMPICS 2008

The Beijing 2008 Olympics are widely recognized as a major logistic and operational success as well as a landmark sporting event with 10,500 athletes from 204 countries taking part in the 302 events.

The 2008 Olympics represented a major way for China to signal the country's opening up policy. Alongside this important effort in public diplomacy, the Games catalyzed a major project of urban transformation and new infrastructure development in the capitol city. Most of the capital invested in the 2008 Olympics was in fact spent on infrastructure, which has helped shape and foster a greater environmental awareness among the public and was an opportunity to showcase China's commitment to growing in an environmentally sustainable manner.

[16] Aichi 2005 Environmental Report.

The Beijing Olympics highlighted a number of environmental issues, including the city's poor air quality. During the bid phase in 2000, Beijing set ambitious goals to improve the city's environment. The goals ranged from addressing air and water quality and waste management to introducing environmental considerations in the development of new infrastructure.

As specified in the UNEP environmental report on the Games, in order to accelerate the achievement of environmental goals, Beijing decided to move forward the deadlines of a number of existing environmental targets in the Beijing 'Environmental Master Plan'.[17] The outcomes became visible even before the Games started through:

- new wastewater treatment plants,
- expanded solid waste processing facilities,
- increased forestation and green belt areas,
- an improved public transportation fleet

Alongside the initiatives undertaken by the Beijing Municipality, the Beijing Organizing Committee implemented several projects to deliver sustainable Games. These initiatives ranged from waste reduction and recycling schemes at the venues and sustainable transport during the Games, to cooperation with sponsors on environmental sustainability and dialogue with environmental NGOs.

Air quality - The initiatives to improve air quality and reduce air pollution included:

- relocation and refitting of major polluting industries
- restrictions on construction sites
- conversion of coal burning boilers to cleaner fuels (natural gas)
- implementation of vehicle emission standards

Transport - Preparations for the Olympic visitors involved a significant expansion in the transportation infrastructure to improve local, regional, national and international connections. Beijing's airport was renovated and Terminal 3, the world's largest airport terminal, was added. Within the city of Beijing the subway doubled its capacity and size: it went from 4 to 11 train lines and from 64 to 114 stations. The improvement in public transport continues to help millions of residents in their daily commute, and the city's traffic authorities aim to significantly boost the proportion of people relying on public transport.

Energy and industry - The Beijing Games provided a strong catalyst for many environmental measures above and beyond the event itself, which included a significant transition of the energy infrastructure from coal to cleaner energy sources (natural gas).

[17] An environmental protection programme developed by the Municipal Government for 1997-2015.

Water - New wastewater treatment plants were built, along with an improved sewage network. Significant efforts were also made to save and recycle water resources. A variety of water-saving schemes and rainwater collection and re-use systems were implemented in the Olympic Village and several competition venues. Efforts were also made to improve the quality and availability of drinking water, placing the protection of drinking water reservoirs and improving water quality high on the agenda.

Waste - Using the '3-R' principles of 'reduce, reuse, and recycle', Beijing implemented a systematic approach to managing waste. This effort focused on improving waste processing in the city, with new processing and disposal facilities for urban and hazardous waste (industrial and medical) being built around the city. As a result, Beijing is close to achieving its goals for waste management. According to official data, 4.13 million tons of waste were produced in 2006 in the eight central districts, while the overall processing capacity was 3.98 million tons, giving a processing rate of 96.5 per cent. Beijing also worked to improve education and awareness among its citizens about the importance of separating waste for recycling and reuse.

Forestation and protected natural areas - A key area of improvement was forestation and developing new protected areas to improve green coverage in the city and its surroundings. After the city won the bid to host the Olympic Games, green coverage in Beijing, defined as the area covered by lawns and the shadow of trees and bushes, expanded to more than 50 per cent of the city's area.

Lessons learned: Beijing 2008 shows how a mega-event can have a significant impact on urban infrastructure and livability provided that it is properly integrated in an already existing programme of infrastructure, technology and policy roadmap development.

3.5. LILLE 2004: BUILDING A DYNAMIC CULTURAL CAPITAL ON THE LEGACY OF AN INDUSTRIAL CITY

In 2004, Lille was the European Capital of Culture.[18] From the opening celebration on 6 December 2003 until the closing on 28 November 2004, Lille 2004 welcomed 9 million visitors and hosted no less than 2,500 events (performances, exhibitions, festivities, etc.).

Lille is the regional capital of the Nord-Pas de Calais. It is a historical Flemish city and its combined urban area includes 180,000 residents plus those of 86 nearby towns, creating the fourth largest city in France with 1.2 million inhabitants. In the 70s and 80s, Lille went

[18] Palmer R. "*European Cities and Capitals of Culture" Report prepared for the European Commission" Part I and Part II*, Palmer /Rae Associates, 2004.

through a major post-industrial depression with the closing of its textile plants and coal mines. Since then, the city had to rethink its future and undertake a major repositioning of its economy and its image. As a result, Lille decided to pursue the Capital of Culture which it was awarded for 2004.

The main motivation for this was to catalyze a major regeneration of the urban area and its greater region. The theme focused on "bringing back the colour" to Lille and transforming the traditional black and white image of the city and the northern region into a colorful one.

Hosting the European Capital of Culture enabled the city to focus on promoting creativity and exchange throughout the whole region, which it did successfully by engaging in 193 different cultural projects. It promoted social cohesion and enhanced civic pride and self-confidence by promoting creativity and cultural experiences. It brought art into the streets, organized popular street festivals and encouraged encounters between artists and the public.

Organisation and management - The events and venues of Capital of Culture in 2004 encompassed the whole of the Nord-Pas de Calais region as well as parts of Belgium. To this end, the city engaged a variety of institutional partners including State Ministries, city administration, regional administration, specialized departments and relevant local communities.

Cultural programme and cultural impact - The cultural programme took place over a large region. Over 160 towns were partners in the event, 7 of which were in Belgium. The programme included more then 2000 projects divided into three seasons. In general, the events attracted more visitors than anticipated. The opening night on 6 December 2003 attracted over 650,000 people, when only 150,000 were expected.

Infrastructure - For Lille 2004 the State and local authorities implemented several urban development projects that created new public facilities and restored cultural heritage sites. The city and region spent over 70 million Euros in infrastructure projects with funding coming from State and local authorities across the region and the European Union.

Economic impact - The key economic goals that Lille achieved included:

- attracting inward investment and company headquarters
- developing tourism
- expanding the market for cultural events, attractions and services,
- enhancing the general cultural environment and creating cultural employment,
- building and improving cultural infrastructure,
- boosting confidence of the local business community
- improving the external image of the city and region.

Visitor perspectives - From the perspective of visitors, the objective was to increase the number of people coming to Lille and to the region. Traditionally, Lille was a major crossroad, a place where people would pass but not stay. With Lille 2004, the city and region hoped to reverse this trend. A considerable effort was made to shift the view of a gloomy post industrial city into a vibrant cultural center. Participation in culture was an important objective and almost a quarter of the events in the programme took place in public spaces with open air activities and parades taking place every month.

Social perspectives - To meet the objectives of enhancing pride and self-confidence in the region, public participation in culture was viewed as having primary importance. To this end, the cultural approach aimed at blurring the distinction between 'high' arts and popular culture, by bringing many activities into the streets and designing projects in urban space that would favour participation and exchange of ideas. Many free events allowed an even broader participation. Many projects also had a strong thematic content aimed at social cohesion. They focused on social inclusion efforts, education about culture and cultural values, civil society and democratic participation, community and NGO development, cultural diversity and migration.

Legacy and long-term effects - The Lille 2004 programme was conceived as part of a long-term cultural development of the region and has had considerable political support. In addition to the tangible legacy in the city, the event supported the desired long-term efforts to transform the image of the city and improve its social fabric. Lille is today a city that continues its journey towards the future, with the designation of Lille3000.

Lessons Learned:

An event such as the European Capital of Culture can have impacts that span well beyond the cultural theme and help regenerate an entire industrial urban landscape very much in line with the vision of creative cities.

4. BETTER CITY, BETTER LIFE: HOW TO ENSURE SUCCESSFUL MEGA-EVENTS THAT BENEFIT YOUR CITY

One of the major concerns connected to mega-events is their sustainability from many different perspectives: environmental, social and economic. The degree of risk involved is quite high, but, as the case studies show, the rewards can be even higher.

Investment in a mega-event is an investment for the public good and that is how the event should be conceived and managed. Although international oversight bodies play a key role in ensuring this aspect, the host city and all of its partners are the most responsible to this end.

The first World Expo was held in London in 1851 and the first Summer Olympic Games of the modern era were held in Athens in 1896. Since then, cities and governments around the world have continued to see great value in hosting them.

Although each event is a novel experience in a novel context, urban leaders can rely on a number of best practices that have proven to support the success of the event which they wish to host.

Best practice 1: Develop clarity on the goals and objectives for your city based on its overall resources and identity.

This is a fundamental step which will help the city determine which outcomes it expects from the mega-event. It cannot be the other way around, i.e. a mega-event does not set the goal for the city. It is the city that, by setting its goals, will be able to identify which mega-event will be more suited to support their pursuit.

Best practice 2: Choose the right event

As described above, there are a variety of mega and large events that cities can choose from. Here we have not given a full description, but we have illustrated the main ones with a number of criteria that differentiate them.

Best practice 3: Ensure local consensus

No mega-event can be successfully organized without the active engagement of the citizens. If the event is indeed successful, citizens will be the first and ultimate beneficiaries in terms of a better living environment, higher quality services, a healthier and more interesting city to live in. However, they must be part of the preparation, as host cities rely heavily on the contribution of local volunteers. Success starts with the residents.

Best practice 4: Integrate the event into the long-term urban development strategy

As we have seen in the case study above, many of the effects of an Expo will be felt a long time after the event is over. At the same time, the purpose of these events is to accelerate and implement urban transformation. Thus, city administrators have to establish both tangible and intangible benefits that the city needs for the long term. Indeed, from a mega-event perspective, the concept of legacy is almost misleading. In other words, the legacy must be an essential part of the strategy for the city and its outcomes will only be as good as the clarity of the original objectives, which must encompass the overall roadmap for city and regional development.

Large events are generally viewed as catalysts for new inward investments and as a powerful accelerator of the already planned public investments. This is the so-called infrastructure legacy which is one of the clearest results to be achieved with the hosting of a large event. However, the long term impacts also involve the "soft" aspects which bear on the social fabric, the cultural vibrancy, the ability to innovate, an environmentally aware public, an enhanced international image, etc.

Best practice 5: Engage all the key stakeholders

Because the stakeholders in many large events are so different from each other, the project may frequently encounter difficulties, particularly in two areas: determining the appropriate governance and sharing the vision and relevant information. Having recognized the important contribution of the local, regional and national governments, the host must equally understand the perspectives and the role of both the participants as well as the international governing bodies. In this sense, they should all be viewed as "shareholders"[19]. Mega-events are not standard events that happen to be very large. They are public ventures that challenge a city and its administration to engage in new ways of thinking and managing large-scale urban development initiatives in close cooperation with all relevant entities.

Best practice 6: Establish an open and inclusive organization

Last but not least, creating and managing the event organization with an open and inclusive strategy is essential to achieving the greatest benefits. This means not only involving political and business stakeholders but also universities, schools and citizens through information campaigns and volunteer opportunities.

5. LINKS FOR FURTHER INFORMATION

http://www.bie-paris.org

http://www.olympic.org/

http://ec.europa.eu/culture/index_en.htm

http://www.uncsd2012.org/rio20/index.php

[19] V.G. Loscertales, *How to get the most benefits from Mega-events*, paper presented at Global City Conference, Abu Dhabi, 2011.

http://www.expo2010.cn/

http://torino2006.olympic.cn/

http://www.ningbo.gov.cn/

http://www.expo2010.cn/expo/chinese/node578/