

Are We Building Competitive and Liveable Cities?



Guidelines on Developing Eco-efficient and Sustainable Urban Infrastructure in Asia and Latin America

PREVIEW





The guidelines ‘Competitive and Liveable Cities: Developing Eco-efficient and Sustainable Urban Infrastructure in Asia and Latin America’ have been developed by the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), the United Nations Economic Commission for Latin America and the Caribbean (ECLAC), in partnership with the Urban Design Lab (UDL), the Earth Institute, at Columbia University in the City of New York, in the context of the project ‘Eco-efficient and Sustainable Urban Infrastructure in Asia and Latin America’.



UNITED NATIONS



The project has been implemented by ESCAP and ECLAC in partnership with the United Nations Human Settlements Programme (UN-HABITAT).

The objective of the project is to promote the application of eco-efficiency principles and criteria to urban infrastructure development as a basis for enhancing sustainability and for expanding financing opportunities.

Activities included research, expert group meetings, case studies and pilot projects.



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Are We Building Competitive and Liveable Cities?

Developing Eco-efficient and Sustainable Urban Infrastructure in Asia and Latin America

Rae Kwon Chung,

Director, Environment and Development Division,
United Nations Economic and Social Commission for Asia and the Pacific
(UN-ESCAP)



Cities in Asia-Pacific are already suffering from severe environmental problems such as air pollution, traffic congestion or waste, while the basic needs of millions of urban citizens are yet to be met. The unprecedented urbanization of the region poses an even greater challenge for providing adequate housing, energy, water, sanitation and mobility to all. Eco-efficiency principles and criteria can help realize the necessary win-win approaches to environment and development.

Joseluis Samaniego,

Director, Sustainable Development and Human Settlements Division,
United Nations Economic Commission for Latin America and the Caribbean
(UN-ECLAC)



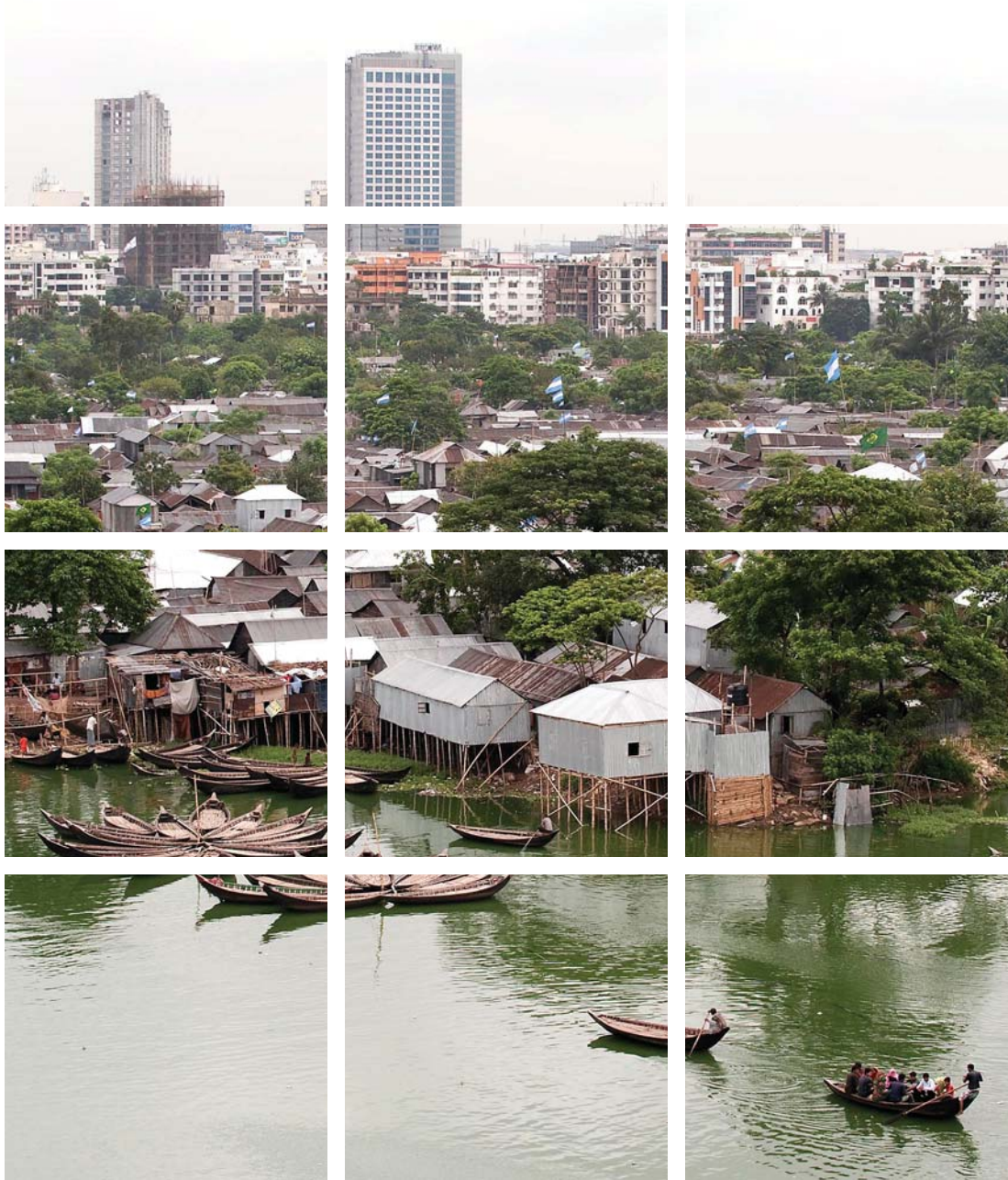
‘Patterns of infrastructure development determine environmental sustainability of economic growth. In turn, eco-efficiency is a key criterion for the development of sustainable infrastructure, and therefore a key objective in developing, planning and building more sustainable cities. Public and private investments in eco-efficient infrastructure in Latin America and the Caribbean are key for mitigation and adaptation to climate change impacts.’

Richard Plunz,

Director, Urban Design Lab,
Earth Institute at Columbia University in the City of New York
(UDL)



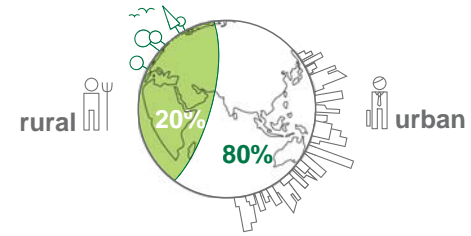
‘The unprecedented scale of our global urbanization requires unprecedented global attention to the design of our cities; to consider not only their physical form and function, but also the enabling factors underlying long-term competitiveness and environmental sustainability. Our timing is crucial with no time to lose.’



Why do we need inclusive and sustainable urban development?

CITIES OF HOPE, CITIES OF DESPAIR

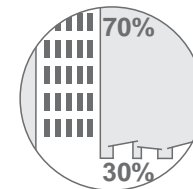
80% of people in Latin America live in cities



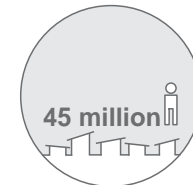
New city like Singapore every month for 20 years



30% of citizens in Asia live in slums



45 million people in Brazil live in slums



Urbanization: Towards a Global City
In Latin America **80%** of people live in urban areas. This figure will grow to **85%** by 2030¹.

In 2030, about **2.6 billion** people will live in cities in Asia-Pacific². This growth is equivalent to adding an entire new city of **4 million** people, such as Singapore³, every **month** for the next **20 years**.

Social Issues: Urbanization of poverty
Approximately **30%** of urban residents in Asia-Pacific live in slums⁴, without basic services. The number of people living in urban slums in India⁵ now exceeds the entire population of the Philippines⁶.

In Brazil **45 million** people live in urban slums⁷. This is almost 3 times the entire population of Chile⁸.

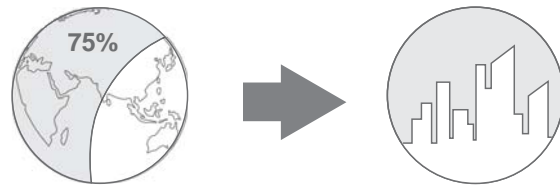
ECOLOGICAL FOOTPRINT

Environment:
Enormous Footprint
 Cities occupy **3%** of the Earth's land surface, house half of the human population, use **75%** of the resources⁹, and account for approximately **2/3** of all used energy and greenhouse gas emissions¹⁰.

The Ecological Footprint measures how much of the Earth or how many planet Earths it would take to regenerate the resources we use and to absorb the waste we produce. In **1990**, our humanity started demanding more than one planet Earth to support our current lifestyle¹¹.

Carrying capacity is defined as the maximum population that can survive indefinitely in a given environment. It depends on the available resources and the consumption habits.¹²

Cities use 75% of the Earth resources



We need more than one planet Earth



Asia needs US\$ 10 trillion over 10 yrs for infrastructure



80% of Asia's GDP is produced by the cities

LAC needs 3% of annual GDP for infrastructure



GDP of Buenos Aires is larger than GDP of Paraguay

CITY ECONOMIES

Finance:
Need for Investment
 Infrastructure investment in Asia-Pacific must reach an estimated **US\$ 10 trillion** over the next **10 years** to keep up with its consumption and construction needs¹³. This enormous investment requirement is comparable with two times the whole Latin America and the Caribbean region's yearly GDP¹⁴.

Infrastructure investment requirements in Latin America and the Caribbean are estimated at **3%** of the region's annual GDP¹⁵.

Economic Issues:
Engines of growth
 In Asia-Pacific over **80%** of the region's GDP is produced in cities and towns¹⁶. Bangkok alone accounts for **38%** of Thailand's GDP¹⁷.

The GDP of Buenos Aires outsizes some of the region's national GDPs like those of Uruguay and Paraguay¹⁸.

**SHAPING
OUR
CITIES**

Are traffic congestion and high energy costs eating up your competitiveness?

Infrastructure has key implications for urban development.

It is difficult and costly to modify. Once built, it locks cities into specific consumption patterns for decades. Constructing, operating and maintaining infrastructure is resource intensive: taking up energy, water, materials and land thereby causing major environmental impacts.

Traffic congestion costs can be as high as **10%** of a city's GDP¹⁹.

Traffic congestion in Bangkok is responsible for **2.1%** loss of the whole country's GDP²⁰.

Traffic congestion in Lima, Peru contributes to the loss of approximately **10%** of GDP or **US\$ 6,240 million** every year¹⁹.



Traffic congestion: Sign of economic growth or low competitiveness?



Building construction: Good investment or long-term cost burden?

Along their life-cycle, buildings alone are estimated to consume up to **40%** of all energy use and cause up to **30%** of GHG emissions²¹.

Cities are at a crossroad

Choices made today will determine the competitiveness, quality of life and environmental sustainability of cities for decades to come.

Cities in Asia and Latin America are at a crossroads in developing and expanding infrastructure in support of fast economic growth and rapid urbanization.



Business as usual:

Eco-efficient and sustainable urban development:

leads to:

- Cities for cars
- More traffic congestion
- More pollution
- Health problems
- High energy bills
- Higher costs on the long run
- Less competitiveness
- Less jobs
- Decreased quality of life

leads to:

- Cities for people
- Fast, safe, affordable transportation
- Vibrant streets and green areas
- Clean and healthy environment
- Lower energy bills
- More value for money
- Attraction of foreign investment
- More jobs
- Increased quality of life

**CHOOSING
OUR
FUTURE**

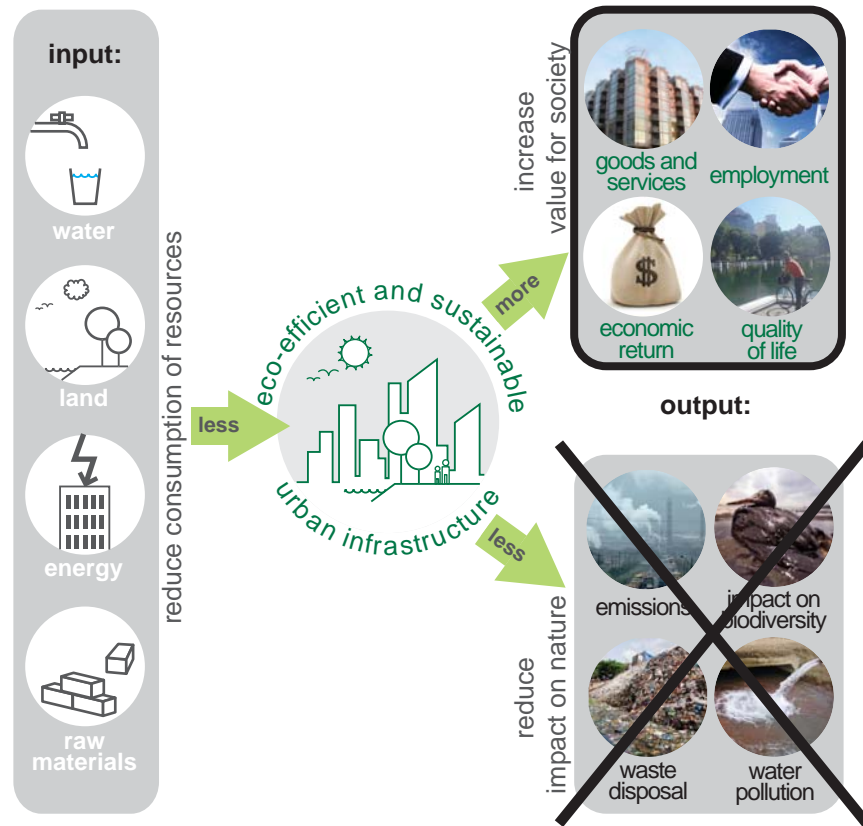
Cities will grow. There is no question about that. How we build them, though, is up to us.

URBAN METABOLISM

Cities as living organisms

People dwell in cities to have access to jobs, education, health, goods and services. Resources like raw materials, land, water and energy are the inputs required to deliver these goods and services that present a value for the society, while producing waste and emissions in the process.

Reducing the consumption of resources and the impact on nature is critical for achieving sustainable development with increased value for society.



'A moral point of view is compatible with efficiency'

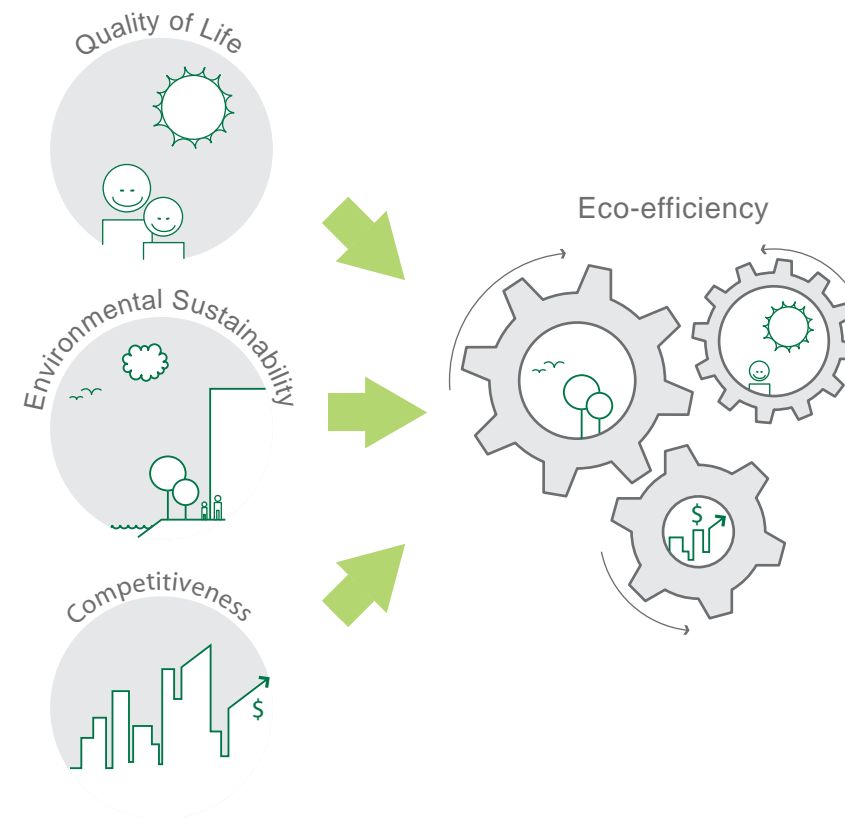
Antanas Mockus,
former mayor of Bogotá

The quality of life of our citizens as well as competitiveness and environmental sustainability of cities depend on the efficiency of this 'urban metabolism'.

Eco-efficiency: a driver for competitiveness and liveability

Principles of eco-efficient and sustainable urban development:

- Maximize quality of life
- Maximize competitiveness
- Maximize environmental sustainability



Eco-efficiency is expressed as the creation of more value with fewer resources and less impact, or doing **more with less**.

Eco-efficiency is a management philosophy which encourages municipalities and businesses to seek for environmental improvements that generate concerted social as well as economic benefits. It promotes innovation, growth and competitiveness while protecting our environment²².

MORE WITH LESS

These principles are not in conflict, but can reinforce each other. The concept of eco-efficiency seeks to develop synergies, rather than just balance trade-offs.

ECO-EFFICIENCY

$$EE = \frac{\text{Economic and Social Value}}{\text{Environmental Impact}}$$

**WHAT
DOES NOT
WORK**



Counter-intuitive examples of bad policies:

Roads are congested

- Why not build more roads or flyovers?

Expanding roads has proven to be ineffective and even counter-productive in easing congestion as it attracts an even higher volume of cars.



Waste is increasing

- Why not plan more landfills?

Landfills bury waste that could be recycled or reused, contaminates ground water, releases greenhouse gases, and uses up valuable land.



Water demand is growing

- Why not utilize more fresh water reserves?

Waste water treatment and reuse can greatly enhance water supply, as well as reducing contamination.



Energy demand is growing

- Why not build new power plants?

Building new power plants is much more expensive than reducing demand and, in many cases, using renewables on the long run.

‘Trying to solve traffic problems by building bigger roads is like putting out a fire with gasoline’

Enrique Peñalosa,
former mayor of Bogotá

Focus on the basics:

Roads are congested

- **Build the city for people, not cars. Develop walkable and bikeable cities and invest in public transport.**

Waste is increasing

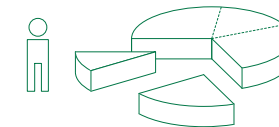
- **Invest in Reduce, Reuse, Recycle (3R) measures.**

Water demand is growing

- **Invest in wastewater treatment and rainwater harvesting.**

Energy demand is growing

- **Invest in energy efficiency and conservation.**



Guidance on choosing and prioritizing appropriate policies and policy instruments will be further elaborated and provided in the complete publication of the Guidelines for Developing Eco-efficient and Sustainable Urban Infrastructure in Asia and Latin America.

**WHAT
DOES
WORK**



STRATEGIC PRINCIPLES

A new way to build competitive and liveable cities:

Eco-efficiency can be used as a driver to promote win-win solutions that maximize competitiveness, quality of life and environmental sustainability. In order to guarantee eco-efficient outcomes, the following strategic principles are critical.

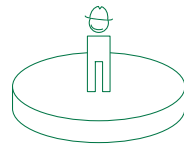
'You must be the change you wish to see in the world.'

Mahatma Gandhi

1. Lead the change

page 15

Drive the change you wish to see in the city. Put sustainable infrastructure on top of your agenda.



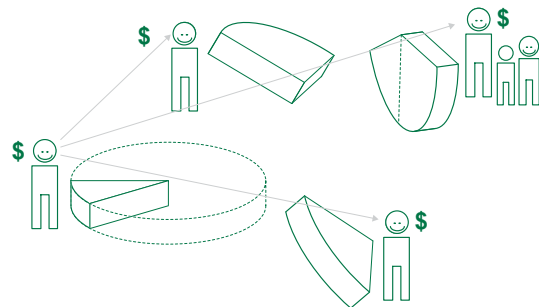
'There is no ideal system except integration.'

Jaime Lerner,
former mayor of Curitiba

2. Link sectors and actors

page 17

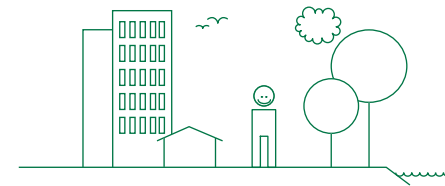
Integrate across sectors and between institutions.



3. Recognize the multiple values of natural resources

page 19

Take a life-cycle approach and consider all values (monetary and not) of natural resources and the environment.



4. Turn 'green' into a business opportunity

page 21

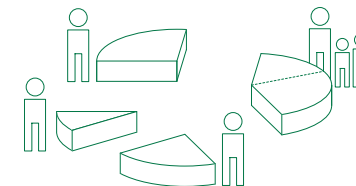
Build the business case for eco-efficient solutions.



5. Build the city for the people together with its people

page 23

Sustainable outcomes can be achieved only through broad-based participation.



STRATEGIC PRINCIPLES

'The concept of incentivizing clean energy so that it's the cheaper, more effective kind of energy is one that is proven to work and is actually a market-based approach.'

Barack Obama

'A good city is a good social event. What interests people the most are other people. Build cities for the people.'

Jan Gehl, architect



Curitiba, Brasil

URBS Rapid Bus System

Off-board fare collection, along with the bus lane, is the key innovative strategy in 'Metronizing' the Bus Transit System and is making it in deed rapid.

The most important element in urban planning was a linear growth pattern, which served to protect both density and green public spaces. A combination of land-use zoning and public transport development led to a decrease of traffic in the city centre and the development of services, housing, and industries along vertical axes.



Seoul, Republic of Korea

Cheongye-Cheong Canal

The historic waterway had to make place for an elevated expressway. In 2003, however, Seoul City embarked upon the restoration of the 5.8 kilometer waterway by peeling back pavement to make this public space thoroughfare a part of the citywide eco-friendly initiative.

Lead the change

Being the one to walk the unpaved road towards changing your city's future requires courage because of potential initial resistance from a number of stakeholders who doubt the benefits of the new intervention. Experiences such as those in Seoul, Republic of Korea and Curitiba, Brazil however, show that in spite of initial resistance, sustainable infrastructure development projects can be very successful, not only in eco-efficiency and sustainability outcomes, but also in increasing the popularity of the mayor or politician pushing the agenda.

Lee Myung Bak

The President of the Republic of Korea

Lee Myung Bak, President of the Republic of Korea, started his political career as mayor of Seoul in 2002. Mr. Lee owes much of his electoral victory to two large-scale sustainable urban development projects he successfully completed as the mayor of Seoul: the restoration of the Cheonggyecheon waterway and the reformation of the public transportation system in Seoul. These sustainable infrastructure initiatives immediately made Mr. Lee, a top Presidential contender.

Jaime Lerner

Three Times Mayor, Two Times Governor, Architect, Planner
Curitiba, Brasil

Following his three mayoral terms, Jaime Lerner won election twice as governor of Paraná State after which he retired from his political career to devote himself to the practice of architecture, planning and worldwide lecturing on sustainable urban design. Among many sustainable initiatives that Mr. Lerner initiated the 'Metronizing' Rapid Bus System stands out as an example of a successful practice that made many cities follow. Mr. Lerner is a visionary leader and a strong advocate of the livable city designed for people.



THE POWER OF LEADERS

STRATEGIC
1
PRINCIPLE

'When the best leader's work is done, the people say: We did it ourselves!'

Lao Tzu, Chinese Taoist Philosopher

Ulsan, Republic of Korea →
Eco-Industrial-Park (EIP)

The Eco-Industrial-Park in Ulsan demonstrates that eco-efficiency is a key driver for local business communities as it can help them to produce better goods and services while using fewer resources and generating less environmental impact; synergies (cooperation) between these companies have resulted in increased efficiency of resource use (in information, materials, water, energy, infrastructure and natural habitat) and less pollution. In case of Yoosung Company and Hankook Paper for instance, the investment to exchange steam, produced from waste, had a payback time of less than half a year.

A decisive point was the cooperative network, supported by the national government. ↓



An Eco-industrial Park (EIP) is a community of businesses that cooperate with each other and with the local community to efficiently share resources (information, materials, water, energy, infrastructure and natural habitat), leading to economic gains, gains in environmental quality, and equitable enhancement of human resources for the business and local community.



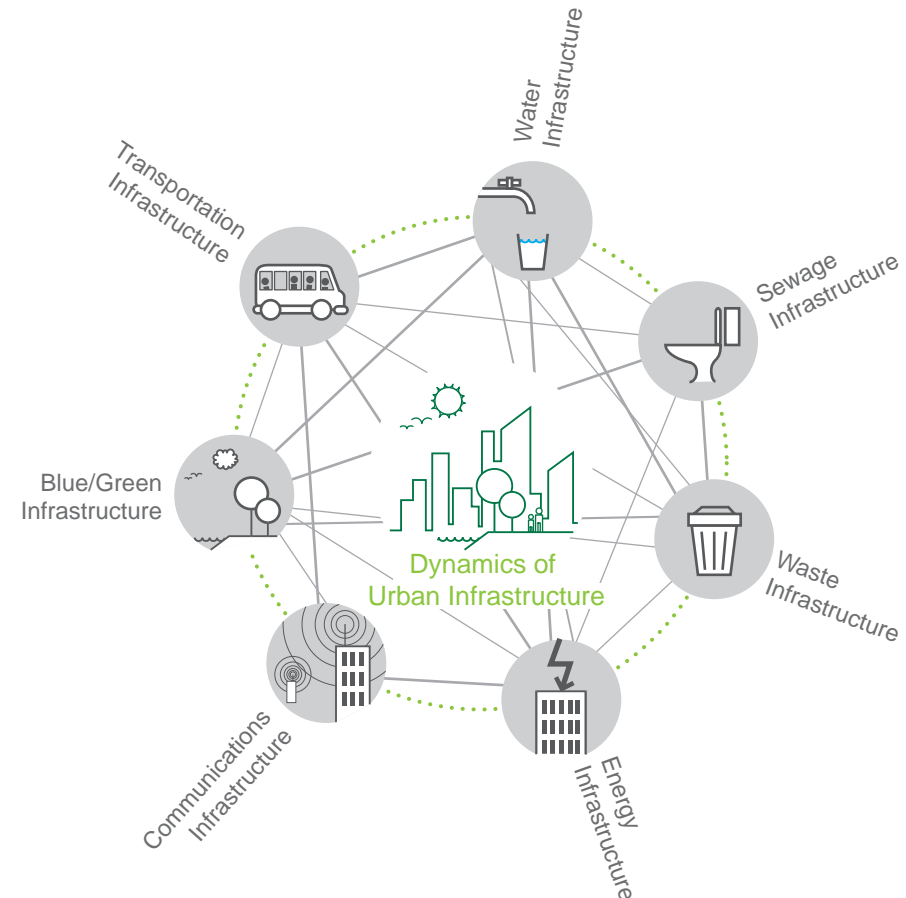
Link sectors and actors

Cities need initiatives that not only focus on the physical element of infrastructure but also measures that promote a good life and economic development. Providing a solution to this need can only be done by breaking away from separated systems in thinking, infrastructures and policies, and start to identify win-win solutions.

Most gains in eco-efficiency can be made by finding integrated solutions among sectors such as transport and land-use planning. Horizontal integration among sectors is needed to identify the cross-cutting issues and potential synergies. Vertical integration between local and regional governmental agencies, the private sector and citizens is needed to develop policies and strategies that benefit all.

What does it mean for the city and its people?

- More competitive and liveable through environmental sustainability
- Attractive, vibrant and healthy living areas

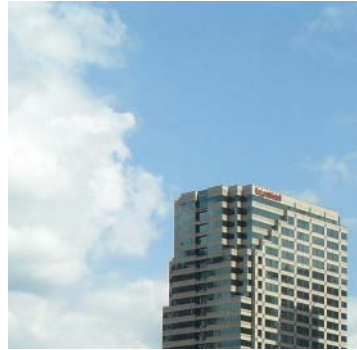


URBAN SYNERGIES

STRATEGIC
2
PRINCIPLE

'If you don't understand the structure of the city, it is difficult to work on it.'
Jaime Lerner,
former mayor of Curitiba

An integrated and sustainable approach to urban development enables cities to respond to current challenges of urban expansion, resource depletion, quality of life and increased competitiveness.



Bogotá, Colombia

Transmilenio Rapid Bus combined with walkable and green areas. Enrique Peñalosa won prizes for his efforts related to transportation, land use and housing for the poor, pollution abatement, and the critical need for public spaces, and their environmental benefits and overall contributions to the quality of life



Singapore

Active, Beautiful and Clean Waters Programme:

'Water for All: Conserve, Value, Enjoy'

- Shift from cost to value
- Shift from economic necessity to social relevance
- Shift from mono-use to multi-functionality



Recognize the multiple values of natural resources

Natural resources, such as water or primary energy sources, need to be considered not only in terms of their direct market price, but more importantly as systems that deliver services to people. Therefore, do not only consider monetary costs, but also non-monetary values of the environment for people, as they can become a driver for increasing quality of life and economic competitiveness.

The case of **Singapore** shows a re-orientation of policy and thinking. From the historically grounded engineering approach that regards infrastructure resources as an economic good, the approach now embraces many of the principles of eco-efficiency by looking at water as a means to improve the quality of life of people and the attractiveness of the city as a whole; water infrastructure management has been integrated as part of the planning and design of the city, so that the local community can begin to embrace its waterways as attractive and positive features in the urban landscape.

The case of **Bogotá, Colombia** shows that cities can be reborn by redesigning them not primarily on economic principles of profit, but on those of social equity and quality of life. Achievements included:

- Installation of a new form of urban management with a focus on principles and strategies of the sustainability
- Introduction of the TransMilenio - a Bus Rapid Transit System currently among the biggest in the world
- Sidewalks improvement initiative
- Renovation of some of the most important avenues of the city
- Construction of the most extensive network of bike paths in Latin America
- Improvement of the existing city parks and the construction of several new ones
- Substantial improvements of infrastructure in the slums of Bogotá

What does it mean for the city and its people?

Local people, as well as international business will embrace the city because of its aesthetic, healthy and dynamic living and work environments. The city will become a place to not only live and work but also enjoy life to the fullest.



Developing infrastructure is not an objective itself. It's purpose is to improve the lives of the citizens.



Dushanbe

Public buildings in Dushanbe are subject to high levels of energy losses due to the poor thermal insulation and heating systems. Energy consumption could be reduced by an estimated 30-50% through energy efficiency measures. 9 storey buildings (360 units) can provide savings up to 44,7 million kWh of energy per year, which is equivalent to US\$ 900,000. The payback time of thermal insulation for wall structures is 4 years while its lifetime is over 20 years, making such an investment a clear business opportunity.

Turn 'green' into a business opportunity

Current infrastructure approaches are biased towards unsustainable approaches as environmental and social costs and benefits, not transmitted through prices, are not taken into account in business cases. Governments, both national and local, need to include externalities (both costs and benefits) into decision-making and build the business case for eco-efficient and sustainable infrastructure development.

Developing parks and green spaces for instance, holds social benefits for users and people living around them, but also overall benefits in economic terms. Parks counter the urban heat effect, which results not only in improving living conditions for people, but also lowering their energy bills because of its direct effect on energy consumption of buildings. Urban greening projects can increase the value of land around them. Therefore, cities can potentially earn more money by planning a park surrounded by buildings instead of solely buildings in the same space.

Resource efficient buildings also show win-win outcomes: if we don't take into account the life-cycle costs and impacts of buildings, but only the initial construction costs, we will end up paying (external) costs for about 40 years: high energy bills, inefficient and costly management, maintenance and demolition. Moreover, we will miss out on the benefits: affordable, comfortable, attractive and environmental sustainable housing.

Building the business case for eco-efficient infrastructure requires a mix of policy instruments such as regulations, economic and fiscal instruments, as well as voluntary agreements with the private sector.

The guidelines will provide detailed information on how and when to apply such policy instruments, and how to identify and prioritize specific policies.



**GREEN
AND
PROFITABLE**

STRATEGIC
4
PRINCIPLE



To make an impact on society, eco-efficiency must go beyond simply improving existing processes. It must also involve changing existing processes, creating new policies and changing or influencing markets with new ideas and rules²².



Metro Manila, Philippines →
 PPP Public-private partnership for water supply and sanitation services
 This case illustrates that all actors - private investors, the local government, and citizens - can benefit from public private partnership (PPP) projects. Well managed, the PPP in Metro Manila helped to extend water access to low-income communities²³.



Surabaya, Indonesia ↑
 Comprehensive Kampung Improvement
 - Improved 1.2 million people's living environment spread over 3,008 ha
 - 220 km footpaths and roads
 - 93 km drains and culverts
 - 56 km water pipes
 - 86 public bathing, washing and toilet facilities
 - improved solid waste collection
 - constructed elementary schools and public health centers²³



Build the city for the people together with its people

While strong leadership is required to steer the process, broad-based participation in planning and developing infrastructure is essential in order to guarantee win-win outcomes and the overall sustainability of solutions.

We can improve the lives of people by allowing them to design their own environment. It is increasingly recognized that the involvement of local communities in designing and building a liveable local environment form the main building blocks towards truly sustainable cities. Focus should be put on establishing affordable access to services and job creation through social links, grouping of efforts and the search for solutions based on local ideas, circumstances and needs.

The case of **Surabaya, Indonesia**, shows that community-based mobilization of resources and implementation activities is very effective while dealing with low-income group problems. A sense of ownership, especially through the creation of independent institutions in communities, helped to make the city inclusive, responsible and credible. Although this programme made up a fifth of the total city development budget, it served almost two thirds of the population, mostly low-income groups.

The planning and implementation of public private partnerships contracts have showed to be pitfalls in many cases around the world. However, the case of **Manila, the Philippines** shows that political will, experienced advisers and good public relations can push and speed up the process of designing, planning and implementation, making private sector participation in urban infrastructure for low-income groups feasible.

What does it mean for the city and its people?

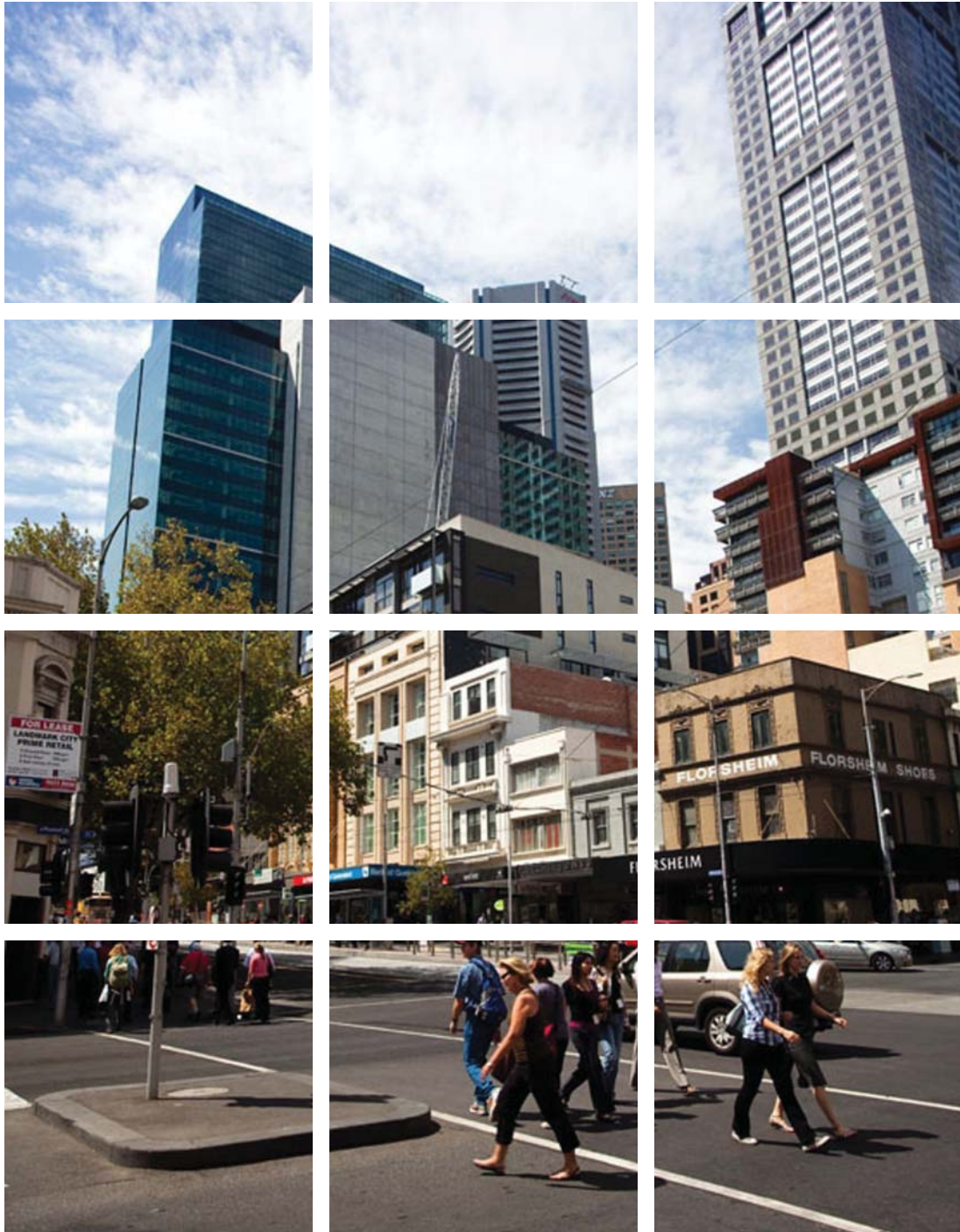
- Feeling of ownership and belonging: the power to change things for yourself and the local environment
- Faster and more appropriate and efficient infrastructure development



CITY FOR THE PEOPLE

STRATEGIC
5
 PRINCIPLE

Public Private Partnerships (PPPs) need to focus on increasing the local responsibilities and attracting the private sector through transparency of planning and budgets.



Towards eco-efficient and sustainable cities

**WIN-WIN
SOLUTION**

The need for inclusive and sustainable cities

Cities are fast growing concentrations of people, economic growth, development and poverty and enormous footprints calling for investments to keep up with consumption needs.

Infrastructure has key implications for urban development

Constructing, maintaining and operating infrastructure is very resource intensive and once built, infrastructures lock cities into specific consumption patterns for decades. Choices made today will determine the competitiveness, quality of life and sustainability of cities for decades to come.

Eco-efficiency: a driver for competitiveness and liveability

Doing more with less means maximizing the quality of life, competitiveness and environmental sustainability of cities.

A new way to build competitive and liveable cities

By initiating change, linking sectors and actors and identifying the multiple values of natural resources, we can turn green into a business opportunity and start to (re)build infrastructure which will be embraced by people, the city, the planet and our shared future.

The guidelines

By reflecting on the key principles and criteria of eco-efficiency in detail, by giving best practice examples and by paving the path forward, the guidelines will provide crucial lessons and steering in developing infrastructure and cities in a sustainable way. With tools and methods to apply eco-efficiency principles to infrastructure development, you will be able to prioritize appropriate policies and interventions and develop strategies and plans for implementation. The guidelines will inform and guide inspired politicians and planners who believe that cities are crucial in improving the quality of our lives.



Keep the holistic view:
think globally, act locally!

- ¹ Percentage of people living in urban areas in Latin America in 2030: 84.87%. United Nations (2009) World Urbanization Prospect, the 2009 Revision Online: esa.un.org/unpd/wup/index.htm (visited 19-10-2010)
- ² Number of people living in urban areas in Asia in 2030: 2,598,358. United Nations (2009) World Urbanization Prospect, the 2009 Revision. Online: esa.un.org/unpd/wup/index.htm (visited 19-10-2010)
- ³ Number of people living in Singapore in 2004: 4,238,300. United Nations Data. Online: data.un.org/Data.aspx?q=slums&d=MDG&f=seriesRowID:711 (visited 19-10-2010)
- ⁴ Percentage of urban population living in slums in Asia-Pacific in 2010: Eastern Asia: 28.2%; South Asia: 35%; South-East Asia: 31%; West Asia: 24.6%; Oceania: 24.1%. UN-HABITAT (2010). State of the world's cities 2010/2011. Bridging the urban divide.
- ⁵ Number of people living in urban slums in India in 2007: 109,501,151. United Nations Data. Online: data.un.org/Data.aspx?q=slums&d=MDG&f=seriesRowID:711 (visited 19-10-2010)
- ⁶ Population of the Philippines in 2008: 93,617. United Nations Data. Online: data.un.org/Data.aspx?q=slums&d=MDG&f=seriesRowID:711 (visited 19-10-2010)
- ⁷ Number of people living in urban slums in Brazil in 2007 45,707,606. United Nations Data. Online: data.un.org/Data.aspx?q=slums&d=MDG&f=seriesRowID:711 (visited 19-10-2010)
- ⁸ Population of Chile in 2008: 17,135. United Nations Data. Online: data.un.org/Data.aspx?q=slums&d=MDG&f=seriesRowID:711 (visited 19-10-2010)
- ⁹ Girardet (1995) Connections, Autumn. Online: www.ourplanet.com/aaas/pages/population06.html# (visited 19-10-2010)
- ¹⁰ World Energy Outlook Report (2008)
- ¹¹ Global footprint network. Online: www.footprintnetwork.org/en/index.php/GFN/page/data_sources/ (visited 19-10-2010)
- ¹² The Sustainable Scale Project: Online: www.sustainablescale.org
- ¹³ UN-Habitat (2010). The state of Asian cities 2010/2011
- ¹⁴ Latin America and the Caribbean GDP in millions of US dollars: 3,949,249. An estimate for 2009 produced by the International Monetary Fund in April 2010.
- ¹⁵ ADB Infrastructure funding requirements. Online: www.adb.org/Documents/Books/Infrastructure-Operations/chap04.pdf (visited 19-10-2010)
- ¹⁶ UN-Habitat (2010). The state of Asian cities 2010/2011
- ¹⁷ UNEP (2010). Online: www.unep.org/civil-society/LinkClick.aspx?fileticket=5K38DQP4vg8%3D&tabid=2910&language=en-US (visited 4-11-2010)
- ¹⁸ GDP in Millions of US dollars: Buenos Aires: 36,2; Uruguay: 31,511; Paraguay: 14,216. International Monetary fund 2009.
- ¹⁹ CTL (2000) Congreso de Transporte de Lima. Organizado por la Municipalidad de Lima
- ²⁰ United Nations ESCAP (2007). Sustainable Infrastructure in Asia: Overview and Proceedings. Seoul Initiative Policy Forum on Sustainable Infrastructure. Seoul, Korea, September 6–8, 2006. Online: www.unescap.org/esd/publications/st/2448/Sustainable%20Infrastructure%20in%20Asia.pdf (visited 19-10-2010)
- ²¹ UNEP (2009, p 3) Buildings and Climate Change. Online: www.unep.org/sbci/pdfs/SBCI-BCCSummary.pdf (visited 19-10-2010)
- ²² WBCSD (2000) Creating more value with less impact. Online: www.wbcsd.org/web/publications (visited 4-11-2010)
- ²³ Kitakyushu Initiative

Photographs

Cover: Kibae Park, Joris Oele, Morana Stipisic, ESCAP/ **Page 2:** Kibae Park/ **Page 6:** Kibae Park/ **Page 7:** left - Fang-zhou Zhou, right - Ulsan Metropolitan City/ **Page 14:** top - Stephanie Vacek, right - Morana Stipisic, bottom - Lina Faria/ **Page 16:** Ulsan Metropolitan City/ **Page 18:** top - Flaminia Maietti, middle right - Enrique Peñalosa, bottom - Public Utilities Board (PUB) Singapore/ **Page 20:** top - Kibae Park, bottom - Ulsan Metropolitan City/ **Page 22:** top left - Kitakyushu initiative, top right - Kibae Park, bottom - ESCAP, **Page 24:** Evert Doorn

Sources of quotes are not referenced. We kindly ask for the understanding of the authors.

Carbon Footprint

is a measure of the impact our activities have on the environment, and in particular climate change. It relates to the amount of greenhouse gases produced in our day-to-day lives through burning fossil fuels for electricity, heating and transportation etc. It is a measurement of all greenhouse gases we individually produce and has units of tonnes (or kg) of carbon dioxide equivalent.

To calculate your carbon footprint, go to online: www.carbonfootprint.com/calculator.aspx (visited 4-11-2010)

Source: Carbon Footprint™. Online: www.carbonfootprint.com (visited 4-11-2010)

Carrying Capacity

can be defined as the maximal population size of a given species that an area can support without reducing its ability to support the same species in the future. Specifically, it is a measure of the amount of renewable resources in the environment in units of the number of organisms these resources can support.

Source: Roughgarden (1979)

Eco-efficiency

is defined as ‘the delivery of competitively-priced goods and services that satisfy human needs and bring quality of life, while progressively reducing ecological impacts and resource intensity throughout the life-cycle to a level at least in line with the earth’s estimated carrying capacity’.

Source: WBCSD (2000)

Ecological Footprint

is a measure of how much biologically productive land and water an individual, population or activity requires to produce all the resources it consumes and to absorb the waste it generates using prevailing technology and resource management practices. Today humanity uses the equivalent of 1.5 planets to provide the resources we use and absorb our waste. If everyone lived the lifestyle of the average American we would need 5 planets. Turning resources into waste faster than waste can be turned back into resources puts us in global ecological overshoot, depleting the very resources on which human life and biodiversity depend.

Source: Global Footprint Network. Online: www.footprintnetwork.org (visited 4-11-2010)

Eco-Industrial Park (EIP)

is a community of businesses that cooperate with each other and with the local community to efficiently share resources (information, materials, water, energy, infrastructure and natural habitat), leading to economic gains, gains in environmental quality, and equitable enhancement of human resources for the business and local community’

Source: Chertow: Uncovering Industrial Symbiosis (2007)

Life cycle analysis and thinking

implies that everyone in the whole chain of a product’s life cycle, from cradle to grave, has a responsibility and a role to play, taking into account all relevant external effects. From the extraction of the raw material through refining, manufacturing, use or consumption to its reuse, recycling or disposal, individuals must be aware of the impact that this product has on the environment and try to reduce it as much as possible. The impacts of all life cycle stages need to be considered when taking informed decisions on the production and consumption patterns, policies and management strategies.

Source: UNEP (2003)

Sustainable Development

The Brundtland Report of the World Commission on Environment and Development defines sustainable development as follows: ‘Humanity has the ability to make development sustainable – to ensure that it meets the needs of the present without compromising the ability of future generations to meet their needs.’

Source: United Nations (1987)

