



Urban Planning for City Leaders

URBAN PLANNING FOR CITY LEADERS

2nd Edition

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Foreword



Dr. Joan Clos

Among the greatest challenges of the twenty-first century is the rapid growth of cities. Over the last century, our world is rapidly becoming predominantly urban. As such, cities embody some of society's most pressing challenges, as diverse as unemployment, climate change, and environmental degradation. But cities also hold the key to unlocking national urban development. They present real opportunities for unleashing enormous economic potential, increasing energy efficiency, reducing inequities, and creating sustainable livelihoods for all. History has shown that urbanization leads to development. It is also clear that urbanization is a source rather than simply a by-product of development. While Africa and Asia are among the least urbanized continents, they also have the fastest rates of urbanization in the world. Urbanization can therefore be used as a powerful lever for transforming lives and livelihoods.

Growing cities and towns face additional challenges, which include: high percentages of people living in slums; expansion and dominance of the informal sector; inadequate urban basic services, especially water, sanitation and energy; unplanned peri-urban expansion; social and political conflict over land resources; high levels of vulnerability to natural disasters; and poor mobility systems. If cities are to play their role as drivers of economic and social development, these challenges have to be addressed through effective planning and governance.

Tapping the opportunity presented by urbanization to advance sustainable human development is one of the defining challenges facing many of the countries in which UN-Habitat works. Unfortunately, many developing countries lack strategies for urban planning and design. Urban planning, where it happens, tends to be inadequate for addressing the many challenges which are endemic to rapid expansion. Evidence of this includes ineffective and unsustainable urban policies, excessive zoning and inadequate enforcement, developments far from the city core, poor connectivity resulting from insufficient allocation of land to streets and transportation systems, and the lack of appropriate urban design that allows for optimum density. The result of inefficient or non-existent planning limits economic potential and impinges on the health, opportunities, and well-being of city residents.

Appropriate urban planning for developing economies can be simple, enforceable, flexible, and responsive to shifting local needs. City governments must have sufficient capacity to facilitate agreement among residents on the path forward, build social trust, and arbitrate conflicts of interest where they occur, including in land disputes.

With sufficient capacity and more appropriate urban planning, countries can tap the opportunity for development which urbanization represents. Cities can generate economies of scale, enhance productivity, facilitate the exchange of ideas, and spur innovation.

This Guide has been designed to fill the gap between the technical and the policy dimensions of urban planning and to help local leaders to better communicate with their planning departments and ask the right questions. All too often planning has been disconnected from the day to day realities and needs of citizens. This guide offers practical advice and insight into how leaders around the world can succeed in leveraging capacities and know-how from communities, professionals and the private sector in tackling pressing urban development needs.

A new approach is needed to urban planning in which local leaders are principally engaged in shaping the future growth of our cities. I believe that this guide will not only raise awareness and build capacities in this regard, but will also offer directions for upcoming initiatives in this regard. As part of the World Urban Campaign, UN-Habitat has launched the “I’m a City Changer” campaign with the aim of promoting sustainable urban development and creating awareness among citizens for a better urban future. This publication will undoubtedly serve as a vital plank in this platform for change, enabling and empowering communities, partners and their leaders around the world.



Dr. Joan Clos
Under-Secretary-General, United Nations
Executive Director, UN-Habitat

From the Desk of a Mayor



Aníbal Gaviria Correa

Good Planning will Transform your City

Urban planning is a key tool for local leaders in supporting the realization of a city's vision. A guide that offers lessons and ideas on urban planning is important for mayors and other local leaders. In our experience in Medellín, Colombia, we have learned the importance of urban planning for good development. We have instruments for urban planning that are approved by the Council with the involvement of residents and it is mandatory for local leaders to produce plans. Although they are often regarded as a bureaucratic requirement, urban plans - even those with a short validity of four years - can have an impact on a city for the next 20 years and more if they are properly conceived and systematically executed.

Indeed, a good plan is key to development. If it is created with the involvement of residents and clearly identifies the pillars of future development it can play a crucial role in the growth of the city. Its impact is dependent on several factors: it needs to reflect the social contract of the specific territory and it should not be subject to abrupt change and modification with each change in government. In Medellín, we have achieved an important transformation of the city because we successfully maintained a continuity of ideas and approach to urban development over the past 10 years. This has been possible because successive governments over the period have been synchronized – each building on the good planning ideas of its predecessor until the planning goals were achieved.

Urban plans and the extension of services and infrastructure that they support have been critical in Medellín to demonstrate the presence of the public authorities and of the state, particularly in areas of the city where informal and chaotic development was the norm. Bringing public actors to such areas has had a powerful transformative effect. In Medellín, we addressed problems created by the difficult landscape by planning mass transport systems. Dealing with geography and with transport needs in an innovative way, with the use of economic and ecologic advantages, has resulted in improved mobility. This, combined with investment in other infrastructure, public services and equipment, has changed areas that were previously entirely degraded and marginalized.

This guide offers insights from real experiences on what it takes to have an impact and to transform an urban reality through urban planning. It is particularly inspiring because it clearly links planning and financing, which is important for effective execution. Urban planning can only achieve as much as the support it has from public investment and realistic investments projections. Support from private investors, compliance by residents and developers are also important. Public participation and dialogue with the community is paramount, particularly during the execution of any intervention. Urban Planning for City Leaders presents many successful practices that emphasize strategies to address real issues. It shares ideas and provides inspiration around key principles of good urban planning that can result in real urban transformation.

Aníbal Gaviria Correa
Mayor of the City of Medellín, 2012-2015

From the Desk of a CEO



Dr. Roland Busch

World Class Cities need Good Planning

Today, cities are the main growth centres of economies, as well as being the growth centres of populations and of the use of resources. At Siemens, we believe that cities are also the protagonists driving the change towards a more sustainable future and enhanced quality of life. More than one billion people still do not have access to electricity, sanitation or clean drinking water. The number of urban dwellers in developing countries is expected to double - from two billion to four billion people - between 2000 and 2030. The challenges and opportunities for cities in developing countries must be understood in this context – one where, currently, there is a gap between the provision of basic services and the rapid growth in the urban population.

Enormous amounts of infrastructure will need to be built in urban areas in the coming decades. Globally, cities will invest, on average, two trillion Euro a year, creating an urgency and an opportunity to build “right”, to use the resources efficiently and to address the vital services needed to create well functioning cities. The future needs are clear. Cities need to become more energy efficient and strike a balance between three fundamental goals: quality of life, economic competitiveness and environmental protection.

Cities come in all sizes and shapes. Some will be created from scratch and many existing cities will continue to expand and grow. Good urban planning can provide the framework for making decisions that are resource effective and sustainable for all cities. All experience shows that well managed and thoughtfully designed cities provide increased well-being for their citizens. The decisions on density, land-use and spatial patterns that local leaders take have a major impact on energy consumption, CO₂ production and cost of construction.

Integrating knowledge from infrastructure and technology providers in the early stages of spatial planning is essential for getting the infrastructure “right”. Partnerships between local governments and business can also be an effective way of delivering complex infrastructure projects, and an active private sector is essential for meeting urbanization challenges. Infrastructure investments are long-term decisions and the choices we make today will “lock” us into patterns dictating the carbon, land and water intensity of our future development. The Urban Planning for City Leaders guide is a UN-Habitat initiative that Siemens is proud to support, because we believe that sustainable urban planning is one of the prerequisites for greening the urban infrastructure.

Let us make all cities world class.

Dr. Roland Busch
Member of the Managing Board of Siemens AG
CEO Infrastructure & Cities Sector





Terms used in this book

Accessibility: A general term used to describe the degree to which a product, device, service or environment is available to as many people as possible. The physical access to a space or service is one of its components and the one used in this document.

Carbon credit: “Certified Emission Reduction” credits (CER), generically called “carbon credits” under the Clean Development Mechanism (CDMs) programme by the International Framework Convention on Climate Change (IFCCC). A carbon credit is a permit that allows a country or organization to produce a certain amount of carbon emissions that can be traded if the full allowance is not used. Oxford Dictionary.

Carbon sequestration is the process of increasing the uptake of carbon dioxide by reservoirs of forests, soils and other ecosystems.

Commons and Common goods: The commons were traditionally defined as the elements of the environment - forests, atmosphere, rivers, fisheries or grazing land - that were shared, used and enjoyed by all. Today, the commons are also understood within a cultural sphere. These commons include literature, music, arts, design, film, video, television, radio, information, software and sites of heritage. The commons can also include public goods, such as public space, public education, health and the infrastructure that allows our society to function (such as electricity or water delivery systems).

Connectivity: Street connectivity refers to the density of connections in a street network

and the directness of links. A well-connected street network has many short links, numerous intersections, and minimal cul-de-sacs.

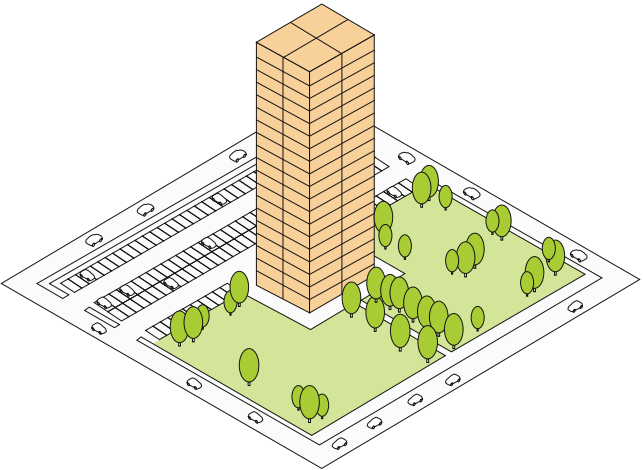
As connectivity increases, travel distances decrease and route options and travel modes increase, allowing more direct travel between destinations, creating a more accessible and resilient system.

Floor Area Ratio: Floor area ratio (FAR), floor space ratio (FSR), floor space index (FSI), site ratio and plot ratio are all terms for the ratio of a building's total floor area to the size of the parcel of land upon which it is built. The terms can also refer to limits imposed on such a ratio.

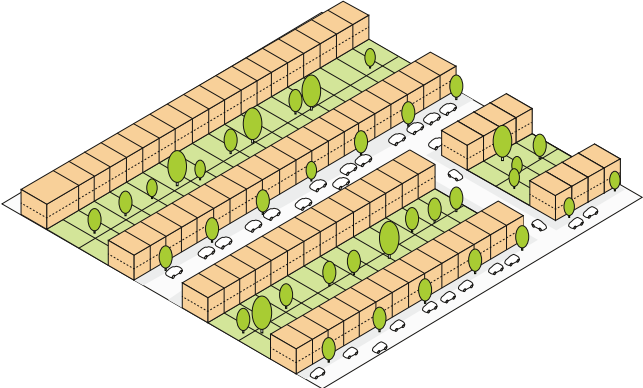
As a formula: Floor area ratio = (Total covered area on all floors of all buildings on a certain plot)/(Area of the plot). Thus, FAR of 2.0 would indicate that the total floor area of a building is two times the gross area of the plot on which it is constructed, as would be found in a multiple-story building. The floor area ratio can be used in zoning to limit the amount of construction in a certain area. For example, if the relevant zoning ordinance permits construction on a parcel, and if construction must adhere to a 0.10 FAR, then the total area of all floors in all buildings constructed on the parcel must be no more than one-tenth the area of the parcel itself. FAR as a planning standard should be used in conjunction with other traditional design standards (height, lot coverage and setbacks or build-to lines) to ensure quality of the outcome. FAR alone is just a quantity of buildable space.

Illustration 0.1 Density configurations on one hectare

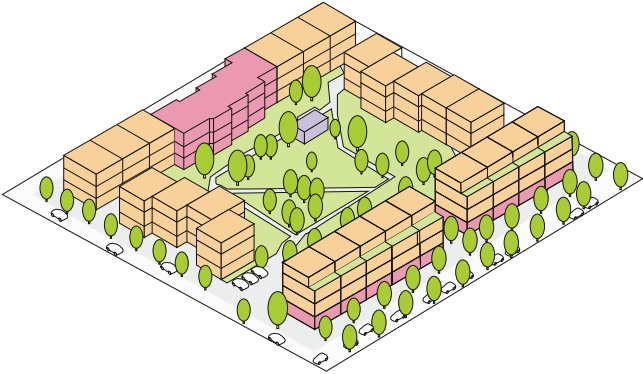
Density: 75 dwellings / ha
High building height
Low plot coverage






Density: 75 dwellings / ha
Low building height
High plot coverage



Density: 75 dwellings / ha
Medium building height
Medium plot coverage



-  Residential
-  Office and commercial
-  Public facilities

Source: Javier Mozas, Aurora Fernández Per (2006), *Density: New Collective Housing*

Greenhouse gas GHG: According to the Intergovernmental Panel on Climate Change, greenhouse gases are those gaseous constituents of the atmosphere, both natural and anthropogenic (produced by human activities), that absorb and emit radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, the atmosphere and clouds. This property causes the greenhouse effect. Water vapour (H_2O), carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4) and ozone (O_3) are the primary greenhouse gases in the Earth's atmosphere. Since the beginning of the Industrial Revolution, the burning of fossil fuels has contributed to the increase in carbon dioxide.

Informal settlements and slums: The terms are frequently interchangeable. A slum is a settlement made up of households that lack one or more of the following five conditions: access to potable water, access to hygienic sanitation facilities, sufficient living area per person (not more than three people sharing the same room), structural quality and durability of dwellings and security of tenure. The term "slum" originates from affordable housing schemes that were planned and built to specific standards but which, over time, have become physically deteriorated, overcrowded and inhabited by lowest income groups only.¹

There is no single definition of the term "informal settlement". It generally refers to unplanned squatter areas that lack street grids

and basic infrastructure, with precarious shacks erected on unsanctioned subdivisions of land or without the consent of the land owner. An informal settlement may be referred to as a shanty or squatter settlement.²

Infrastructure costs:

- Capital costs are the initial total costs associated with installing an infrastructure asset.
- Operating costs are associated with maintaining and repairing an asset.
- Replacement costs are the costs of entirely replacing an asset at the end of its useful life.

Modernist urban planning: A planning approach prevalent in the decades after the Second World War and characterized by single-use zoning and low density suburban development that relied on inexpensive fossil energy, cars and public investment in infrastructure.

Resilience is the capacity to adapt when exposed to a hazard or systemic change in order to maintain an acceptable level of functional organization.

Smart grid is an electrical grid that uses computers and other technology to gather and act on information, such as information about the behavior of suppliers and consumers, in an automated fashion to improve the efficiency, reliability, economics and sustainability of the production and distribution of electricity.

Subsidy and cross-subsidy: A benefit given by the government to groups or individuals, usually in the form of a cash payment or tax reduction. The subsidy is usually given to remove some type of burden, promote certain behaviour or for equity reasons. Cross-subsidies imply that tariffs or other prices for services and goods are set in a way that distributes costs differently among different categories of customers. One main objective is to reduce the price barriers for access to certain services for certain customer groups.

Value capture is the harnessing, through many different mechanisms, for example taxation, of the increase in land and building value brought about by planning, public investments, development of new services etc.

Introduction

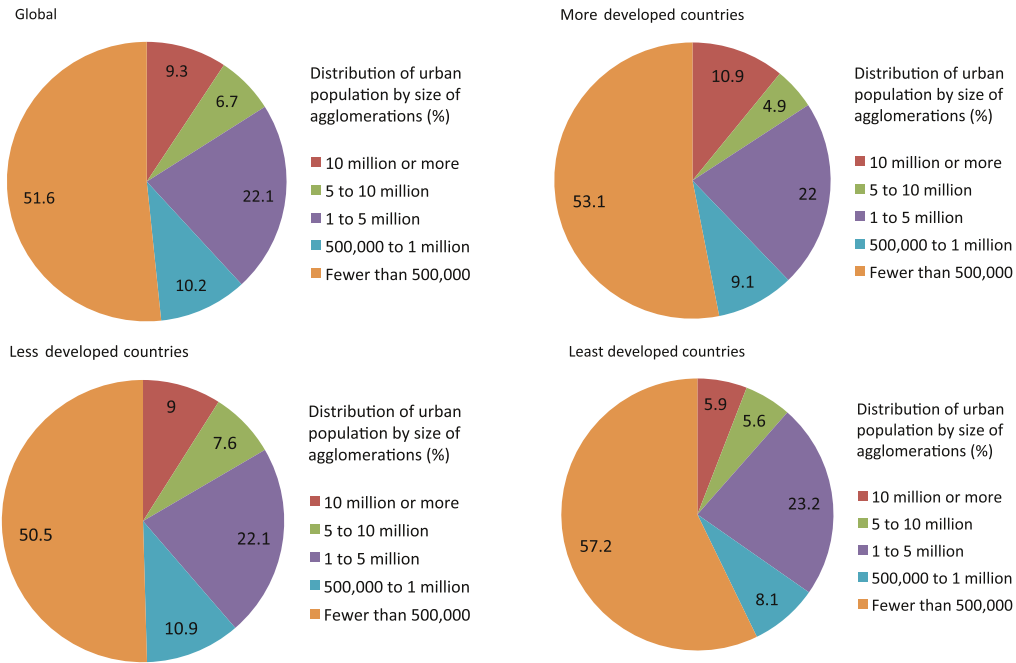
Urban Planning for City Leaders is a UN-Habitat initiative to provide local leaders and decision makers with the tools to support urban planning good practice. It aims to inform leaders about the value that urban planning could bring to their cities and to facilitate a collaborative dialogue between leaders, policy makers and planners on urban development.



This guide is a resource that is substantial without being an encyclopaedia and it gives leaders a practical snapshot of urban planning that can help to improve their communication with planners. Although its contents are relevant for large cities, the guide primarily targets leaders of rapidly growing intermediate cities in developing and emerging countries. This is where a significant portion of the world's urban population lives today and where the largest share of the nearly two billion new urban residents expected in the next 20 years will need to be accommodated.

Intermediate cities - those with a population of between 20,000 and 2,000,000³ - will have to make room for a population growth of up to 5 per cent annually, and they will have to provide urban services with scarce financial resources and a significant backlog in planning. Because intermediate cities are likely to experience acute stresses, it is with them that a big impact can be made on a global scale. Cities cannot develop effectively when confronted by rapid population growth that far outstrips their capacity to provide services. They need to be better prepared to make the most of this growth, and to channel and manage it in a proactive way.

Chart 0.1 Urban population by city size and region (2010)



Source: GRHS 2011⁴

How can cities prepare for urban growth?

Short-term thinking and a reactive approach is not enough to prepare cities for urban growth. It is also verifiable that cities that prepare for urbanization challenges are more able to address them. On the contrary, leaders who do not act could also miss a rare opportunity to make cities economically, socially and environmentally robust.

Prepared cities need proactive city leaders.

Cities need forward-looking leaders who anticipate problems and take pre-emptive action. This guide advocates urban planning to help leaders to:

- Look at the whole system and promote an integrated, cross-sector approach that capitalizes on synergies towards efficiency.
- Plan at a sufficient scale so as to deal with common issues such as slums, sprawl and inadequate services.
- Make an impact by implementing demand-led plans in which citizens and all stakeholders are involved.

Why planning? This question frames the first section of the guide, which discusses why local leaders should think of urban planning as a way to achieve their goals. There is no shortage of information on cities and some cities have more than enough plans, although many of these are unlikely to be carried out. There is an urgent need to embrace an approach to urban planning that can deliver collectively held, desired scenarios that efficiently use resources, and that go beyond regulatory restrictions to create collaborative, flexible and responsive frameworks that are linked with execution.

How to plan to address key urban development challenges? The second section of the guide is built around ten “how to” topics that answer questions which leaders are frequently faced with and features a number of sample approaches of what leaders could do. There are also examples of precedents or success stories that include leaders’ views.

Table 0.1 Distribution of urban population by size of agglomeration

	Number of urban agglomerations Estimates and projections			Distribution of urban population by size of agglomerations (%)			Population estimates and projections '000		
	2000	2010	2020	2000	2010	2020	2000	2010	2020
WORLD									
10 million or more	16	21	28	8.2	9.3	10.4	231,624	324,190	436,308
5 to 10 million	28	33	43	6.9	6.7	7.0	195,644	233,827	290,456
1 to 5 million	305	388	467	20.6	22.1	22.0	584,050	772,084	917,985
500,000 to 1 million	402	516	608	9.6	10.2	10.2	273,483	355,619	425,329
Fewer than 500,000	54.7	51.6	50.4	1,552,631	1,800,607	2,106,156

Source: GRHS 2011⁵

Why urban planning?

Projections of urban population growth around the world tell us that between 2000 and 2050 the amount of urban space will need to be doubled in developed countries and expanded by 326 per cent in developing countries to accommodate people.⁶ This is equivalent to building a city the size of Greater London every month for the next 40 years. Local governments will have to manage this growth and the severe strain it will put on municipal finances. They will also have to address the resulting social inequality and make plans to reduce environmental degradation and deal with the effects of climate change.

The fact that this population growth will occur largely in intermediate cities, with little human resource capacity and limited budgets, will compound the problem.

The day-to-day affairs of local government leave city leaders with little time to contemplate any long-term strategies that may, in any case, take longer than the terms of office of elected and appointed leaders to carry out. Government departments often lack the resources to take the initiative on long-term change and on complex problems that require interdepartmental responses. Leadership and direction are essential to make ends meet. While there are no instant and universal formulas for success, there are many proven approaches that can empower local leaders to seize the future by planning their cities.

Urban planning is an important tool for city leaders to achieve sustainable development. It helps to formulate medium- and long-term objectives that reconcile a collective vision with the rational organization of the resources to achieve it. Planning makes the most of municipal budgets by informing infrastructure and services investments, and balancing demands for growth with the need to protect the environment. It also distributes economic development within a given area to reach social objectives, and creates a framework for collaboration between local governments, the private sector and the public at large.

Often, local leaders view urban planning as simply developing drawings and images of the city in the future, without discerning how this process and the decisions it requires can become the backbone of urban transformation.

Urban planning is not about images but is a way to make a difference; it is a framework that helps leaders transform a vision into reality using space as a key resource for development and engaging stakeholders along the way.

Because this guide focuses principally on spatially-related planning issues, the terms “urban planning”, “spatial planning” and “planning” are interchangeable.

Ten reasons for planning

The following points depict a contemporary approach to planning that can help city leaders to drive constructive change

Thriving cities have a framework for growth

Anticipating benefits the present

Planning helps leaders to make an impact, step by step

Urban form makes a difference

Having a direction has a positive impact on the urban economy

Major efforts to enhance quality of life, prosperity and equity have been made in a number of cities. Such transformational impact is not achieved by being spontaneous. Thriving cities have a vision and follow it through with a framework to develop in an orderly way. A framework is not about centralized command and control but is a tool to anticipate needs, to coordinate efforts and to find a path to a goal that everyone can follow.

Anticipating the future means being better prepared today. By staying ahead of challenges, city leaders are ready to see opportunities and manage risks from a particular vantage point. With reliable information on the current situation, they will be able to make connections between the long-term vision and short-term actions. On the other hand, cities that do not actively plan for their future are likely to be left behind.

Local leaders are elected and appointed to improve cities. Given the magnitude of the challenges that cities face, it is unlikely that all the desired improvements will happen immediately. Successful cities build a momentum by tackling priority projects that are aligned with an overall vision. Planning identifies pressing issues and available resources, and ensures that initiatives are not redundant or going in different directions.

Housing, employment, accessibility and safety are key concerns for urban dwellers and are strongly correlated to urban form. The correct policies on density, land use, public space and the layout of infrastructure and services can make a difference to the delivery of good quality of life at the right price. Designing a spatial pattern that addresses citizens' concerns is a means for delivering a better city.

Making sure there are plenty of jobs in the city is a primary concern for local leaders. Cities compete to attract investment to generate economic activity. Planning coordinates the spatial location and distribution of economic activity, and facilitates value capture from public investments and the transformation of rural to urban land.

A collectively held plan
builds lasting synergies

A broader territorial
perspective helps cities
attain economies of scale

Continuity generates
credibility

Anticipating is more cost
effective than reacting to
problems

A framework gives
consistency to messages

City leaders who see opportunities in urbanization need to rally all possible contributions toward developing them. A collectively held framework gives local leaders a road map to reach out to citizens, to energize departments, to mobilize partners so that they engage in realizing the vision, and to leverage synergies between stakeholders.

Cities do not exist in vacuums but are connected to a surrounding region with which they share resources and opportunities. Rather than just looking within municipal boundaries, city leaders who plan together can create a competitive advantage out of cross-municipal coordination. In addition to spatial efficiencies, this would allow them to draw on economies of scale to boost their negotiation power.

Successful cities have ensured continuity of plans through political cycles, realizing that a stable road map makes the plans more credible. Investment is a long-term endeavour that benefits from predictable conditions. Spatial planning reduces uncertainties and its continuity helps to create transparent opportunities for an engaged society.

Local leaders can drive constructive change if they are active rather than passive leaders; leaders who anticipate rather than react get to the root of problems. Unplanned spatial patterns are inefficient and require more resources to maintain, and the high cost of bad or no decisions is likely to be irreversible.

Communication is a key asset for cities, but the opportunity to connect and convey a city's advantages can be undermined by empty or contradictory messages. Momentum and support are increased when local leaders demonstrate substantive, even if incremental, progress that is consistent with the collective vision and framework.

How to plan to address key urban development challenges

A city leader's main responsibility is to embody and promote public interest on the path to development. In doing so, he or she has to make lasting decisions that enhance the quality of life within the city, and that do not create negative impacts outside of it.

This guide is about making urban planning work in the interest of the city as a whole – it puts at the centre of attention the creation, protection and enhancement of commons (such as natural resources, the climate, public health, safety) and the development of adequate urban assets (public space, infrastructure, the right mix of activities and people, adequate housing etc), both of which are needed for people to develop and businesses to thrive.

The guide shows how urban planning plays a key role in setting the foundation for urban development and shaping the future of a city. It provides advice on how to make spatial choices that nurture better cities. It links space, processes and resources to show how urban planning works together with finance, legislation and management.

*"Cities are made of stones,
rules and people,"
Joan Clos, Executive
Director, UN-Habitat.*

Five obstacles to better urban planning

Inability to identify the
core issues

Inappropriate or outdated
planning approaches and
tools

Weak capacity to develop
and implement plans

Legal frameworks that
do not provide sufficient
traction for plans

Plans that do not have
sufficient time

Myopic vision will result in a poor plan, and planning without values is futile. Also, plans may not feature the steps necessary to implement them. A collective vision championed by leaders is the basis of impact planning and success stories show clearly that a vision has to drive the plan to reap real benefits for the city.

Plans conceived exclusively by technical experts, in isolation; plans using imported approaches that are not adapted to local conditions; and plans based on mechanical and detached assessments may be irrelevant in a specific context. Modernist planning has generally been ineffective in many contexts; leaders have to consider the relevance of plans and their practical application. Successful experiences show that innovative, relevant approaches can be created in cities of the developing world.

Often cities have insufficient human resources to develop plans and implement them. Developing such capacities within local planning departments, by using other agencies and by engaging the community and interest groups, is a key strategy to address this and produce better plans.

A sound legal framework is indispensable for the implementation of plans as it creates the conditions for all actors to work in certainty. Many cities that have had major successes in planning also have progressive legislation that ensures that plans are legally binding documents and include sanctions for non-compliance by residents and developers.

Implementation of plans requires monitoring capacity, credible institutions and low levels of corruption and impunity. Lack of continuity because of political cycles, and uncommitted leaders who fail to assess the long-term negative consequences of overruling plans can be major hurdles to success. Methods of implementing plans adapted to the local context need to be built in from the start.

Thinking implementation from the start

Make planning simpler

Be strategic

Identify responsibilities and
set performance indicators

Build inter-departmental
teams

Deal with the legal
dimension early

The planning system can be complex, time consuming and expensive, and may feature duplications and gaps.⁷ The attempt to create comprehensive plans may take decades and plans could be outdated before they are executed. On the other hand, plans that overlook institutional, technical, and financial constraints may eventually have to be abandoned. Adopting a demand-driven approach towards pragmatic and modular frameworks can lead to implementation that has an impact.

Responding to real needs in a way that offers long term perspective and is at the same time concrete and well phased will help to ensure that plans will live to be implemented. Plans that lack a vision and do not have a response to real problems are easily sidelined and forgotten when political agendas change. Choosing which are the key issues to address and assets to develop to support the city development amidst constraints and challenges is not easy and requires insight and capacity to ask the right questions.

There cannot be accountability without concrete roles and targets and the resources needed to realize them. Not setting these from the beginning creates confusion and lack of accountability that makes goals unreachable.

Transformative projects require holistic thinking to overcome governance bottlenecks and fragmented operations. Cities that promote a policy of integration and teamwork ensure that urban development frameworks and sector policies are mutually supportive and that implementers understand that. Designating a specific group with responsibilities for strategic thinking and coordination, and institutionalizing inter-departmental cooperation and day-to-day work alignment might require system and behaviour changes but will be more efficient.

A plan that is approved by a city council is a binding document. Determining whether the local government has the ability to implement a plan or whether it will rely on agreements with other levels of government or private partners is part of the necessary legal groundwork.

Calculate the plan capital and running costs and its impact on municipal revenue

Obtain early support to increase the likelihood of a positive impact

Phase implementation in terms of space and resources

A clear picture of the lifecycle costs should be a critical part of planning. However, long-term costs associated with policy decisions are often overlooked, especially operation and maintenance (O&M) costs which, in some cities, can be heavy financial burdens. Planning decisions and their implementation will also impact on the revenue base, and sound management practices will need to be introduced to be able to recover resources.

Cities that have reached out to stakeholders benefit from setting priorities that reflect real needs and therefore increase the impact of investment. If stakeholders are on board from the beginning it is less likely that proposals will be opposed later on. Broad support aligns a local agenda with that of other levels of government and also enlists the private sector.

Taxpayers' money should be managed carefully and used wisely. The same principle should apply to plan implementation. How financially possible a plan is will dictate how the programme components are phased and which of them will need to be funded by an external source. Evaluating results and making necessary policy adjustments would enable effective scaling up.

How to choose the urban pattern that can best serve your city

The size of urban population growth in the next four decades, especially in developing countries, will be massive. If a city leader opts for not making decisions on urban development matters, his or her city will lose a unique chance to grow sustainably. Proactive responses from city leaders will have a positive impact on a city's livability and competitiveness over the long term. Decision-makers that prepare for growth plan in advance and at sufficient scale to create the conditions for a compact spatial structure that is aligned with the city's characteristics, creates net benefits to the public at large and minimizes negative externalities. Promoting a sensible use of land through density policies would make these goals durable.



Amman, Jordan © UN-Habitat/Thomas Stellmach

Capture the advantages of mixed-use, compact patterns

Key tasks in linking vision and spatial structure

1. Lead and facilitate the strategic vision process
2. Engage all stakeholders
3. Provide data on spatial assets (environment, topography, infrastructure, etc.) for the vision exercise
4. Document the preferred strategic vision
5. Agree on the strategic goals to be achieved each year
6. Develop an urban development framework and budget to realize the vision
7. Allocate resources through the local government annual budget
8. Seek the commitment of stakeholders to develop their own plans to achieve the vision
9. Set indicators by which performance is to be measured
10. Report back to the community.

At constant population, if Mexico City increased its density by 8 per cent from its current average, it would release an amount of land twice as large as Central Park in New York City.

Shape a collective vision

A strategic vision shapes a preferred future for the city.

Many of the issues affecting cities partially stem from the lack of comprehensive strategic planning before making spatial decisions. Spatial planning is enriched if it is linked with a vision for the future that is holistic and is legitimized if this vision is collectively held. A successful vision has a spatial dimension that reflects a city's unique cultural and physical traits; it provides direction for the activities of all stakeholders, encourages them to work cohesively and ensures everyone is working towards the same goal.

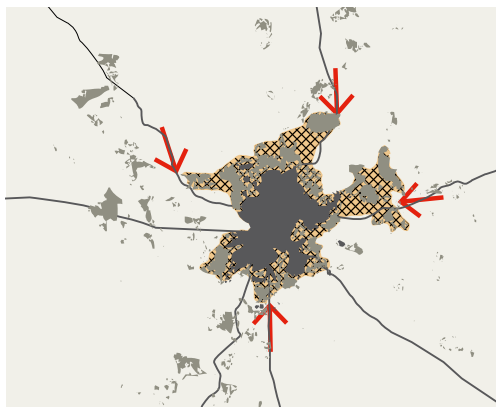
Make informed decisions on preferred urban spatial structure

Intensification, extension, multiplication: three policy options to accommodate growth.

To accommodate urban population growth, cities can either increase their current carrying capacity, expand their boundaries, create a spatial system with many new town centres, or use a combination of all these approaches. The choice is unique to each context and will be informed by population growth projections, land availability, topographic characteristics, cultural aspects, and the city's ability to implement, including investment and enforcement capacity.

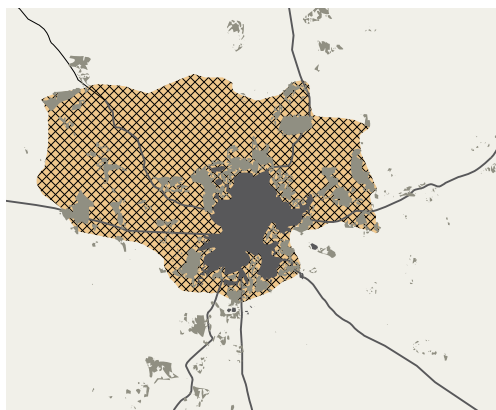
Intensify the density of existing built-up

areas through infill development and setting growth limits, which would need to be moved outwards at regular intervals to prevent land shortages. Intensifying density implies regenerating brownfields and replacing existing buildings with new ones that accommodate more people. Consolidating built-up areas needs regulations to preserve no-development zones and to control a trend towards the decline of density (of both people and buildings).⁸ This approach may be adequate for cities with strong enforcement capabilities and where population growth is relatively stable. A successful example is Portland's Urban Growth Boundary in the United States.



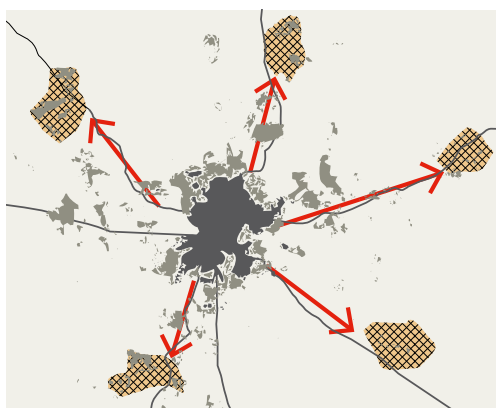
Extend the city at the fringes of the built-up

area. Cities growing faster than 1-2 per cent per year need to ensure there is enough land to accommodate people and this could be at least twice the size of the existing land area.⁹ A city extension would border the existing footprint, and its infrastructure and transport systems would be fully integrated with it. The extended area may include urban services whose capacity has been calculated to also serve residents living in deprived districts in the existing city. Planning an extension requires vision and commitment. New York's Manhattan Commissioners' Plan of 1811 in the United States is one far-sighted extension plan.



Multiply nodes by building satellite towns

that might be associated with existing urban masses. Although they would be physically separated and at least partially independent administratively, economically and socially, satellite towns would be coordinated with the central city to capitalize on synergies and economies of scale. Satellite towns differ from suburbs in that they have their own sources of employment and services, which would also prevent them from becoming dormitories. This option is suitable for fast-growing, large cities. The Comprehensive Plan of Shanghai 1999–2020 in China features nine satellite towns that absorb people who migrate from rural areas.



Promote mixed land use

Single-use of land can induce social fragmentation. Separating incompatible land uses, such as polluting industries and housing, is a rational decision. However, in the early twentieth century, modern planning promoted mono-functional use separating housing from workplaces and commercial and social uses. Residential areas were also designed for homogeneous income groups. The negative side of this policy is that it hinders the access to urban amenities of lower income groups and different ethnic backgrounds, thus reducing opportunities for civic interaction and social integration. This type of design has economic opportunity costs because it precludes synergies and mutual stimulation among productive activities. Single-use, together with low-densities, encourages the use of individual mobility and erodes the viability of public transport networks, further reinforcing the exclusion of the less privileged.

Allowing compatible uses to co-exist brings several benefits. Mixed-use is not a new approach. It is the *raison d'être* for urban agglomerations and was the norm in cities before the car, prior to the advent of modern planning practices. The term mixed-use generally implies the co-existence of three or more significant revenue-producing uses.¹⁰ Removing zoning barriers to mixing compatible uses could produce the following benefits :

- Social benefits, improving accessibility to services and urban amenities for a broader segment of the population, and increasing housing options for diverse household types. It enhances the perceived safety of an

area by increasing the number of people on the street.

- Economic benefits, increasing the business potential of transactions and trade as co-location of activities attracts more potential customers during more hours of the day. This is reflected in increased income from business taxes. Commercial uses in close proximity to residential areas are often reflected in higher property values, helping raise local tax revenue.¹¹
- Infrastructure benefits, reducing the overall demand for commuter travel, shortening average trip lengths and reducing car use altogether. In addition to minimizing road infrastructure requirements and reducing the amount of land allocated for parking, mixed land use also provides a greater base for using public transport and walking and biking.

To support a mixed-use city, at least 40 per cent of the floor area should be allocated for economic uses.

Monofunctional zoning should be reduced to no more than 10-15 per cent of the overall land.

Plan for compact patterns

Spatial patterns may be defined by density and land use policy. The combination of these attributes can define three spatial patterns with a number of others being largely a result of the combination of these two. A dispersed pattern is generally low-density with single land use; a fragmented pattern is made of patches of single-use built up areas with large unused areas in between; a compact pattern is denser and land use is mixed. Spatial pattern choices determine the amount of land supply that the city would need to accommodate growth, which is larger in dispersed patterns than in land-intensive, compact ones.

- **Dispersed patterns.** Single-use, low-density patterns are commonly identified as urban sprawl. Sprawl was the prevalent choice in developed, land-rich countries in the years following the Second World War; it tends to consume significant amounts

of land per capita and generates larger per capita infrastructure installation and maintenance costs. This is because water and sewerage pipes and electricity lines need to be extended over longer distances to reach relatively fewer people. Services such as waste collection, police and fire protection require greater expenditures. Public transport may be unviable; dispersed patterns depend on individual transport, which requires public investment in roads that can be 30 per cent higher than compact patterns.¹² Congestion has productivity costs stemming from longer commuting times. Extensive land consumption often breaks up natural habitats and may damage sensitive ecosystems. Single-use policies may lead to social fragmentation that are evident in slums and gated communities co-existing side by side.



Single-use, low density pattern in the suburbs of Brasilia, Brazil
© Pablo Vaggione



High density needs to be planned to prevent diseconomies of overcrowding, Dhaka, Bangladesh © UN Photo/Kibae Park

- **Fragmented patterns:** a fragmented pattern is characterized by high density areas which are single use and result in patches of mono functional, dense built up areas. Typically they are characterized by low cost residential estates in the outskirts of cities, built separately from shopping and commercial centres, business and directional centres, industrial or recreational areas. Gated communities add to the fragmentation. Large highways are the only viable connectivity between such areas and result in high mobility costs. Interstitial spaces in higher income countries can be maintained as parks and green areas, but in developing countries they are focus of informal residential developments by residents who cannot afford commuting costs. The result is a segregated city, which restricts different income groups from accessing its various areas.
- **Compact patterns.** A compact pattern is land-intensive, with medium-high densities, mixed-use land policies forming a continuous footprint where growth is adjacent to consolidated areas. Compact patterns are thought to improve accessibility, induce a more cost-effective use of infrastructure and urban services, reduce erosion of natural resources, lower business costs and improve social equality. Benefits of compact patterns include:
 - **Better accessibility,** reduces the need to travel and trip distances, and thus congestion and pollution; optimizes cost of transporting goods and improves access to services.
 - **Lower infrastructure cost** and more efficient use of urban services, which means less expense for local governments, residents and developers. The cost of installation and maintenance for roads, water mains and sewerage lines per unit are lower, since there are more taxpayers in the area to pay for them.¹³ It also reduces the cost of maintenance, particularly for transport and waste collection.¹⁴ A compact pattern would increase the viability of local energy generation and distribution technologies, including smart grids and district heating.
 - **Preserves land resources** for agriculture, green lands and water and energy provision as less land would need to be built up. Compact patterns allow for a reduction in the amount of land dedicated to conventional parking.¹⁵
 - **Lower cost of economic transactions,** as proximity reduces the cost of taking part in economic transactions. For example, when a market is close to its customers, transport costs are reduced.
 - **Social integration** leads to awareness of different cultural and social groups and thus has a social cohesion function. In diverse areas, children benefit from multicultural education, which may lead to an increased capacity for learning languages and different perspectives, all of which are key traits for employment in a globalized world.

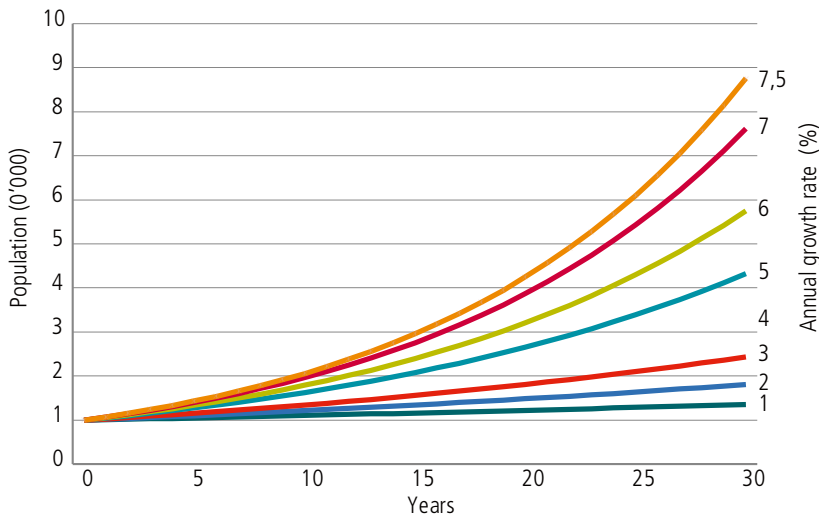
Make density a key variable

Anticipate urban land needs

Estimate realistic land requirements over a 30-year period. Depending on expected population increase and population densities that want to be achieved, it is possible to estimate the land that is needed to accommodate growth. Land requirements comprise both built-up areas and un-built, open space and are estimated for periods of 20 to 30 years in advance. For example, the population in Bamako, Mali, is growing at 4.45 per cent annually, which means that its current 1.8 million people will grow to 6.3 million by 2030. At current density, the Bamako area will increase 3.5 times in the next 30 years. Un-built areas generally account for 50 to 40 per cent of the built-up area needs.¹⁶

Land needs depend on density trends and choices. Estimating the land needs is done by using the average density combined with population and housing trends (larger dwelling and smaller families is a common trend). In the example presented (next page), Kisumu has a population density of 45 people per hectare (similar to Los Angeles, although given that people live in much smaller dwellings, this is achieved with much less floor space). Taking into account the population growth rate, the size of the average family, the average desired size of the dwelling, it is possible to calculate the amount of residential floor area needed. Adding to this the floor area needed for other activities (economic and services, which can represent 40 per cent of the total floor area) results in the total floor area needed.

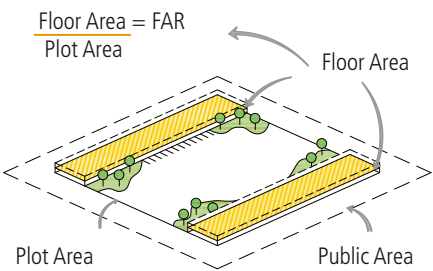
Graph 1.1 Population growth curves for different annual growth rates



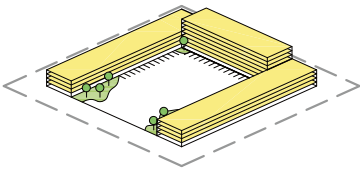
Source: UN-Habitat

Illustration 1.1 Estimating urban land needs in a model city

Population	1,000,000
Family size	5
Dwellings	200,000
Dwellings size	60m ²
Residential Floor Area	12,000,000m ²
Other Floor Area	10,000,000m ²
Total Floor Area	22,000,000m ²

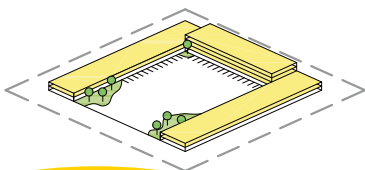


Scenario 1



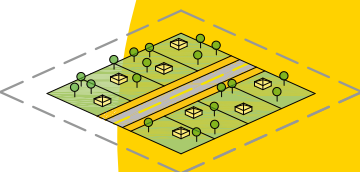
FAR	3.0
Plot Area	733 ha
Public Area	733 ha
Total Area	1,467 ha
Population Density	681.82 people/ha
Residential Density	136 dwellings/ha

Scenario 2

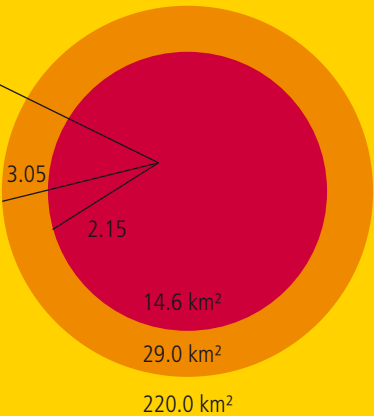


FAR	1.5
Plot Area	1,467 ha
Public Area	1,467 ha
Total Area	2,933 ha
Population Density	340.91 people/ha
Residential Density	68 dwellings/ha

Scenario 3



FAR	0.2
Plot Area	11,000 ha
Public Area	11,000 ha
Total Area	22,000 ha
Population Density	45.45 people/ha
Residential Density	9 dwellings/ha



Source: UN-Habitat/Laura Petrella, Thomas Stellmach

Extending the urban limit is a key step in guiding future urban growth. Preparing for growth means also identifying areas to direct urban growth towards and ensuring it steers away from fragile areas and natural heritage sites. Extension areas should be close to existing developed areas and infrastructure. Establishing the limits of the new urban area and its key features (street grid and basic infrastructure location) will help to direct new developments as well as investments. Structuring such areas by identifying the main grid is also crucial for efficient development. City limits need to be sufficiently flexible to be expanded if needed and the area sufficiently large to avoid land constraints.

Once cities reach a certain population and spatial size, agglomeration benefits may decrease. The association between income and city size becomes negative once a threshold population of around seven million people is reached.¹⁷ This is because diseconomies of scale, such as excessive extension and congestion, may outweigh agglomeration advantages. Studies show that a person's tolerance level for travelling is around one hour per day. This "travel-time" tolerance multiplied by the speed of the mode of transport used determines an efficient spatial size.¹⁸ This may explain why the size of cities remains one-hour wide, and why cities may become dysfunctional beyond a certain size. Cities with high density will be able to grow larger in population but low-density cities will reach their threshold sooner.



Low density expansion in Bamako, Mali
© Flickr/Johanne Veilleux



Istanbul, Turkey is one of the world's megacities
© UN-Habitat/Thomas Stellmach

Density is city-specific. Cultural factors and lifestyles have a significant influence on acceptable density patterns. What is considered to be high density in one culture might be low for another. Spatial planning policies, such as how much land is allocated to non-residential functions and open spaces, plot sizes, building types and the number of household members, all determine density. Detailed data - on a neighbourhood scale - will help set density parameters that can accommodate growth and are appropriate for the culture and cost-effective.

Measuring density

Population density describes the number of people in a given area and is usually expressed as the number of people per hectare (p/ha) or dwelling units per hectare (du/ha). It can also be expressed in other area units such as square kilometers or acres.

Gross density measures the population or dwelling units in the entire urban area, including non-residential uses such as roads, parks and airports.

Net density measures the population or the number of dwelling units over the area allocated for residential use only.

Density in a city is not constant and the average might be different from the density in a particular district or area. For example, the average gross density of New York City in the United States is 32 p/ha, but in Manhattan – a New York City borough– it is around 215 p/ha.



Growth management, Germany
© Flickr/La Citta Vita



Shanghai Anting New Town, China
© Frank P. Palmer

The per capita costs of most urban services increase if the density is low.¹⁹ A higher population density reduces both the capital and operating costs of solid waste collection and disposal services, water supply, sanitation, and police and fire services. The per capita, capital, operating and maintenance costs of shared infrastructure in metropolitan areas fall as density increases because distribution networks are more compact and the costs are distributed over a larger number of users.²⁰ This makes it easier to recover costs and ensure maintenance. Low density in poor countries often means that no services can be provided at all and this,

in turn, creates distrust in the municipality's capacity to service the city. And if services are provided, they need to be heavily subsidized.

*In Toronto, Canada, 152 p/ha would mean 40 per cent less total infrastructure costs than areas where there is a density pattern of 66 p/ha.*²¹

Table 1.1 Population density in selected cities

Rank	City / Urban area	Country	Population	Built up area (in sqKm)	Density (people per ha)
1	Dhaka	Bangladesh	9,196,964	165.63	555.30
2	Hong Kong	China	5,179,089	97.63	530.50
3	Mumbai	India	16,161,758	370.90	435.70
4	Saidpur	Bangladesh	233,478	7.59	307.40
5	Rajshahi	Bangladesh	599,525	20.26	295.90
6	Milano	Italy	17,335,085	635.17	273.80
7	Casablanca	Morocco	3,004,505	114.31	262.80
8	Cairo	Egypt	13,083,621	569.17	229.90
9	Baku	Azerbaijan	2,067,017	90.15	229.30
10	Addis Ababa	Ethiopia	2,510,904	118.65	211.60
11	Seoul	Korea, Republic of	14,546,082	706.14	206.00
12	Ho Chi Minh City	Vietnam	4,309,449	210.33	204.90
13	Singapore	Singapore	4,309,797	245.24	175.70
14	Mexico City	Mexico	17,224,096	1058.53	162.70
15	Santiago	Chile	5,337,512	438.51	121.70
16	Bangkok	Thailand	9,761,697	1025.93	95.10
17	Kigali	Rwanda	354,273	45.02	78.70
18	Beijing	China	11,866,211	1576.38	75.30
19	Paris	France	9,519,527	1482.08	64.20
20	Los Angeles	United States	13,218,754	3850.89	34.30

Source: Lincoln Institute

Implications of low-density patterns

Some of the high costs associated with low-density urban spatial structures are generated by traffic congestion, noise pollution and traffic-related accidents. A larger extent of urbanized land also results in a loss of agricultural, recreational and natural lands. As density decreases, per capita electricity demand tends to increase.²² For example, energy consumed for transport needs in an urban area with less than 25 p/ha may be an annual average of 55,000 mega joules per person, but in an area with 100 p/ha this figure would be about 300 per cent less.²³



Low density pattern in Nouakchott, Mauritania
© UN-Habitat

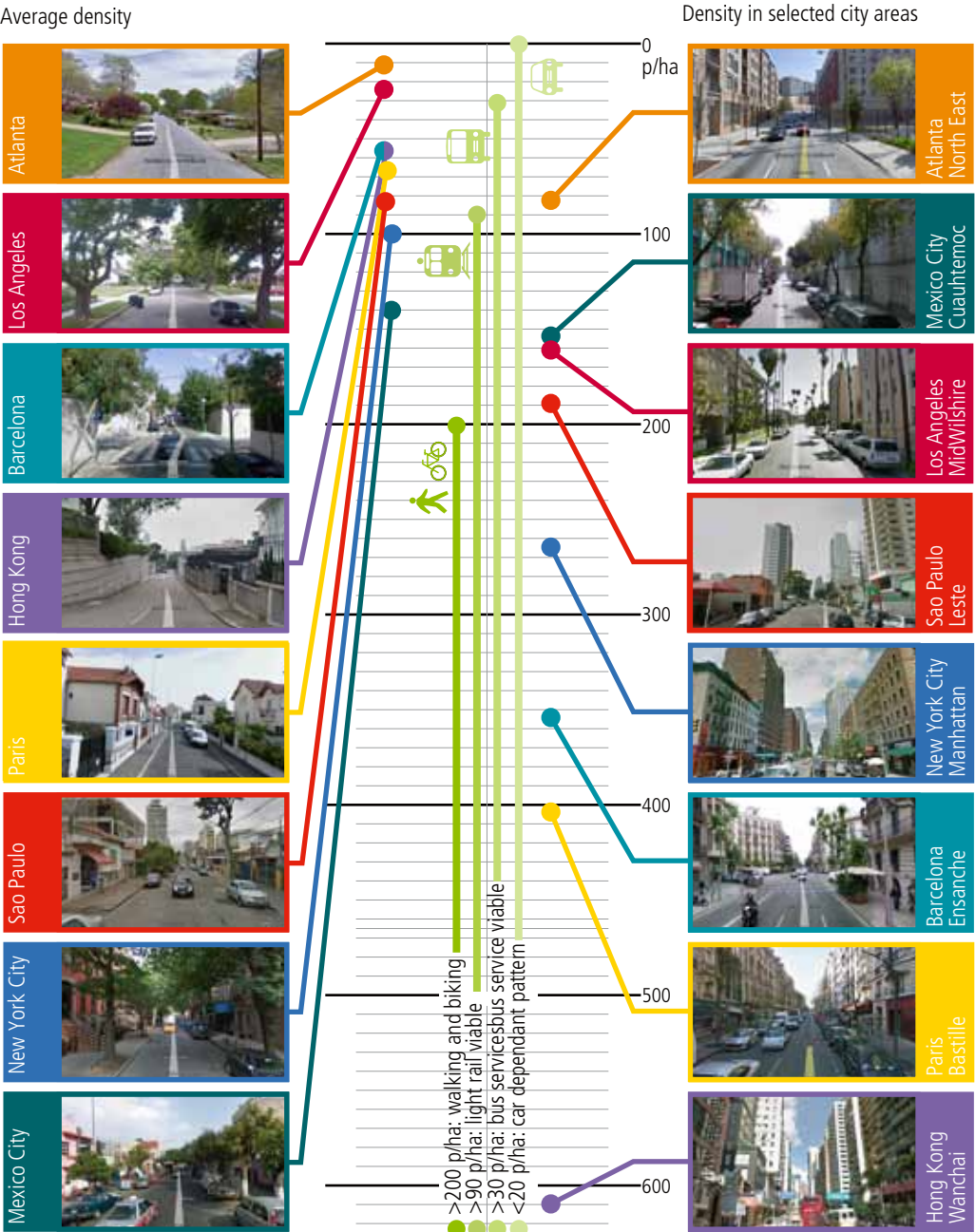
Implications of high-density patterns

High-density helps to reach economies of scale both in trunk infrastructure and in treatment plants such as those that treat sewage. The lower costs per household can be passed on to residents and the smaller debt load helps fiscal stability. Higher density can enable a city to introduce district heating and cooling systems because they service more customers.²⁴ Also, as higher-density building development yields higher taxes²⁵, such a pattern would enable service investment capacity. As property values are generally greatest in high-density areas, their contributions to public revenue through property taxes may enable density to pay off the actual costs that it generates.²⁶



High density in Hunchun city in China
© UN-Habitat/Alessandro Scotti

Illustration 1.2 Density and streetscapes



Source: Author, various sources

Urban densities are decreasing globally.

Urban densities tend to decrease with population growth – ease of transport, the low cost of fuel and the comparatively high economic productivity of urban land uses have resulted in a fast transformation of agricultural or natural land into urban land. Low density urban sprawl is associated with increasing pressure on resources, degradation of farmland, lack of services and high commuting needs. Increased fuel prices, as well as increased interest in agriculture production following recent food price hikes, may impact on this trend. As cities will have to accommodate growing population in the future, maintaining an optimal density will be a key challenge which will require deliberate policies.

In areas with extremely high densities, the high cost of land may increase the cost of infrastructure installation.

This may suggest that beyond a given threshold, the benefits of higher density become less significant and disadvantages of overcrowding may emerge. Urban services may be less economical when density rises beyond the infrastructure capacity.²⁷ In addition to health problems, extreme density might lead to congestion and pollution, and, without planning, a loss of green space and vegetation. If urban growth is not planned in advance, it can be extremely expensive to secure space for new infrastructure. Plans that intensify the density of existing areas need to foresee an increase in infrastructure capacity and its associated maintenance costs.

The intensive use of infrastructure in high densities may increase the cost of maintenance.²⁸

Research in 247 large counties in the United States of around 30 p/ha found that public spending first declines as density increases but then can increase sharply, leading to average costs of public service provision that exceed the minimum by as much as 43 per cent in very dense counties.²⁹

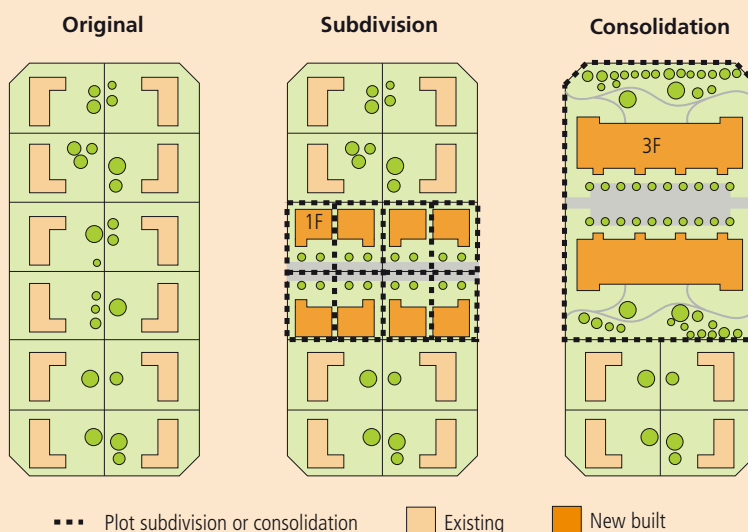
*A study in the United States shows that water and sewerage systems in extreme density areas would increase the nominal installation costs by 20 per cent when compared to low density areas.*³⁰

Cape Town Densification Strategy

In Cape Town, South Africa, densification is viewed as a necessary step to promote the long-term sustainability of the city's valuable natural, urban and rural environment. Integrated, higher-density development is motivated for:

- Small businesses dependent on vibrant markets;
- Supporting a range of social services and facilities;
- Cheaper provision per building unit of bulk services such as water, sewerage and electricity;
- Integrating public transport with other forms (walking, cycling); and
- Integrated land uses – ranging from directly mixed uses to reasonable spatial proximity of different uses.

The Provincial Spatial Development Framework prepared in 2005 supports the increase of the average gross density from 10 – 13 dwelling units/ hectare to 25 du/ha. Considering Cape Town's average of 3.8 – 4 people per household, the target density would be about 100 p/ha. The Cape Town Densification Strategy identifies the following generic ways to increase density:



The strategy indicates that density increase needs to be guided by:

Land use: areas with mixed-use (including different types of residential development) are best suited as locations for higher densities. Higher-density residential development is not particularly appropriate in predominantly industrial areas.

Built and heritage factors: higher-density needs to ensure scale, height and design fit with the existing fabric, especially if the area is of a valuable built character.

Infrastructure: the capacity to accommodate larger flows of traffic with the provision of upgraded public transport according to an impact assessment; the capacity of the existing infrastructure and services to accommodate increased demands.

Socioeconomic factors: ensuring compatibility with the surrounding local community preventing negative social and environmental impacts.

Natural environment: higher-density development in scenic and sensitive landscapes should be adjusted so as to not negatively impact on the surrounding natural environment.

Define and enhance public space

Secure sufficient public space in advance

Urban plans define the separation between public and private space. This key action has a lasting impact and cannot be easily changed. Creating public space in an already developed area requires complex expropriation programmes which can be expensive. Planning for public space ahead of urban growth may achieve at least similar results but at a fraction of the cost. A clear delimitation of public and private space can address encroachment issues and occupation of street spaces.

Public space is important for the creation of private value. It is the existence of public space that ensures accessibility to plots and buildings, and supports mobility. It is in public space that basic service networks can be located, including drainage, sewerage, water supply pipes and electricity poles. Without public space, it would be impossible to introduce new infrastructure such as communication cables, private property would not function and insufficient public space will stifle the possibility of private investment.

A ratio of 50% of public space is common in successful cities. Manhattan, Barcelona and Brussels have up to 35% of city area allocated to street space and an additional 15% for other public uses.

Plan a system of public spaces

Public space is a vital component of a successful city. Well designed and managed public spaces are a key asset for a city and have a positive impact on its economy. Investment in public space contributes to improved health and well-being; it reduces the impact of climate change; encourages people to walk and cycle; increases safety and reduces fear of crime. It can improve residential neighbourhoods, safeguard property values, be more attractive to tourists and increase retail activity. For example, business turnover in a London high street location increased by between 5 and 15 per cent following investment in a nearby public space; a 1 per cent increase in green space can lead to an increase of between 0.3 and 0.5 per cent in average house prices.³¹



Good quality public space in dense urban setting in Beirut, Lebanon © UN-Habitat/Thomas Stellmach

Reap the benefits of well-designed streets

Streets are the heart of a city. They mould the urban form and carry the public utilities that a city needs to function; they are the heart of the urban public area and are a key factor in the quality of life of a city. They enable people to move and communicate and they are the setting for businesses and the exchange of services and goods. Well-planned streets can become the symbol of a city. The Champs-Élysées in Paris (France), Las Ramblas in Barcelona (Spain) and Nanjing Road in Shanghai (China) are streets that are famous all over the world.

Streets are the most important type of public space. The share of street space of the total urban land is a key determinant of the success and effectiveness of urban development. Cities that do not have sufficient public space are slower to transform and more difficult to modernize. Many of the successful restructuring processes have mainly focused on delivering a new public space structure. Cities with high densities are particularly in need of public and street space to provide sufficient space for circulation, interaction and the laying of infrastructure.

Table 1.2 Street Density

Country	Cities	Source	Land Area (km²)	Street area (km²)	Street total length (km)	Street density (km/(km²))	% of land allocated to street
Kenya	Nairobi	a	696	48	4984	7.3	7
Philippines	Manila	a	38.5	4	491	12.8	10
India	Mumbai	a	468	47	1941	13.7	10
Senegal	Dakar	b	289	28	3623	12.5	10
Egypt	Cairo	a	453	50	4983	11.0	11
Belgium	Brussels	b	139	35	2802	20.2	25
Spain	Barcelona	b	98.58	30			33
United States of America	Manhattan	a	59	21	2057	34.9	36

Notes:

Street density is measured as the total length of linear kilometers of streets per one square kilometer of land.
% Land allocated to streets is the total land area covered by streets as a percentage of the total land area.

Source:

- a) United Nations Human Settlements Programme (UN-Habitat), Global Urban Indicators Database 2012.
- b) United Nations Human Settlements Programme (UN-Habitat), Global Urban Indicators Database 2013 forthcoming publication.

What makes a high-quality street?

- pavements wide enough to accommodate all users, with potential obstructions placed out of the way
- enough crossing points, in the right places
- traffic levels that are not excessive
- public spaces along the street
- good lighting
- signage, landmarks and good sightlines
- sense of security
- high standards of maintenance
- smooth, clean, well-drained surfaces
- no litter, graffiti or signs of anti-social behaviour

Source: CABI (2007) *Paved with gold: the real value of good street design*. Available: <http://web.archive.nationalarchives.gov.uk/20110118095356/http://www.cabi.org.uk/files/paved-with-gold-summary.pdf> Accessed 5 June 2012.

Street networks guide development. Because 25 to 35 per cent of a city's developed land is likely to be dedicated to road infrastructure,³² street grids should be an important part of spatial planning. When planning extensions, the arterial and street grids are highly effective in guiding growth. A planned grid with arterial roads spaced no more than one kilometre apart gives access to public transport within a 10 minute walk,³³ and a smaller grid of streets ensures that block size is human-scale. Long and continuous streets without breaks and cul-de-sacs ease traffic and facilitate the flow of public transport systems.

Improving the quality of streets brings economic and environmental benefits.

- Research in London shows that an achievable improvement in street design can add an average of 5.2 per cent to residential prices on high streets and an average of 4.9 per cent to retail rents.³⁴
- In environmental terms, a 10 per cent improvement in a street's walking quality could yield a reduction of 15 kg of CO₂ per household per year as reliance on cars would be reduced.³⁵
- "Improvements" are things like wider pavements, better street lighting, less distance between lights, more planted areas and shade. Also, pedestrian-friendly block lengths, differences in use, and level ground encourage walking.



Planned green system in Berlin, Germany
© UN-Habitat/Alain Grimard

Plan green public spaces

Green areas contribute to improved environmental conditions by increasing air quality, reducing the heat island effect, and sequestering carbon. Air pollution is reduced when dust and smoke particles, especially from vehicle exhausts, are trapped by trees and vegetation. Trees can influence the degree of solar radiation, air movement, humidity and air temperature and they provide protection from heavy rains. Vegetation in dense urban areas can reduce the urban heat island effect produced by the concentration of pavements and concrete.



Green areas improve environmental conditions and property values, Port-of-Spain, Trinidad © UN-Habitat/Alain Grimard

Greening schemes bring significant pay offs.

Increasing tree cover in some cities by 10 per cent can reduce the energy used for heating and cooling by up to 10 per cent.³⁶ Proximity to green open space tends to increase property values by 3 per cent.³⁷ A study in New York City in the United States calculated the monetary value of the city's five million trees based on estimations of the trees' impact on property values, the amount of carbon dioxide they removed from the air and the amount of energy their shade conserved. It concluded that for every dollar spent on trees the benefits for each resident could be quantified at USD 5.60.³⁸ Budgeting for greening schemes in other sectors, such as water treatment, highway construction, flood-plain protection and business and industrial zones, can increase their feasibility. Securing resources for green schemes requires coordination across departments, engaging private developers and stimulating citizens and local businesses to participate in the upkeep of the area.

Nine square metres is the minimum amount of green space per capita recommended by the World Health Organization, which recommends all residents live within a 15-minute walk of a green space.

From motorway to public space

Cheonggyecheon, Seoul



River Cheonggyecheon, Seoul Korea © John Dolci

Cheonggyecheon is a river that runs for 5.8 kilometres through the heart of Seoul in South Korea. In the 1950s, a significant flow of immigrants resulted in the encroachment of informal settlements along the sides of the river. Used as a sewer, it became seriously polluted and prone to flooding. In 1958, the river was covered with concrete and, in the early 1970s, a 16 metre-wide elevated motorway was built over it. All makeshift houses along Cheonggyecheon were demolished. At the time, this intervention was considered to be an example of the successful industrialization and modernization of South Korea. By the late 1980s, however, the congested motorway came to be seen as the cause of poor air quality and environmental degradation. Furthermore, Cheonggyecheon acted as an urban fault line separating the dynamic area to the south of the motorway from the lagging and less competitive north.

In 2003, led by Lee Myung-Bak, Seoul's mayor at the time and now South Korea's president, the metropolitan government decided to remove the motorway and restore the river. ***The Cheonggyecheon urban renewal project was seen as an opportunity to address environmental, mobility, public space and economic development issues at the same time.***

How to improve access and avoid congestion

People's ability to move to and from their homes to their workplace, shops, schools, and health centres is essential for a city's good performance. Accessibility - the ease of reaching these places - affects household income and housing location decisions; improving accessibility starts with acknowledging that the goal is to facilitate the movement of people, not cars. By combining spatial planning and transport policies, local governments would reduce people's need to travel; improve travel conditions with affordable and efficient public transport options; and manage supply and demand traffic to curb congestion, which is a major barrier to productivity and a headache for residents.



Tetouan, Morocco © UN-Habitat/Alessandro Scotti

Reduce the need to travel through proximity

Link land use and transport planning

Spatial and transport planning are strongly linked. A city's spatial pattern is enabled by transport, and the development of transport networks shapes cities over the long term. Investment in transport will have higher impact if it is linked to spatial planning from the start. For example, intermodal stations are focal points for property development and economic activity; they increase demand for public transport and reduce land consumption. Locating people near transport nodes is a good planning decision and similarly it is good to locate people near activities. Both have a positive impact on urban transport. A critical mass of users (for example, above 50 p/ha) is vital to achieve economies of scale for public transport services. Mixed-use land policies can reduce the distance between residential and employment areas which lessens dependency on cars and travel demand altogether.

Spatial patterns influence travel demand.

Dispersed patterns induce one trip per task (for example to the office or supermarket), whereas with a compact spatial pattern several tasks are possible in a single trip. Density and mixed-use around public transport stops will increase use and, hence, system viability. For example, in China, central Hong Kong's high density results in 85 per cent of all trips being made on public transport³⁹ but in areas with density below 35 p/ha, trips on public transport are only 10 per cent of the total. Different densities support different service levels of public transport: a basic bus service needs a density of around

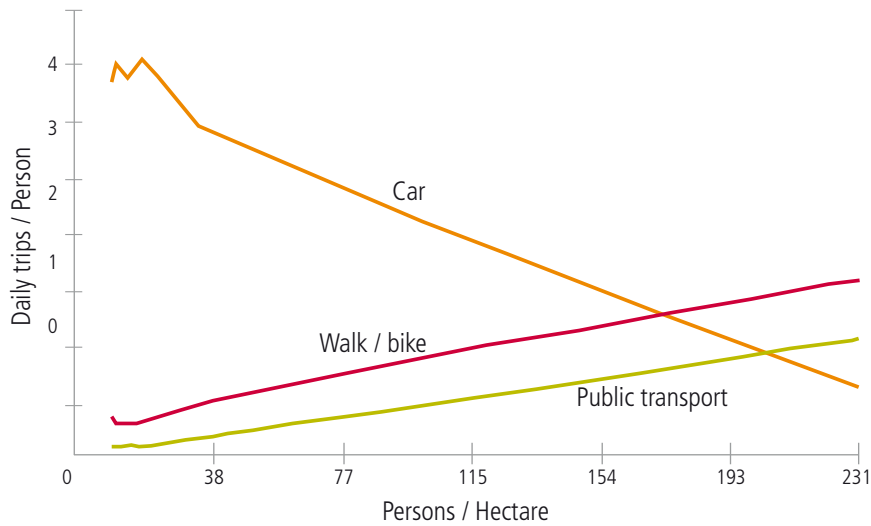
35-40 p/ha; an intermediate bus service is viable with a density of 50 p/ha;⁴⁰ light rail transit would be viable in areas with a density of 90-120 p/ha.⁴¹ The distance from origin is a key determinant of travel demand with one study in the United Kingdom estimating that with a density of 150 p/ha, more than 80 per cent of people could walk or cycle to services.⁴²

Linking job location and transport needs increases land efficiency. Parking needs are high if economic activity is not clustered around nodes and development corridors;⁴⁴ parking space also prevents land in premium locations being used for more economically productive activities. In the United States, in central Houston land used for parking is more than 50 per cent of the land area,⁴⁵ and in Atlanta, only 1 per cent of the jobs created between 1990 and 1998 were within 800 metres of a transport node while 77 per cent of the jobs were outside the transport network.⁴⁶



In Central Hong Kong, 85 per cent of all trips are made on public transport, Hong Kong, China © Foter

Graph 2.1 Daily Trips vs Population Density (USA,1990)



Source: Dunphy RT and Fisher K (1996) ⁴³



Parking lots in Atlanta, USA
© Daniel Goldin



A mixed-use development with public space near a transport node in Walnut Creek, California © Sam Newberg

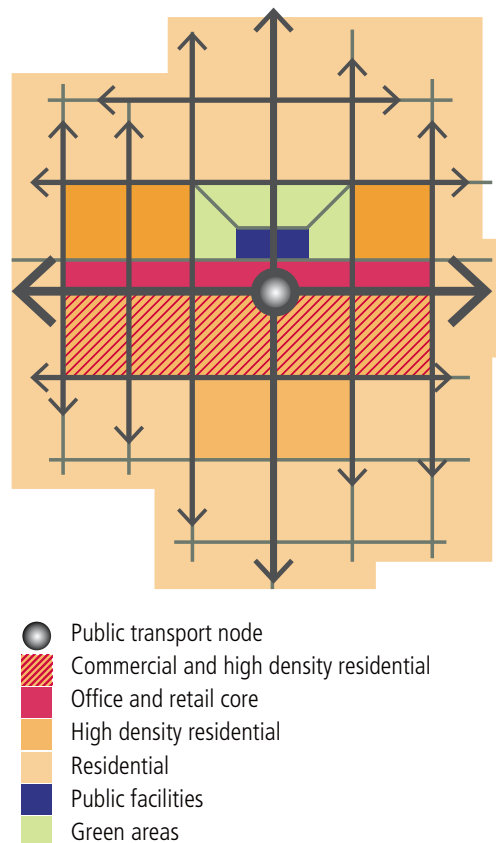
Use spatial planning to reduce need to travel

A compact pattern adjacent to a public transport node has many benefits. Nodes bring together public space and health, shopping and community facilities. Most dwellings would be located within 800 metres of the transport node; streets are designed for walking and cycling, with traffic calming features, bike lanes and carefully designed pavements. Parking is minimized. Transit Oriented Developments (TODs) have an average density of about 60 p/ha and above, and combine office, retail and housing uses. The use mix varies with location. TODs increase public transport use, improve access to jobs and reduce commuter times per household worker.⁴⁷ A TOD can reduce car use per capita by half and save households around 20 per cent of their income since they would cut car-related expenditures.⁴⁸

Corridors extend development along the axes between public transportation nodes. Higher densities along corridors increase the feasibility of a public transport system. Rail in particular has a density-inducing effect around stations that can be leveraged to connect dispersed people. In Atlanta, BeltLine is a proposed 35 km, rail-based development corridor that would generate 5,600 units of affordable housing and 526 ha of new parks.⁴⁹ Regional urban corridors are experiencing fast urban transformation.⁵⁰ For example, India's Delhi Mumbai Industrial Corridor is a 150 km wide, 1,500 km long corridor served by a multi-

modal, high-speed freight corridor that brings together nine industrial zones, three ports and six airports over six Indian states.⁵¹

Illustration 2.1 Transit Oriented Development



Source: Calthorpe, 1993

Plan a well-connected street grid

A well connected grid supports public transport and decreases congestion.

In the extension of urban areas, plans need to create a grid of streets with arterial and secondary roads that are well connected through intersections. Arteries are usually planned approximately one kilometre apart from each other and local streets provide links between them. An arterial road every 1 to 1.5 km is considered viable, while local streets provide links between them. The grid should connect origins and destinations with multiple alternative routes, avoiding dead-ends. Intersections every 100 metres make a more minute grid that is friendly to pedestrians as well. In built up areas, projects that work to increase connectivity are able to reduce congestion and also increase the economic vibrancy of the area. This expansion and rationalization of the urban public space to support mobility, accessibility and the development of vibrant streets is one of the key interventions in new and existing urban areas.

Building wider roads is not the solution to congestion.

Actually, building wider roads may create more congestion.⁵² When road space for cars is reduced, traffic shrinks because drivers change their routines, as a study in over 100 locations in Canada, Australia and Japan showed. These locations had a 14-25 per cent traffic decrease following road space reduction and, where accompanying schemes made public transport more attractive, people were more likely to use it.⁵³

Assessing street connectivity

UN-Habitat's Composite Street Connectivity Index (CSCI) allows one to assess a street network in terms of mobility for all users, to anticipate response to traffic congestion and to improve conditions for walking and cycling. It has been tested in various cities both in the developed and developing world and represents an effective measurement tool based on geo-spatial information.

Source: UN-HABITAT, Global Urban Observatory, 2012. Street Connectivity, Promoting Street for all users, 2013 forthcoming publication



Building wider roads may create more congestion.
Traffic jam in San Francisco © Young man Blog

Good intersections rather than width make the road grid efficient. In the extension of urban areas, plans need to create a grid of roads with arterial and secondary roads well connected through intersections. Most congestion on arteries is caused by limited traffic flow at intersections rather than the dimensions of the local street sections.⁵⁴ Good connectivity is ensured when there are frequent intersections and multiple routes to get from point A to point B. Cul-de-sacs, T-junctions and the privatization of public roads (often for security reasons) all contribute to congestion and to reduced mobility.

Street design improves neighbourhood's social qualities. A human-friendly scale is not a traffic flow impediment, but an excessive road width can create a barrier. For example, local streets wider than two lanes tend to discourage people from crossing and one study found that residents of streets with light traffic had, on average, twice as many acquaintances as the people on streets with heavy traffic.⁵⁵ Streets

that give priority to pedestrians and cyclists, and are safe and friendly, help to create a unified neighbourhood.

Traffic calming is a cost-effective way to upgrade a streetscape. Streets can be redesigned to slow traffic flow with the use of roundabouts, speed humps, curb extensions, raised intersections and narrowing. The streetscape is improved by installing street furniture, widening pavements and planting trees. Benefits include an increased attractiveness of neighbourhoods, easier social interaction, increased safety, less noise and pollution, and reduced heat island effect. Traffic calming measures can be used on streets and also arteries, for example by reducing the number of lanes. In New York City, the redesign of Broadway has reclaimed space from the car, enlarged pavements and introduced cycle lanes. The celebrated new public space has more human traffic and fewer cyclist and pedestrian injuries, while traffic conditions have slightly improved.



Street redesign at Tyson's corner, Fair County, Virginia
© Gerrit Knapp

Car-free zones are dynamic and attractive urban areas if public transport is accessible and there is an adequate land use mix and density. Car-free zones can also operate on a temporary basis, providing a good setting for markets. Initiatives to limit car access are often received negatively by commerce and other businesses, however, they have been proved to increase commercial revenue and property values.

According to Braess' Paradox, adding extra capacity to a network where the moving entities selfishly choose their route can, in some cases, reduce overall performance.⁵⁶

Examples of successful pedestrian areas

When most of Nuremberg's (Germany) city centre was pedestrianized in the late 1980s, traffic not only decreased markedly in that area but it also decreased by approximately 5 per cent city-wide.⁵⁷ The 3rd Street Promenade in Santa Monica in Los Angeles in the United States is a successful pedestrian area in a car-centric city. With a population of 156,000, Old Fes (Morocco) may be the world's most populated completely car-free zone, showing that pedestrian zones can be fully functional urban districts.



Old Fes is a densely populated and economically vibrant car-free zone © Manfred Schweda



Times Square in New York City, USA, has been recently pedestrianized © Silke Schilling

Prioritize public transport modes

Understand the implications of transport options

In many countries, car ownership is only affordable for a few. In Nairobi (Kenya), there are two million inhabitants but only 300,000 cars are registered (1 for every 7 inhabitants). Without an effective and affordable public transport system, most of the population cannot easily commute or has to spend a large portion of income on transport. Favouring private car owners in transport planning decisions, such as imposing limitations on collective transport or not providing adequate commuter stations etc, increases inequalities and poverty.

Trends in private car ownership are likely to put additional strain on a city transport system. In many countries, private car ownership is growing exponentially due to population growth and improved economic conditions. Without adequate public transport systems in place, and good planning choices that increase connectivity and proximity, congestion, pollution and energy consumption will also increase exponentially.

Relying on cars as the main form of transport has several negative side effects. Cars offer the convenience of individual choice but this advantage is traded for much more land being used for road space and parking. Cars' land consumption and infrastructure costs can be a significant part of a city's budget and this cost is heavily subsidized by both drivers and non-drivers. Car-centric cities have higher congestion and public health costs from emissions, smog

and other pollutants, as well as from the sedentary lifestyles they create. A city with more cars is prone to more accidents, which generate economic and human costs. Cars can also induce loss of street life and community.

The cost of congestion

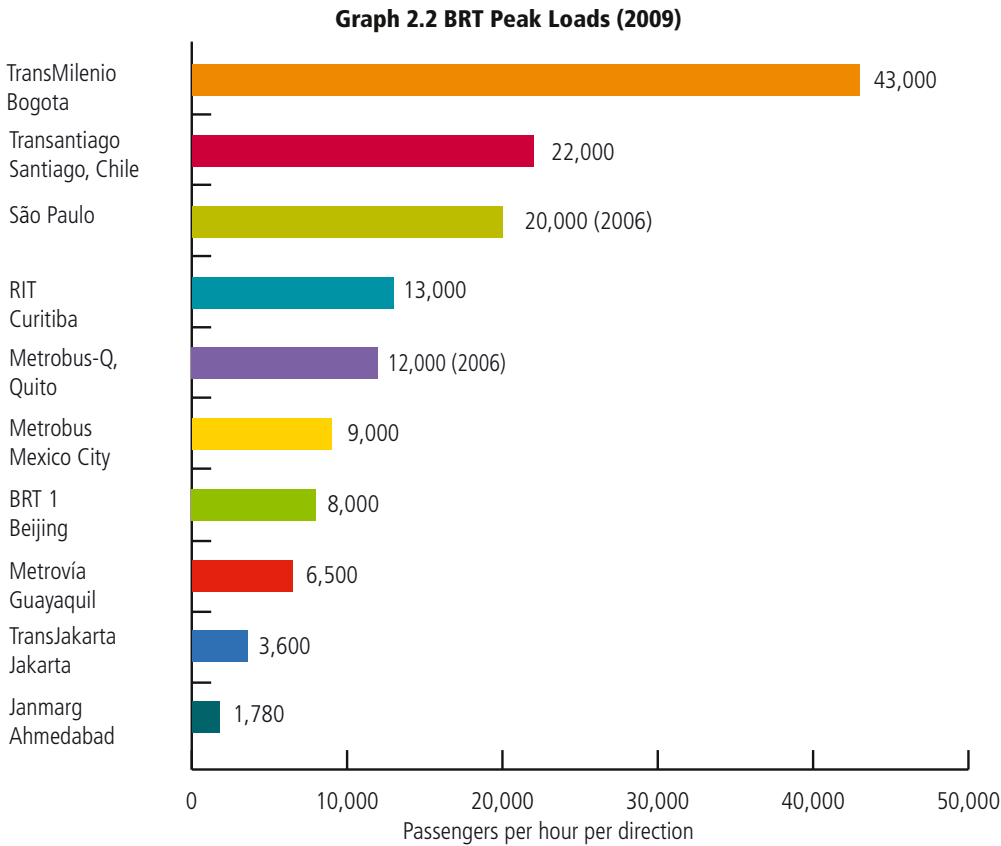
Congestion accounts for significant percentages of the gross domestic product in many major cities (for example, Buenos Aires in Argentina 3.4; Mexico City in Mexico 2.6). About 90 per cent of the cost comes from the value of the time lost by drivers, 7 per cent from the fuel consumed and 3 per cent from gas emissions.⁵⁸ In addition to stress and physical and mental fatigue, congestion causes significant numbers of early deaths from respiratory illnesses; it also degrades green areas which, in turn, diminishes their carbon sequestration properties.



Congestion is a serious threat to air quality in Mexico City © Fidel Gonzalez

Public transport can get large numbers of people to their destinations efficiently. It is space efficient in terms of area per traveller, which can free significant amounts of land in prime locations that would otherwise be allocated for parking. Buses are adaptive to the spatial structure and require low investment in infrastructure; however they are generally slower than cars. This can be addressed by Bus Rapid Transit (BRT) that runs on semi-exclusive lanes and has a higher passenger

capacity. Light rails and metro systems require higher infrastructure investment but are very reliable and have a high capacity. Rail transport induces more intensive land development around nodes and is emissions free if running on electricity. After the pioneering experiences of Curitiba (Brazil) and Bogota (Colombia), BRT systems have been implemented in hundreds of cities around the world and adapted to local circumstances on all continents.



Source: EMBARQ/World Resources Institute

Walking and cycling supplement public transport networks. Walking is extremely cost-effective and, providing that pollution levels are acceptable, has positive effects on health. A comfortable distance from home for everyday trips is about 800 metres;⁶⁰ for services, such as banks and shops, a maximum distance of 2 km is the ideal in good urban design.⁶¹ Cyclists

can benefit from specially designated lanes or widened pavements that are safe for them, and from parking bays that prevent theft. Bicycle sharing schemes have been successful in many cities; in Paris (France), for example, the Velib system is used by up to 150,000 people daily with the range for bicycle trips up to 25 km.

Table 2.1 Public transport modes

	Investment requirements	Capacity	Speed	Travel time reliability	Environmental impact
Bus	Low	Medium	Low	Low	High
BRT	Medium	High	High	High	Medium
Light rail	High	High	High	High	Very low
Metro	Very high	Very high	Very high	Very high	Very low

Source: Author



The Velib bike sharing scheme in Paris, France, is highly successful © PPS



Bus Rapid Transit in Bogota, Colombia © Flickr/EMBARQ Brasil

Prioritize public transport by spatial planning

Spatial planning determines public transport speed. Speed, reliability and convenient operating hours are key success factors for public transport systems. Travellers will choose

the type of transport which will get them to their destination the quickest at a reasonable price. Travel time depends on the type of right-of way (RoW) that public transport runs on. (A RoW is a strip of land that is reserved in spatial plans for transport.) The higher the standard, the better the performance and the greater the associated costs.

Table 2.2 Capacity and infrastructure costs of different transport systems.

Transport infrastructure	Capacity (pers/h/d)	Capital costs (USD/km)	Capital costs / capacity
Dual-lane highway	2,000	10m - 20m	5,000 - 10,000
Urban street (car use only)	800	2m - 5m	2,500 - 7,000
Bike path (2m)	3,500	100,000	30
Pedestrian walkway/pavement (2m)	4,500	100,000	20
Commuter Rail	20,000 - 40,000	40m - 80m	2,000
Metro Rail	20,000 - 70,000	40m - 350m	2,000 - 5,000
Light Rail	10,000 - 30,000	10m - 25m	800 - 1,000
Bus Rapid Transit	5,000 - 40,000	1m - 10m	200 - 250
Bus Lane	10,000	1m - 5m	300 - 500

Source: Rode and Gipp (2001), VTPI (2009), Wright (2002), Brillon (1994), UNEP⁶²



A privately run bus in Dakar, Senegal
© UN-Habitat/Laura Petrella



An elevated train running on an exclusive right of way in Seoul, Korea
© UN-Photo/Kibae Park

Table 2.3 Vehicular Rights of Way

RoW Category	Separation from other modes	Crossings	Cost	Speed	Example
Exclusive	Fully separated	Fully separated	High	High	Metro, elevated rail
Semi-exclusive	Partially separated	At grade	Medium	Medium	BRT, light rail
Street running	Mixed with general traffic	At grade	Low	Slower than private cars	Bus

Source: Vuchic⁶³, Walker

Proximity and convenient transfers are essential. A convenient distance from origin to transport station would be less than 800 metres. Seamless continuity between modes can be achieved by intermodal stations that connect various types of transport and main routes with feeder services. Transport intersections generate areas of economic activity and high property development potential. The surroundings of

intermodal stations and the station building itself are prime sites for mixed-use commercial, office and residential developments that can make the station's construction cost viable. Intermodal stations can also be focal points for both formal and informal businesses and, to prevent road bottlenecks and service delays, stations need to have space for informal trade.



Urban cog railway being loaded with bicycles in Stuttgart, Germany © City of Stuttgart



Pedestrian, bicycle and metro interchange, Barcelona, Spain © UN-Habitat

Promote affordability and the integration of informal networks

Public transport is frequently subsidized to make it affordable. Public transport prices are variable: as price increases, the demand decreases. To keep demand high and allow the poor to use public transport, various forms of subsidies can be used. Subsidizing the operating costs or the fares are the two most common approaches. Direct transfers to the users are even more effective as a pro poor policy. In Chile, rather than getting subsidized fares, 40 per cent of the population benefited from compensation paid to them directly after the 2004 oil price increase. In Los Angeles in the United States, subsidies cover between 50 per cent and 80 per cent of average operating costs for buses and rail respectively.⁶⁴



Subsidized bus line in Chile
© La Tejuela

Integrating informal transport operators can benefit the formal system.

Informal operators provide an important service that is often well adapted to local conditions. They deliver affordable services in instances where scarce municipal resources have led to a deteriorating service and higher fares. Informal fleets reach outlying residences in sprawling areas. Efforts should be made to interlink them as well as possible with the formal systems; for example, informal networks can work as feeder systems for BRT or metro lines if they are integrated into overall transport plans. Because transfer nodes create places for informal trade markets, station areas need to be designed with suitable, demarcated space for loading and unloading to reduce traffic bottlenecks. Rather than banning informal operators, local governments can set incentives and regulations that capture the benefits they may bring while mitigating negative factors, such as road safety and pollution.



Regulated moto-taxi in Kigali, Rwanda
© UN-Habitat/Thomas Stellmach

Direct demand to efficient transport options

Manage car demand

Road pricing, parking management and circulation policies reduce car demand. Road pricing policies have been implemented in Singapore, London (England) and Stockholm (Sweden) where drivers pay to enter the city centre or use special lanes. Parking management has the potential to modify demand on an area-wide basis yet, despite being relatively easy to implement, is often under used. Rationing policies, which restrict cars with licence plate numbers ending in specific numbers during rush hour, have been implemented in Bogotá (Colombia), La Paz (Bolivia), Santiago de Chile (Chile), São Paulo (Brazil) and Quito (Ecuador).

Optimize the efficiency of existing infrastructure through management

Traffic operations can improve the supply side. For example, reversible commuter lanes and movable median barriers that add capacity during peak periods make an existing road system more efficient. Managing intersections with a police presence or with traffic lights can eliminate bottlenecks and increase mobility and safety. Facilitating or restricting traffic turns at key intersections and increasing the radius of corners can ease the movement of larger vehicles. One-way streets and improved lighting and signage are other measures that may help. In comparison with projects that increase road capacity, most of these improvements can be implemented relatively quickly and at a low cost.



Road pricing in Singapore was first introduced in 1975
© Wikipediamailler_diablo



Traffic management depends on time of day along Copacabana seafront, Rio de Janeiro, Brazil © Flickr/Brian Snelson

Table 2.4 Supply and Demand Management Measures

Type of measure	Approaches	Measures
Demand-side	Spatial planning	Rights-of-way and road grids planning Mixed land-use Intermodal nodes Park and ride facilities
	ICT-based substitutes	Teleworking
	Information services for travellers	Pre-trip information
	Pricing	Congestion pricing Parking pricing Public transport allowances and incentives
	Administrative	Parking management Circulation regulation ("placa y pico") Vehicle registration
Supply-side	Road traffic operation	Traffic management systems Signal improvements Incident management
	Preferential treatment	Bus and high occupancy lanes Bicycle and pedestrian infrastructure
	Public transport operation	Ease of transfer between modes Schedule optimization Fare coordination
	Freight coordination	Loading and unloading regulation

Source: Adapted from OECD⁶⁵



Traffic policeman in Istanbul, Turkey
© Flickr/Scott James Remnant



Mama Ngina Street, a one way street in Nairobi CBD, Kenya
© UN-Habitat/Cecilia Andersson

Land use as driving force for transport planning

Curitiba, Brazil



Curitiba, Brazil © Flickr/Thomas Locke Hobbs

Curitiba's well-known Bus Rapid Transit is the result of the far-sighted integration of spatial and transport planning to address urban growth pressures. The outcome of the integrated approach is an efficient transport system which is a structuring component of the city and is the preferred mode of travel for most people.

Curitiba's BRT system did not develop overnight, nor was it isolated from other aspects of urban planning. The 1966 master plan, which integrated land use and public transport plans, was consistently followed over several different local government administrations with the oversight of the Institute of Urban Research and Planning of Curitiba (IPPUC).

Solution

The most salient proposal of the 1966 plan was to arrange growth from the city core outward in a radial, linear pattern through structural axes that concentrate economic activity. To guide growth along these axes, the local government established detailed land use and zoning plans. There were also clear rules on the transfer of development rights from land in places the local government desired to preserve to land in locations the city wished to develop. Higher-density commercial and residential development along structural axes was encouraged to provide the economic density and user base that would make the transport system financially sustainable. The municipality initially acquired land and reserved rights-of-way along the strategic axes. These comprised of three parallel routes, a block apart. The outer lanes are for local access and parking, and the middle lane accommodates buses exclusively.

Curitiba's BRT times are two-thirds less than a conventional bus system, due to the dedicated lane, off-board payment, bi-articulated buses with large capacity, and stations that expedite bus entry and exit. The stations were designed as cylindrical, clear-walled platforms which facilitate the efficient and simultaneous loading and unloading of passengers, including those using wheelchairs.

The system is managed by Urbanização de Curitiba (URBS), a local government agency, but is served by 10 private companies. These are paid by the distances they travel rather than by the passengers they carry, allowing for a balanced distribution of bus routes and eliminating the previously destructive competition that clogged the main roads and left other parts of the city underserved. All 10 bus companies get an operating profit. The fleet's average age is a little more than five years.

Passengers pay a flat fare for travel throughout the system, with unlimited transfers. The construction cost of Curitiba's BRT system was USD 3 million per kilometre, which was more affordable than a light rail system at a cost of between USD 8 million and USD 12 million per kilometre or a subway (USD 50 million to USD 100 million per kilometre).

Results

Although today Curitiba is not immune to pressures stemming from increasing private vehicle fleets such as pollution and sprawl, which are common to growing cities, the close integration of land use and transport planning and policy continuity have had positive effects on the city's structure.

Because housing, service facilities and job centres have been incrementally developed along the axes and linked to the transport system, the distances between homes, jobs, and schools have shortened. The service reaches almost 90 per cent of the city area and stations are located less than 500 metres from most people.

The system transports about two million people per day. Around 70 per cent of Curitiba's commuters use public transport daily to travel to work. Bus capacity and the reduced travel times have resulted in 50 per cent less energy consumption compared with non-articulated conventional bus services. Buses use a special fuel made up of diesel, alcohol and soybean additive which is less polluting and cuts particle emissions by up to 43 per cent.

As a result, Curitiba, which grew from around 361,000 people in 1960 to 1.8 million in 2007 managed to minimize congestion in the central area and sprawling development in the periphery.

How to provide infrastructure and key services

Cities need infrastructure to make them work. Infrastructure improves quality of life and induces economic growth but inadequate and underperforming infrastructure reduces economic output and badly affects living conditions. The provision of a basic infrastructure for water, energy and waste management is fundamental to a thriving city and is urgently needed in rapidly developing cities. It requires substantial long-term investment to meet capital and maintenance costs, which cannot be met by municipalities alone. Urban planning is central in the deployment of infrastructure and infrastructure investment is a foremost influencer of urban form. Integrating infrastructure in urban planning is key for optimizing investment and asset performance.



Enable urbanization through an integrated approach to infrastructure

Build a city's foundations through infrastructure

Infrastructure determines a city's welfare and economic activity. Although some areas of infrastructure provision are outside the scope of a local government, the infrastructure that affects most people's lives is delivered by municipalities or its partners. In developing countries, urbanization has been a principal driver of national economic growth. Continued growth requires finding innovative and complementary ways to finance infrastructure and increase its effectiveness, which has positive effects on private investment and living standards.

Infrastructure is a key step of urbanization.

Once an expansion area has been identified, and public and street space has been defined, infrastructure prepares land for urban functions, guides development and creates a virtuous cycle of investment. Providing infrastructure is the single most important public investment action and needs to be planned carefully in terms of:

- Service standards and technological choices, including affordability, cost recovery and the possibility to upgrade and expand;
- Investment phasing, determining where and how much to invest.

Capital cost must be affordable and cost recovery needs to be considered. When infrastructure is built, the investment directly benefits private landowners, whose land increases in value and economic potential. Infrastructure is fundamental to private and collective wealth creation and therefore in many

contexts, the full cost of area infrastructure is charged to the owners. Such charges can even cover the construction of the mains and other public investments. However, affordability and the need to make land available also to lower income groups, are important considerations and, in some cities, cross subsidies have worked well to recover investments across areas with different revenues. Phasing the construction and improvement of infrastructure and choosing appropriate standard and technologies is also key to making investment affordable.

Operational costs must be affordable for end users and viable for suppliers.

Not charging enough may have negative consequences for households - which would have to contend with inadequate services and access difficulties - and for supplying entities, which would be unable to invest in service maintenance. Paying tariffs is a socially and politically sensitive matter but making the benefits of paying outweigh



Road under construction, Cape Town, South Africa
© Flickr/Warrenski

those of not paying tangibly improves people's response. Affordability may also be a function of how charges are calculated. Tariffs that are per use only, without including minimum consumption and network installation costs, are more likely to be accepted. Community-based tariffs can be effective, but they require genuinely equitable community management and ownership.

What is affordable?

The World Health Organization (WHO) says that a water bill of more than 5 per cent of the monthly household income or expenditure is considered unaffordable and that the affordability threshold for water, electricity and gas together would be at 15 per cent of household monthly income.



Infrastructure is a significant enabler of urban growth, Budapest, Hungary © Akil Sokoli

Improve infrastructure efficiency using spatial planning

Spatial planning helps define infrastructure investment by clearly identifying which areas can be serviced, through which technology options, and when. Not all locations and layouts can support all technology options and not all investment can be delivered at the same time. Plans that integrate infrastructure spatial reserves, cost of technology and recovery options would be better able and quicker to bridge the gap with execution. In general, it is thought that technology can overcome almost any physical constraint. However, costs may escalate when the spatial layout is not favourable, or if the sequencing is wrong, and may result in a significant toll on municipal resources. Liaising with technology providers in the early stages might provide a valuable reality check on infrastructure plans.



Roadways for new housing, Uberlandia, Brazil © UN-Habitat/Alessandro Scotti

A planned infrastructure delivery sequence

1. Demarcating the public space, including the road grid reserves, which occupy about 30 per cent of the total land
2. Building basic drainage within the road reserve
3. Water supply network within the road reserve
4. Sanitation network and waste collection mode
5. Power grid within the road reserve
6. Street paving and improving
7. Laying out cable for information communication technology (ICT)

Source: UN-Habitat



Drainage infrastructure greatly improves the conditions of sloping areas in Medellin, Colombia © UN-Habitat/Laura Petrella

How infrastructure capital costs are related to spatial planning

The capital cost of trunk infrastructure can be separated into two components:

- The distribution network (the system of water distribution mains and trunk sewers)
- The central facility to which the system is linked (a water treatment plant, water source, a sewage treatment plant).

The cost of the distribution network is related to three factors: the demand that determines the required system capacity; the extent of the urban area to be served; and the distance to the central facility. While flow volumes are directly dependent upon the overall population to be served, the latter two factors are directly linked to spatial planning. The lower the densities are, the greater the area a sewer or water system must service and traverse. Higher densities reduce the extent of the network and the total length of pipe required. The location of central facilities may be tied to fixed factors, such as the location of a water body, which may be outside the urban area. Longer distances to the central facility yield higher costs. An upstream relative location for water supply and a downstream location for water treatment result in more effective service provision.

Distributed infrastructure can enable access for remote areas.

Centralized, supply-driven systems with large production facilities and distribution systems across long distances can take years to plan and install and require significant capital investments. Small-scale systems at the neighbourhood or even individual level enable services to be provided to off-grid areas and reduce the dependence and burden on major infrastructure systems which are already near capacity if urbanization overtakes the speed by which a centralized approach can deliver. Distributed infrastructure requires technological innovation and integrated planning approaches.

Spatial planning can contribute to sector coordination.

A key challenge for a city is to build practical synergies between sectors such as water, waste, transportation, energy and telecommunications, which often operate in isolation. Although each sector might

produce acceptable results in their own field, a transformative impact requires cross-sector interaction. Because it provides a spatial reference shared by sectors, spatial planning can be a lever for improved integration. For example, investment in water efficiency can result in energy savings and investment in waste management can generate energy and reduce health costs.

Multi-sector projects can be cost-effective, save time and minimize disruption to residents.

For example, cities may consider the advantages of bundling the construction of road, water, sewerage, and storm infrastructure. The co-location of underground infrastructure and road construction in a service corridor is a typical practice in many cities and may reduce overall costs by taking advantage of economies of scale in construction and machinery rental, and ease maintenance. In bundled projects, issues of land control and enforcement of land reserves at the flanks of the corridor may be negotiated only once, which saves time and money.



Bhushan educating women on composting, Siddhipur, India © UN-Habitat

Address water challenges

Understand the dimensions of the water challenge

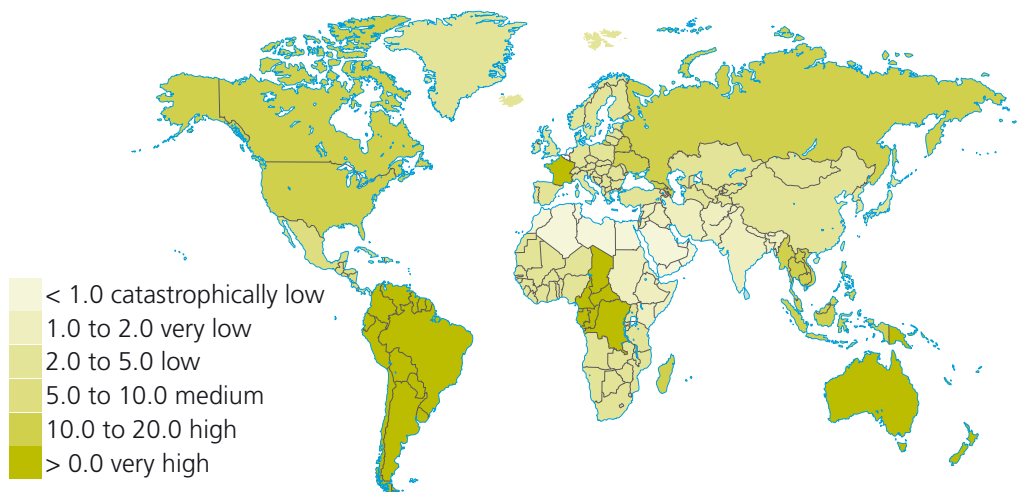
Water is scarce and sources are far from cities. Water plays a vital role in public health, economic growth and environmental sustainability but only about 0.01 per cent of the Earth's water is usable.⁶⁶ The principal sources of water for human use, lakes, rivers, soil moisture and relatively shallow groundwater basins, are unevenly distributed and, in general, are far from urban areas. About 36 per cent of the world's population, or 2.4 billion people, live in water-scarce regions⁶⁷ and 52 per cent will experience severe water scarcity by 2050.

Urban access to water supply is limited.

In 2010, about 884 million people did not have access to a piped water supply or to a safe water source. This is an issue that hinders the growth of cities such as Maputo in Mozambique, where almost 20 per cent of its 1.3 million people had no access to potable water in 2003, and megacities such as Jakarta, where about half of its 10 million inhabitants had no access in 2007.⁶⁸

The World Health Organization estimates that good health and cleanliness requires a daily supply of about 30 litres of water per person.

Illustration 3.1 Water availability by sub-region in 2000 (1,000m³ per capita/year)



Source: Compiled from UNDP, UNEP, World Bank and WRI 2000 and United Nations Population Division 2001

Demand is growing and overconsumption is the norm.

By 2020, water use is expected to increase by 40 per cent⁶⁹ and is already excessive in some cities. For example, Addis Ababa (Ethiopia) consumes double the WHO daily recommendation, Lagos (Nigeria) triples the amount and Kolkata (India) consumes four times more. Bangkok (Thailand), Nanjing (China), Porto Alegre (Brazil), Montevideo (Uruguay), Johannesburg (South Africa) and Tunis (Tunisia) all consume ten times the recommendation, while Los Angeles and Phoenix in the United States over 20 times.⁷⁰

Leakages and customer abuse are significant problems.

These problems can be conservatively estimated to cost USD 141 billion per year worldwide with a third of them occurring in developing countries, where about 45 million cubic metres are lost daily from the distribution networks.⁷¹ The amount of water leaked could serve nearly 200 million people. In Rio de Janeiro (Brazil), Buenos Aires (Argentina), Bucharest (Romania), Sofia (Bulgaria) and Nairobi (Kenya), about half the water in the system is leaked.⁷² Every day, about 30 million cubic metres are not invoiced because of theft, poor metering and corruption.

Integrate water management and spatial planning

Spatial planning should incorporate the water cycle and current and future supply and demand as a key driver.

Water sensitive planning should induce water consumption reduction, facilitate the safe reuse of water, leverage as many water supply options as possible, and enable the combination of centralized and decentralized systems. Urban water plans would keep development away from key water catchment and storage areas, minimizing impervious surfaces to favour water retention and aquifer recharge. Water plans should also enable coordination between jurisdictions to boost investment impact.



Greywater sampling in a peri urban area, Nakuru, Kenya
© Flickr/Laura Kraft/Sustainable sanitation

Water supply systems require a significant amount of space. Water is drawn from its source, purified and pumped to reservoirs before being distributed through networks to consumers. The geographical distribution of water sources might result in water systems that extend over thousands of kilometres. Once water is used, wastewater is typically discharged into a sewerage system and treated in a wastewater treatment plant before being discharged into a river, lake or the sea, or reused.

Water distribution systems influence spatial structure and vice versa. The construction of distribution systems, which require large fixed investments, influences spatial development. Dispersed patterns atomize demand for water and need a larger distribution and collection system, while compact patterns help to minimize the costs of capital and operations. Costs related to distribution networks typically account for 70 per cent of the overall system costs.

Table 3.1 How water supply distribution and treatment is linked to spatial structure

Connect To:	How
SOURCE	
Land-use	Protecting green open spaces prevents the contamination of river and underground water; Reducing impervious surfaces can increase infiltration and aquifer recharge; Water reservoir tanks consume land
Density	Concentration of population reduces impervious cover and allows larger green areas to be protected
Buildings	Harvesting
DISTRIBUTION	
Land-use	Different uses have a different demand; locating activities on upstream slopes increases distribution costs
Density	Concentration of people reduces network length
Street/public space	Availability of space to lay pipes reduces costs
Buildings	Tall buildings may require additional pressure
TREATMENT	
Land use	Location of treatment plants need to be compatible with other uses; Underground treatment plants save land
Density	Onsite treatment such as septic tanks can be a solution for dispersed patterns
Buildings	Water recycling can begin at building level

Source: Adapted from H. Srinivas

Reduce water consumption and relieve stress on fresh water sources

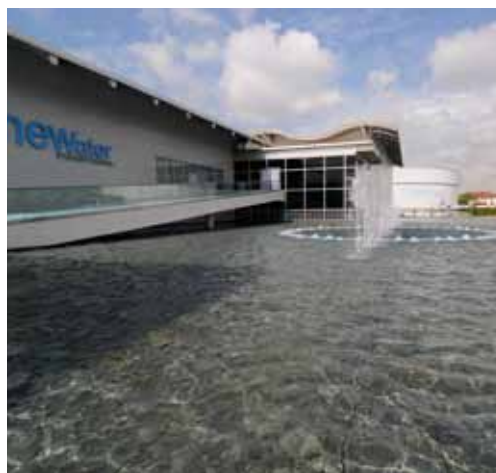
Significant savings can be achieved through better demand management. Incentives and regulating the use of efficient appliances can have a significant impact; for example, a toilet that continues to run after flushing can waste in one hour the amount of water recommended by the WHO to be consumed per person per day.⁷³ In pilot schemes in Canada, the introduction of efficient appliances reduced water consumption by 52 per cent. Using meters is also an incentive to save water. Controlling the use of water for irrigation through efficient systems, such as subsurface irrigation, has also been extremely effective because usually each sprinkler head used to irrigate lawns consumes in three minutes the equivalent of the WHO standard per person per day.

Cities increasingly use alternative water sources. Water harvesting at household and building level can significantly reduce the demand for piped water and reusing wastewater after treatment can also produce significant savings. Greywater can be used for watering plants or recycled for flushing toilets. Wastewater treatment plants are facilities of significant size and cost, and, in the past, produced pungent odours. Singapore, however, has five treatment plants, and the NEWater reclaimed water scheme now meets 30 per cent of the water demand.⁷⁴

The roof at Frankfurt Airport, built in 1993, captures 16,000 cubic metres of rainfall which is used for cleaning, gardening and flushing toilets.



Informal water distribution in Dakar, Senegal
© UN-Habitat/Laura Petrella



In Singapore, the NEWater reclaimed water scheme meets 30% of water demand © PUB

Systems can be incrementally designed, implemented and upgraded as people's ability to pay increases. Centralized systems result in large distribution networks with treatment plants far from people's houses. These systems require significant upfront capital investment, are not able to change and are frequently engineered with limited opportunities for the reuse of treated water. Developing well fields close to demand centres would lead to a simpler network and lower energy and capital costs. Providing both water and sanitation in an integrated manner, and facilitating reuse and energy recovery are additional traits of demand-centric systems.

Natural or constructed wetlands for water treatment can have multiple benefits.

Treatment wetlands use natural processes involving wetland vegetation, soils and their associated microbial assemblages to assist in treating an effluent or other water source.

Treatment wetlands offer opportunities to regain some of the natural functions of wetlands and offset some of the significant losses in wetland areas, while reducing the land requirements and energy inputs associated with conventional treatment plants.

A wastewater plant under a public space

The plant in Sant Adrià de Besòs treats more than 70 per cent of the Spanish city of Barcelona's wastewater by removing both particulate and gaseous pollutants to eliminate odours. The plant occupies 90,000 square metres and has been built underground, beneath Barcelona Forum's premium accommodations, convention centre and public space.



Water treatment plant in Chicago, USA
© Flickr/Neal Jennings/Sweet one



Constructed wetland in Olympic Forest Park, Beijing, China
© Flickr/Sustainable sanitation

Consider subsidies carefully

Water tariffs are increasing but cost recovery is a challenge. Over the past five years, average water tariffs have increased significantly in both developed and some developing countries. For example, prices in Australia have increased by 85 per cent and in South Africa by 70 per cent.⁷⁵ Water tariffs range from USD 0.10 in least developed countries to over USD 1 per cubic metre in developed nations.⁷⁶ While tariffs are increasing, only 30 per cent of utilities globally, and 50 per cent in developed countries, generate sufficient revenue to cover operation and capital costs.⁷⁷

Subsidies do not always fulfil their objective.

Utilities must provide acceptable levels of service in a commercially viable system. This goal has significant political and economic implications, and may lead to subsidized prices that have an adverse impact on poor consumers.⁷⁸

Cross-subsidies between residential users do not always fulfil their objective and must be carefully formulated. Because service providers often provide water and other services, such as energy and telecommunications, consolidating these services may yield certain benefits, such as common billing and the option to cross-subsidize water services with revenues from electricity sales, if permitted by law.



Engaging the community in water management in Myanmar © UN-Habitat/Veronica Wijaya



Aqueducts transport water in Saint Louis, Senegal © UN-Habitat/Marie Dariel-Scognamillo

Collect and dispose of waste efficiently

Understand the dynamics of municipal waste management

Effective waste management is essential for healthy and competitive cities, but many municipalities struggle to keep cities clean because the cost of solid waste management in medium-size cities can be as much as 50 per cent of the total municipal budget.⁷⁹ Waste management has important public health implications because it is one of the two main carriers and propagators of infectious diseases (the other carrier being water). Waste that is burned or disposed of at uncontrolled sites can pollute air, land and water. Ineffective solid waste management practices make a poor impression on foreign investors and tourists, and may result in loss of reputation and investment.

Cities produce more and more solid waste.

Economic growth and changes in consumption patterns tend to generate higher rates of waste per capita. In 2007, the average waste generated per capita in Organisation for Economic Cooperation and Development (OECD) countries was 556 kg.⁸⁰ The amount of waste generated in cities in developing countries is rapidly increasing and many are at or above OECD levels. For example, Bangkok (Thailand) and São Paulo (Brazil) generate 534 and 550 kg per capita respectively. Kuala Lumpur (Malaysia) generates more than the OECD average, at 815 kg per capita per year.⁸¹



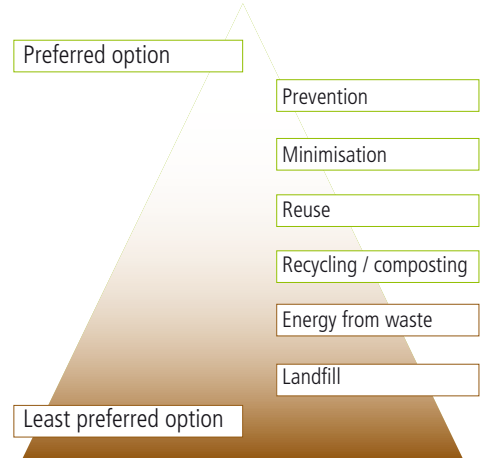
Uncontrolled sites can pollute air, land and water, Onitsha, Nigeria © UN-Habitat/Alessandro Scotti



Waste in Julio Mesquita, Monumental Font, Sao Paulo, Brazil © Flickr/Douglas R. Nascimento, Blog do Milton Jung

“Reduce, reuse, recycle and recover” is the cornerstone of most waste minimisation strategies. The waste hierarchy classifies waste management strategies in order to extract maximum practical benefits from products whilst generating the minimum amount of waste. Reduction (that is, prevention and minimization) includes practices such as the manufacture of products with longer lives. Although a city can encourage responsible consumption, legally enforcing production patterns would generally be outside the policy scope of a local government. Reusing promotes products that may be used more than once; recycling processes used materials into new products; and energy recovery includes technologies, such as methane capture, that harness waste or by-products to generate usable energy.

Graph 3.1 Waste hierarchy



Source: Eco2city

Integrate waste management and spatial planning

The size and location of disposal sites determines costs and externalities. The cost advantage of constructing and operating large-scale landfills over small-scale landfills has resulted in a trend of regional facilities. Larger landfills can be more cost effective per tonne but may have greater transport costs and adverse effects on property values than smaller landfills; they are also usually disliked by the community. Site location can minimize factors such as increased traffic, noise, unpleasant odours, environmental degradation and limited land utility, and buffer areas determine where sites should not be located. Measures such as providing spaces for sorting and recycling close to areas where waste is produced can help to reduce the size of a disposal site.

The United Kingdom will run out of landfill space by 2018 with current waste generation rates.

Criteria for a landfill location

1. Located outside densely populated areas
2. Within 10 km of an urban area
3. Located between 0,2 and 10 km of a major road
4. Not located within 1 km of surface water
5. Avoid areas of groundwater vulnerability
6. Not located within 500 m of a railway line
7. Avoid areas of ecological value
8. Not located within 500 m of sites of historic importance
9. Avoid taking up fertile agricultural land
10. Be acceptable to the public

Source: Baban, S.M.J. and Flannagan, J.⁸²

Lack of cadastral information induces low cost recovery.

In nine out of ten cities where there is a rubbish collection fee, it is collected with the property's tax bill, usually as a separate item,⁸³ but this system needs an updated cadastre. An alternative practice is to collect rubbish fees with another utility bill, for example, electricity. In Colombia, some cities have a single utility bill that covers many services such as water, sewerage, telephone, electricity and solid waste. Cities in Ecuador attach a surcharge of 10-12 per cent to electricity bills to cover waste management costs.



Dumping of urban waste in Peru
© Foter/Alex E. Proimos



Young waste pickers at Ghazipur, India
© Flickr/Mackenzienicole

Table 3.2 How waste management is linked to spatial structure

Connect To:	How
Land-use	<ul style="list-style-type: none">• Preventing open dump sites• Selection of landfills sites taking into account buffer areas to protect land values and natural resources near them• Land management information and cadastres for cost recovery• Provision of space for composting and other recycling activities• Location of incineration plant
Density	<ul style="list-style-type: none">• Higher density, compact patterns yield lower collection costs
Infrastructure	<ul style="list-style-type: none">• Providing roads, energy and water to waste disposal and recycling facilities• Accessibility for waste collection
Buildings	<ul style="list-style-type: none">• Amount of waste generated in construction and future operation
Services to Buildings	<ul style="list-style-type: none">• Facilitating recycling services

Source: Adapted from H. Srinivas

Composting is an inexpensive process that can deal with half of urban waste making it a suitable option, especially for cities in developing countries. If it is part of an integrated waste management programme, composting favours recycling and helps reduce greenhouse gas (GHG).⁸⁴ Lahore Compost

Limited is a private enterprise operating under a 25-year agreement with the local government of Lahore in Pakistan's Punjab province. It has a concession to process 1,000 tons per day of solid waste from residential areas as well as fruit and vegetable markets. The composting process normally takes around 60 days to complete.⁸⁵



Compost ready for curing at Pimpri Chinchwad composting facility, Maharashtra, India © Columbia University Earth Engineering Center



Refuse hideaway landfill, Middleton, USA © Flickr/Wisconsin Department of Natural Resources

Use the informal sector for waste collection

Employing informal waste pickers creates jobs, saves municipalities money and protects the environment.

Waste collection in areas with narrow streets may be improved by involving local residents, which will also reduce health hazards and prevent soil and water contamination. In 2007, an estimated six million people in China, about a million in India and half a million in Brazil were engaged in waste picking.⁸⁷ A creative way to incorporate waste pickers is the Green Exchange, implemented in Curitiba in Brazil since 1991, in which people can exchange four kilograms of recyclable waste for one kilogram of food.

Waste pickers organize themselves where local governments support the formation of organized groups.

This support helps create microenterprises which serve neighbourhoods without waste collection services and provides income opportunities for entrepreneurial people. In Brazil's Belo Horizonte municipality, about 380 waste pickers have formed the group ASMARE, which recycles 500 tonnes of material a month. In São Paulo, also in Brazil, COOPAMARE brings together 80 members and about 200 independent waste pickers who earn about USD 300 a month - twice the minimum wage - collecting and selling about 100 tonnes of recyclables a month.

Ciudad Saludable

In Peru, the non-profit organization Ciudad Saludable (Healthy City) has formalized over 6,500 waste pickers who collect approximately 292,637 tonnes of recyclable material per year with a market value of USD 18.5 million. Over 200 cities have increased their recycling rates from 40 per cent to 80 per cent by integrating waste pickers, making a direct impact on nine million people and saving two million trees per year. In addition, waste pickers' monthly incomes have doubled up to between USD 180 and USD 260 per month.



Waste pickers in Cajamarca, Peru
© Ciudad Saludable

Improve energy efficiency

Understand key energy trends

Local initiatives can take national energy plans forward at a practical level. Most energy is produced outside cities and energy plans are generally made at the national level. These are relevant to cities as they regulate supply sources, consumption reduction and incentives for getting the best performance. However, cities are taking a practical approach and are increasingly starting initiatives which, sometimes, have even more ambitious targets. These initiatives may include advanced policies in land use, building standards that require energy efficiency measures, energy generation and storage initiatives, and demand-side management.

Leapfrogging

One of the more obvious opportunities for cities in developing countries is that of “leapfrogging” – skipping inferior, less efficient, more expensive or more polluting technologies and industries and move directly to more advanced ones. This means they do not repeat the mistakes of highly industrialized societies in creating an energy infrastructure based on fossil fuels, but “jump” directly to renewable energy sources and more efficient distribution approaches.

Source: UN-Habitat and ICLEI⁸⁹

Dundalk Sustainable Energy Zone

The Sustainable Energy Zone in Dundalk, Ireland, is a four square kilometre area with mixed uses. Its aim is to stimulate a national move towards sustainable energy practice by demonstrating the benefits in an exemplary community. Specific targets are:

- 20 per cent electricity from renewable sources
- 20 per cent heat from renewable sources
- 40 per cent improvement in the energy performance of selected buildings

Source: SEA⁸⁸



Solar water heating in Hunchun, China
© UN-Habitat/Alessandro Scotti

Local energy planning in Barcelona

The Barcelona Energy Agency in Spain was established in 2002 and brings together various relevant municipal departments, energy agencies and local universities. Its aim is to promote local renewable energy sources and energy efficiency, support the public sector in its initiatives and provide information and advice to business and citizens. Through energy audits, forecasts and scenario planning, the Barcelona Energy Improvement Plan establishes local measures, such as the Solar Ordinance, which regulates the installation of thermal solar panels in buildings, producing an estimated energy saving of 24,840 MWh/year.⁹⁰

There is a shift to a demand-led approach in energy planning. Significant benefits can be gained by planning according to the conditions needed by users and considering that these conditions need not only be met through systems that require energy. For instance, the need for home heating in winter or cooling in summer can be met by insulation or by an energy-efficient design; the need for hot water can be met by installing solar water heaters; and the energy input required by an industry may be supplied by the waste energy and waste products produced by that same industry.

Table 3.3 Supply and demand-led approaches

Deficiencies of a supply-led approach	Benefits of a demand-led approach
Focus on the needs of the supply industry	Consumer needs lead the way so supply is planned to fit needs
Focus on the sale of energy sources that does not motivate energy efficiency	Energy efficiency and appropriate means to meet energy service needs (cooking, warm house etc.) become all important.
Potential for inaccurate future demand projections	Tracked energy demand used for projections
A supply side focus would miss household generation opportunities	A wider range of users can satisfy their energy service needs
Little attention is given to behaviour change	Demand-side management is considered prior to supply side solutions.
The majority of users have no input	Constant interaction with users who are empowered to make choices
Users have little control over their energy expenditure.	Users have much greater control over their energy expenditure.
Vulnerability to energy scarcity	The system gains in flexibility and robustness

Source: Author

Link to urban planning

Energy is a central factor in spatial planning decisions. In the era of cheap fossil fuel, energy was not a significant factor in spatial planning. In an era where oil use has passed its peak, spatial planning is one way to reduce energy consumption and GHG emissions. For example, energy needs for heating increase three-fold in a sprawl pattern compared to a compact pattern.⁹¹ One study has shown that when the population density doubles, energy efficiency in service industry areas can increase by approximately 12 per cent.⁹²

Transport policies have an impact on energy consumption. An effective urban form brings jobs and housing closer together, and so reducing the amount of travel. Other ways to reduce energy consumption are to link centres of employment and services by an efficient public transport; control private vehicle use by promoting walking and cycling; and provide incentives for the use of efficient vehicles. Cities with low density tend to consume much more energy in private vehicle transport; one

study in Dublin, Ireland, showed that residents of areas with densities of 40 p/ha use 50 per cent less energy in their commute to work than the average for the region, which has lower density.⁹³

Standards in urban design and architecture can reduce consumption. Design criteria include north-south orientation, cross-ventilation, green areas and roof gardens, water recycling, rainwater harvesting and choosing local and recyclable construction materials amongst others. Multi-unit developments can increase their energy efficiency by using natural lighting in corridors, stairwells and car parks; using low-wattage lighting appliances; and providing well-lit and comfortable alternatives to lifts. Energy efficiency standards may relate to heat and cold generation systems, types of insulation, individual consumption metering, periodic reviews of systems and energy certifications of buildings, amongst others. Street lighting systems that have been retrofitted with energy-efficient lamps have resulted in savings of around 45 per cent in Alcorcón, Spain, with costs recovered in six years.⁹⁴

Table 3.4 How energy demand and supply is linked to spatial structure

Connect To:	How
Land-use	<ul style="list-style-type: none">• Land information in cadastres enables targeted energy audits because different activities have different demands; it also facilitates demand forecast• Mobility and energy consumption are positively correlated• Multi-polar patterns are best suited for decentralized energy production
Public space and green areas	<ul style="list-style-type: none">• Green areas reduce the heat island effect, energy demand for air conditioning, and heating
Density	<ul style="list-style-type: none">• Lower connection costs are achievable in denser settlements
Infrastructure	<ul style="list-style-type: none">• Over ground transmission lines (particularly high voltage) demand large amounts of land• Below grade lines are safer and improve the streetscape• Water supply and treatment can be highly energy intensive if pumping is required• Loop closing opportunities in biogas, waste to energy
Buildings	<ul style="list-style-type: none">• Orientation and design can substantially increase passive energy gains; facilitate active energy devices (for example roof orientation to the sun, etc.)• Retrofitting as part of urban renewal• Energy profile of building to be included in costing and incentives for development

Source: Adapted from H. Srinivas

Local policies can induce the use of renewable energy in the building stock.

Municipalities can set renewable energy targets for buildings, both newly built or those applying for a change of use licence, leaving it up to consumers to choose specific technologies to achieve them. In Rizhao, China, 99 per cent of households in the central district use solar water heaters, and most traffic signals, street and park lights are powered by photovoltaic solar cells.⁹⁵

Retrofitting contributes to optimizing consumption in buildings, which consume between 30 per cent and 40 per cent of all energy worldwide. Local governments can

lead by example and implement retrofitting programmes in administrative offices, health centres, schools, universities and other facilities. Public purchasing, which accounts for around 12-20 per cent of government budgets in developing nations, can be a great way to support the establishment of local specialized firms and technology development in energy efficiency and renewable energy. Retrofitting privately owned buildings for energy efficiency can be triggered by economic incentives and legislation. In Mumbai, India, the cost of retrofitting Inorbit Mall, the country's largest mall, is expected to be recovered in less than five years with ongoing cost savings thereafter.⁹⁶



Chicago City Hall Green Roof, USA
© Flickr/TouringCyclist



Inorbit Mall, Mumbai, India
© Flickr/Zadeus

Improve distribution efficiency

Decentralized energy production systems may suit rapidly expanding cities and less dense settlements. The traditional engineering approach to power supply has been through large, centralized production facilities and extensive distribution systems which require significant investment and long project cycles.⁹⁷ Decentralized systems can reach off-grid locations, save energy and are more resilient against natural and human-made disasters. Technologies available today allow an effective integration of these systems with the grid as demand and supply fluctuates.

Smart grids are considered to be the future of energy management. Intelligent electric meters enable the integration of decentralized power generators, matching supply and demand, and allow flexible billing.⁹⁸ A building on a smart

grid could independently regulate its electricity requirement at any point in the day, store its energy surplus and, if necessary, feed it back into the city distribution network. Smart grids can increase the efficiency of renewable sources in the energy mix. At the grid level, smart sensors can continuously check the functional capability and initiate speedy repairs to avoid energy loss in the case of malfunction.⁹⁹ While smart grids and smart metering may seem far off in cities where a consistent electricity supply is still not guaranteed, leapfrogging would allow a more efficient energy supply and demand model.

Electric vehicles could be help to mainstream renewable energies because they can act as storage for electricity generated by renewable sources. Cities such as London (England) have a network of recharging stations that would make electric cars more acceptable. Developing partnerships to install these stations may mean little or no cost for the city.



A smart grid at work in Wildpoldsried, Allgäu, Germany
© Siemens



Electric vehicles being charged at an autolib-station
in Paris, France © Flickr/Stephen Rees

The transformation of Soweto

Johannesburg, South Africa



Soweto is a large township that forms part of the greater Johannesburg area. A separate municipality until it was incorporated into the Johannesburg Metropolitan Municipality in 2002, today it has a population of about one million people.

The area was the scene of violent clashes between police and civilians during South Africa's apartheid era and is still characterized by extensive areas of poverty that are deprived of basic services. In 2001, the municipality embarked on a substantial planning and investment effort to improve infrastructure, accessibility and safety, and to provide better public spaces.

Vilakazi Street has been upgraded into a high street with shops, restaurants, bars and tourist accommodation, and now brings in visitors and creates economic opportunities for local residents and businesses.

Solution

Three plans - the Soweto Economic Transformation and Development Plan, the Integrated Spatial Framework and the Johannesburg City Safety Strategy - have laid out the basis for change.

“The transformation of Soweto creates new opportunities for its residents and the city – for it is not only about construction, but about jobs and new investment opportunities for the private sector” Executive Mayor Amos Masondo (2001-2011). The plans aligned economic revitalisation, spatial development and crime reduction. Spatial growth was guided to six nodes associated with major public transport intermodal facilities. These feature community facilities and public spaces in pedestrian-friendly areas, with buildings that are inviting. Nodes bring about investment opportunities in office and residential developments, including social housing. The intermodal, mixed-use facilities incorporate spaces for informal traders, while the Soweto Empowerment Zone provides premises and services for small businesses and emerging entrepreneurs.

The framework calls for higher density residential areas within 500 metres of a train station and within 300 metres of the Rea Vaya BRT (Bus Rapid Transit) route, which provides access to central Johannesburg. A safety strategy focuses on the rejuvenation of parks and open spaces, streetscapes, and on managing problematic and abandoned properties.

Results

“Soweto has become a vibrant place, a dynamic, crucial part of the City of Johannesburg,” says Masondo. That safety has improved is supported by statistics from the Moroka Police Station. These show a consistent reduction in violent incidents, from 7 to 10 per cent, in the last five years. The municipality has spent nearly USD 60 million to pave 314 kilometres of roads over a two-year period. Accessibility was further reinforced by cycle paths and vehicular and pedestrian bridges. By 2008, 95 per cent of targeted areas had new public lights. About 5,000 jobs were created in the construction phase. Community-based cleaning services were started in 2008 and are provided on an output-based agreement, reaching 185,738 households. All houses valued at less than USD 18,000 get free waste disposal services. Community awareness programmes, and by-law enforcement to prevent illegal dumping have resulted in huge improvements in public health.

An investment of USD 108 million improved the water supply by installing and upgrading water and sanitation pipelines, fixing leaking in-house plumbing fixtures, and installing 162,000 household-based prepayment water meters. Households are billed only if they consume more than 6,000 litres a month, which is only about 45 per cent of all households in Soweto. Between 2003 and the end of 2008, 64,139 million litres of water had been saved and the project created 11,500 jobs between 2004 and 2007. The Moroka Dam and Thokoza Park were rehabilitated with an investment of USD 2.5 million, becoming a place where up to 15,000 people can come together to relax over weekends. The Greening Soweto Programme focuses on the development of green open spaces that are maintained with the involvement of the local community. Over 200,000 trees have been planted.

Bara Central is a busy public transport facility that serves 60,000 people per day, combining long- and short-distance taxi and bus ranks, various formal and informal retail spaces and offices. Activities around the facility are estimated to yield USD 122 million a year. The Maponya Mall and Jabulani Mall are the result of private investment, something that was previously unthinkable. Property prices in some parts of Soweto have increased by an average of 16 per cent a year since 2000, outperforming the national average.

The Soweto Theatre opened in 2012, instantly becoming a catalyst for local cultural activity, and the Soweto Tourism Centre has developed 147 tourism products. In 2002, less than 250,000 tourists visited Soweto. Six years later, that number had increased to around one million, creating about 1,500 jobs.

How to address informality

The informal economy is estimated to be worth USD 10 trillion globally¹⁰⁰ and helps to make many cities competitive by providing cheap and flexible labour. It creates opportunities for poorer households that the formal economy cannot offer them. Informal settlements provide employment to up to 90 per cent of their inhabitants through thousands of businesses, and, although there are no legal title deeds, these settlements are “home” for millions of families who cannot afford anything on the formal housing market. Local governments in developing countries, where the informal economy can account for close to 50 per cent of the GDP, would benefit from addressing the issues created by informality without stifling the opportunities it brings. Supporting inclusion rather than exclusion, urban planning can contribute to integrate lower income groups and informal areas as part of the city, upgrade existing slums and prevent the formation of new ones.



Make informal settlements part of the city

Revise planning approaches that ignore the informal sector

Improving informal settlements requires shifting the approach from seeing them as a liability to seeing them as an asset.

Rapid urbanization has overwhelmed many municipalities' ability to provide serviced land to accommodate the influx of newcomers, but ignoring this problem will not make it go away. Because informal settlements house a large pool of labour and microbusinesses, citywide strategies that incorporate informal settlements into the formal city could reap important benefits for social cohesion, service delivery and employment creation.

Unrealistic regulations lead to informality.

Zoning and building standards brought with minimal contextualisation from cities with different socio-economic conditions contribute

to market distortions and prevent large segments of lower income households from legally secure land and housing. For example, plans with large plot sizes that are unaffordable for lower income households push these people out of formal land and housing markets. This also fuels the demand for precarious dwellings on underserviced subdivisions that are developed outside planning zones, often in hazardous areas.

In Mumbai, India, 50 per cent of the population live in Dharavi, one of the world's largest slums. Dharavi's annual economic output is estimated at around USD 800 million and its manufacturing businesses export goods worldwide.¹⁰¹



Informal development next to planned areas, Santo Domingo, Dominican Republic © UN Photo/M. Guthrie



Dharavi, Mumbai, India © Flickr/Mark Hillary

Coordinating the release of land with housing programmes and infrastructure provision can make space for lower income groups.

To make a beneficial impact on these groups, policies need to be based on a deep understanding of socio-economic conditions. The timely release of land can be encouraged, for instance, by making developer's infrastructure contributions payable over an extended period of time or providing incentives for more efficient infrastructure delivery. Charges to discourage withholding of land could include the imposition of urban rates for development sites that have not been released and developed within a time period specified by the development plan. Charges for the release of land out of sequence would offset the additional costs of providing infrastructure.

Create opportunities for the informal sector

Good practice in land management contributes to greater housing affordability.

This means avoiding the following: complex or lengthy planning assessment processes; bottlenecks or surges in residential land availability; location imbalance with too much land available in one district; gaps in land supply sequences (long-term as opposed to short-term); and excessive or uncertain fees and charges associated with planning approval.



Street market, Dire Dawa, Ethiopia
© Flickr/A. Davey



Kejetia, a large open air market in Kumasi, Ghana
© Flickr/Adam Jones

Facilitating access to employment areas and allowing a mix of commercial and residential uses helps the integration of the informal sector. This includes planning for accessible settlements with affordable land serviced by public transport, and planning for livelihoods rather than just housing schemes that combine spaces for shops and other economic activities in the ground floor of residential buildings or in close proximity to them. Transport hubs are important civic destinations and taking advantage of their accessibility can bring together formal and informal commercial space, community facilities and public space.

Economic activity can be enhanced by upgrading informal markets. Street vendors and informal market stalls generally converge around transportation nodes in an unorganized manner that may disrupt pedestrian and vehicular traffic and undermine the value of the area. Improving these activity nuclei can be

a catalyst for economic development and, as traders improve their working conditions and are able to grow their businesses, become an incentive for regularization.

In Belo Horizonte, over 2,000 street vendors were registered between 1998 and 2002. They were then provided with commercial space in “popular shopping centres.”



Market day in Belo Horizonte, Brazil
© Flickr/Bruno Girin



An informal market in Dakar, Senegal
© UN-Habitat/Laura Petrella

Mobile phone applications can provide access to banking for the informal sector.

In some African countries, more people have access to a mobile phone than to clean water, a bank account or even electricity.¹⁰² Applications such as M-Pesa, operated by Safaricom in Kenya, have opened up formal financial services to lower income groups and its 17 million users can make money transfers and pay bills through their mobile phones. This scheme has resulted in a fourfold growth of bank accounts since 2007;¹⁰³ it saves households the monetary and opportunity costs of travelling to the nearest bank branch or paying through intermediaries, and improves revenue collection. In Kiamumbi, just outside Nairobi, 59 per cent of households were reported to have used M-Pesa for paying water bills after four months of the service being in place.¹⁰⁴

Link formal and informal service delivery

Partnerships between municipalities and the informal sector can improve water supply and waste collection, and generate employment.

Access to potable water can be enhanced by policies that organize informal providers to ensure distribution to poor settlements. The municipality of Cotonou in Benin joined forces with informal vendors to operate 24 newly-built public drinking fountains to deliver affordable water, resulting in improved service quality. Solid waste management can benefit from merging the informal sector workforce with public-financed facilities. Partnerships where the municipality provides infrastructure and equipment and waste pickers' provide labour are common in Colombian cities.¹⁰⁵



An M-Pesa agent's shop in Kenya
© Mukami Mwongo



Informal water supply in a settlement in Myanmar
© UN-Habitat/Veronica Wijaya

Informal transport solves mobility needs and creates jobs. Informal fleets can be a lifeline to making a living where poor municipal public transport resources have led to limited or no service to outlying residential areas and high fares. In Mexico City (Mexico), informal minibuses provide services connecting barrios on the outer edges of the city to metro stations. Prohibiting informal transport is not a viable solution as it destroys jobs and blocks access to employment. A combination of valuing the service and regulating them can be effective in managing related issues, such as traffic congestion, accidents and pollution.

In Dhaka, Bangladesh, informal transport accounts for 30 per cent of total employment but auto rickshaws emit 30 times more pollutants than a car.



Different modes of transport in Yucatan, Mexico
© Flickr/Gafas



Auto Rickshaws in Dhaka, Bangladesh
© Wikipedia/Volunteer Marek

Upgrade existing informal settlements

Put informal settlements on the map

Mapping enables integration with wider city plans. Often informal settlements are not featured on official maps. However, mapping is essential for upgrading of informal settlements because interventions need thorough information about the settlement's physical conditions and service access, and because durable improvements need to be integrated into the broader city development plan. Mapping makes information simultaneously available to relevant departments; this helps prioritize focus areas and coordinates intervention. Databases can be used for services delivery, taxation and a cadastre,¹⁰⁶ all of which contribute to including informal areas into the formal economy. In Nairobi, Map Kibera, launched in 2009, is an information project which has developed a free and open digital

map with GPS information, images, video, and audio. Data collection and mapping is primarily conducted by youth groups using open source and mobile phone applications.¹⁰⁷

Informal settlements house a large proportion of the population in cities of the developing world. Rapid urbanization has overwhelmed the capacity of municipalities to provide serviced land to accommodate the influx of newcomers. Lower income families and segments of the middle class are progressively pushed out of formal land and the housing market and this fuels demand for lower-priced dwellings in underserved plot subdivisions outside planning codes, often in hazardous areas. In Mumbai (India) and Nairobi (Kenya), 50 per cent of the population live in slums, notably in Dharavi and Kibera, two of the world's largest. The favelas in Rio de Janeiro and Sao Paulo, both in Brazil, house about one fourth of the total population, and 35 per cent of Bogotá in Colombia lives in informal settlements.



Mapping Kibera, Nairobi
© Map Kibera

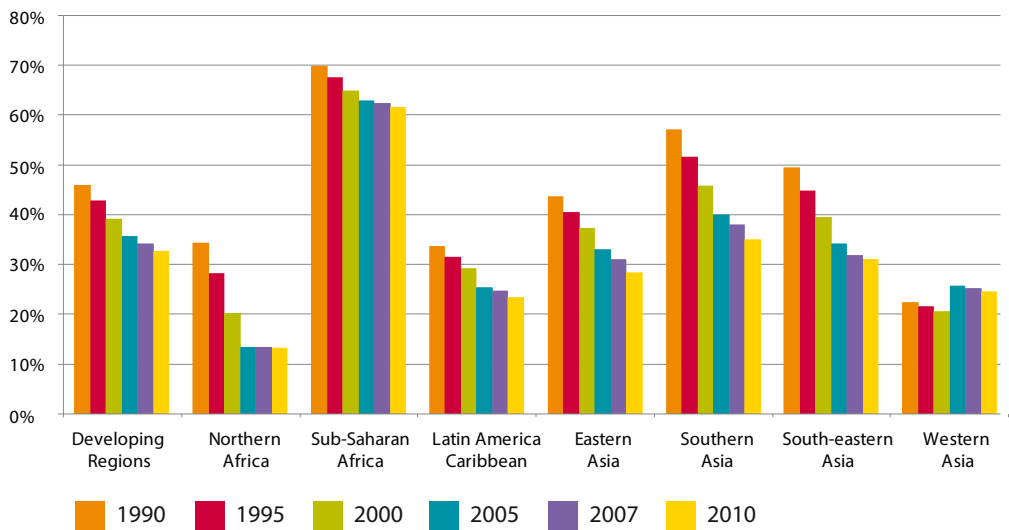
Effective upgrading of informal settlements requires involving the community in assessment and prioritization. Classifying settlements with community input according to the settlements' vulnerability to natural and human-made hazards, legal status and land ownership and physical and socio-economic conditions is an essential first step for upgrading. Following this with a framework to balance priorities with tangible projects would mean added impact from the upgrading strategy.

Resettling slum residents far from their homes and existing income opportunities may create disruption costs that are too high. In situ upgrading is the priority, except in places where dwellings are located in hazardous areas and in places strategic to the city's urban plan. In middle-income countries, broader urban renewal schemes could be considered if society as a whole can benefit, and providing livelihoods are not jeopardized.

What is a slum?

A slum is a settlement made up of households that have one or more of the following five criteria: no access to potable water, no access to hygienic sanitation facilities, insufficient living area per person (more than three people sharing the same room), poor structural quality and no durability of dwellings and no security of tenure.

Graph 4.1 Proportion of urban population living in slum areas



Source: UN-Habitat, *Global Report on Human Settlements*

Table 4.1 Conditions, assessment and sample interventions in informal settlements

Category	Conditions	Assessment	Sample intervention
Hazards	Floodplains, steep slopes, seismic fault line, wetlands, riverbeds, sea proximity	Assign intervention urgency level	Relocate
Tenure	Status of the occupants (illegal occupant, unregistered title, occupancy document, sales document); land ownership (national government, provincial or local authorities, private)	Determine regularization strategy to provide security of tenure	Provide occupancy rights
Physical conditions	Physical gaps (natural or human made), ground water level, soils, density, connections to water and electricity (legal, illegal, metered) building materials (permanent, impermanent)	Identify the system of public spaces Determine housing improvement strategy, infrastructure/ services needs	Establish street and public spaces Road upgrading; microloans for housing; improvement; connections to water supply mains and electric grid
Socio-economic characteristics	Mix of economic activities, level of poverty, ethnicity, presence of undesirable or illegal activities (crime, drugs, prostitution), youth gangs and other socially undesirable manifestations	Determine need for social programmes and economic development initiatives	Launch vocational training and other education programmes; promote community activities; establish a neighbourhood crime watch; preserve local social fabric preventing excessive turnover
City integration	Relative location within the city; accessibility; public facilities (schools, health centres); local employment; public space; planning regulations	Determine key access issues; identify potential for integrating with city-wide functions and amenities; assess key regulatory hurdles	Provide accessibility through public transport or organized informal fleets; create public spaces; reform regulations that limit effective integration

Source: Adapted from Serageldin



Resettlements must take into account accessibility to employment areas, Jinja, Uganda 2005 © Suzi Mutter



One of Cairo's poorest slums overlooking Egypt's Foreign Ministry tower © Flickr/Hossam el-Hamalawy

Take a holistic approach to upgrading

A multi-sector approach to infrastructure is a key component in upgrading. A priority is to expand transport systems so that they reach informal settlements and enable residents to get to work. Access to potable water supply and sanitation would address a critical public health issue; managing solid waste can dramatically reduce health hazards and create income opportunities such as waste picking. Integrating these sectors in all-around interventions improves land value, and, once tenure is secured, asking for residents' to contribute to construction and/or maintenance would not be unreasonable.



Neighbourhood in La Paz, Bolivia
© Flickr/i_gallagher

In La Paz, Bolivia, the installation of sanitary units inside dwellings, the construction of roads and stairways and the improvement of rainwater drainage systems have improved asset value in informal settlements.¹⁰⁸

In Bangladesh, boats that serve as floating schools, libraries and health centres are fitted with waterproof roofs and solar panels, computers, high-speed internet and portable solar lamps.¹⁰⁹

Public space and community facilities are catalysts for self-upgrading. Public space helps create viable communities. Public street spaces increase accessibility and support economic activities, they create economic value in the proximity and facilitate the laying of other infrastructure. Public space also results in a shared identity which induces care for the physical surroundings. It also enhances social interaction and builds trust and relations. Improved streets, plazas and parks give residents a sense of permanence, instil pride in their living environment and act as a catalyst to invest in housing, which will contribute to increase property value and reduce physical marginalization. Community centres in easily accessible venues help engage the community in practical activities, including vocational training, job advisories and social development programmes. Community facilities, which also include health posts, nurseries and schools, can be movable to distribute impact.



Floating school and libraries in Bangladesh reach remote locations © Abir Abdullah-Shidhulai Swaniurvar Sangstha

Security of tenure can be attained step by step. Full titling and registration is obviously the most secure form of tenure for a household. However, titling can be expensive, requires legal and administrative capacity that many developing countries lack, may cause property price increases and displacement of poorer renters, and may exclude women and children.¹¹⁰ Owners of newly-regularized plots might be tempted or pressured to sell to developers who foresee the increasing value of the land.¹¹¹ Renters are particularly vulnerable when owners gain formal titles as rent may increase sharply. Focusing on security of occupancy instead has expanded the capacity of local authorities in regularization.

Steps towards tenure security

- Facilitate access to areas with jobs and improve health conditions;
- Instil a sense of permanence through public space and community facilities;
- Issue a certification that the settlement will not be removed or its residents displaced for a stated period (usually at least 10 years), but without granting of formal titles;
- Provide temporary and renewable occupancy permits;
- Initiate temporary leases that cannot be transferred and long-term leases (i.e. 75-90 years) that may or may not be transferred;
- Assign a number and an address to houses.

Prevent the formation of informal settlements

Make affordable, serviced land available

An undersupply of land for housing can increase housing prices. Lack of affordable land forces the poor to live in informal settlements close to jobs and transport, even if this means they are exposed to tenure insecurity and other hazards. Policies that anticipate population growth should ensure that there is sufficient land zoned for affordable housing; by purchasing land where growth is anticipated, local governments can help to stabilize land markets, and discourage monopolistic or “price inflationary” behaviour. The time it takes to convert land to housing means that it is essential to predict housing demand well in advance, for example a period of 20-30 years.¹¹² Ensuring land is released efficiently when demand shifts and continuously monitoring the market would deter land speculation.

Affordable residential areas need accessibility to basic services. Preparing land for future urban use requires anticipating infrastructure needs. Reserving land for trunk and social infrastructure and public transport gives managers a lot of flexibility to meet future demands; for example, expanding roads onto reserves, which would cost much less than building an arterial road from scratch.¹¹³ Municipalities experiencing high growth may not have the financial and administrative resources to deliver in advance the infrastructure that paves the way for urban development. Specific strategies to overcome this include ensuring a sequential land release so that infrastructure can be provided efficiently, and partnering with developers who can contribute to infrastructure provision. Clear contribution requirements must be made known to them when the land is purchased.



Informal settlements close to jobs and transport in Mumbai, India © UN Photo/J.P. Lafont



Drainage infrastructure in Jardim Iporanga, São Paulo, Brazil © Affordable Housing Institute

Successful new schemes are demand-led.

Until the mid-1990s, many upgrading schemes were developed in locations far from jobs to reduce land costs and so overlooking settlers' priorities. Cost recovery calculations that ignore the economic reality of low-income groups may lead to infrastructure standards which are too expensive.¹¹⁴ In such cases, intended beneficiaries may be inclined to sell or rent and return to informal settlements. Effective site and services schemes would benefit from skilled municipal personnel to run demand-led designs in close partnership with affected communities.



New housing scheme in Uberlandia, Brazil
© UN-Habitat/Alessandro Scotti

Provide access to areas of opportunity

Accessibility is essential for anticipatory schemes.

Laying out a grid of major arterial roads and well-designed streets that are continuous and connected to the existing city network creates economic opportunity, and is central in the integration of informal settlements in the city's urban fabric. Spacing major arteries one kilometre from each other will ensure that future public transit is within a 10-minute walk radius of any single city location. Arteries' widths of between 20 and 30 metres can accommodate car traffic, dedicated bus lanes, bike lanes and pedestrian paths.¹¹⁵

Mixed land use policies shorten the distance to jobs.

Transport to employment centres, either formal or informal, may be costly and can impose a heavy toll on households getting minimum wages. Adopting mixed-used zoning standards will tend to bring together jobs and services and thus reduce the need to commute. Industrial policy in Delhi in India allows 73 different types of household industries, which need permits to operate. Businesses benefit from the availability of labour in informal areas and residents benefit from local jobs.¹¹⁶

Informal settlement upgrading in *Manaus, Brazil*



Manaus PROSAMIM Informal Settlement Upgrade © Skyscraper City

Manaus is the industrial centre of Brazil's Amazon region. Rapid growth, which saw the population increase 500 per cent from 300,000 people to over 1.5 million between 1970 and 2003, was not supported by land control mechanisms or investments in infrastructure. Combined with a lack of affordable housing, unmanaged growth led to illegal settlements developing on the tributaries of the Rio Negro, called Igarapés. These settlements were constantly at risk of flooding. They had no electricity, potable water or sanitation and, since solid and liquid waste was dumped directly into streams, the settlements' sanitary conditions were poor.

A vicious cycle of poverty and pollution began to develop in these areas. Houses built on stilts obstructed the river's drainage creating an acute environmental problem, and the proliferation of mosquitoes and rats was a health hazard. The lack of urban public space and foul smelling streams degraded the surrounding neighbourhoods.

Solution

In 2003, the Government of Amazonas initiated a three-phase upgrading programme, known as Igarapé Manaus Social and Environmental Programme (PROSAMIM), which was coordinated with the municipal government and had support from the Inter-American Development Bank. The integrated approach to upgrading was highlighted by Governor Omar Aziz, who stressed:

“The work of upgrading is not just physical – it’s also about providing opportunities.”

The programme foresaw the establishment of a road grid to connect the area with the city, the rehabilitation of the bridge, the creation of public spaces on the waterfront of the recuperated areas, and the provision of sewer and storm water drainage systems. New housing units were built for the people that had to be relocated. The capacity of municipal and state agencies responsible for urban planning was developed. This facilitated links with the Integrated Local Development Plan and a recently prepared Urban and Environment Master Plan to increase the supply of affordable land.

The first stage was started in 2003 and was ready for execution in three years. Areas of intervention were prioritized based on a socio-environmental cost-benefit analysis which took into account population density and the severity of social and environmental problems. The Igarapé Educandos, a priority area, had a density of 115 p/ha and a population of 31,973 people living under the flood line which was 30 metres above sea level. Housing units were designed using locally available materials and followed area specifications in the Master Plan, which specified a minimum of 54 m² for a two-bedroom unit. The scheme included commercial space, which was offered to residents who had previously owned a shop in the informal settlement. New housing units’ owners were not allowed to make alterations or additions to the dwellings to prevent informal occupation of public areas. New streets were designed to improve accessibility to the area and to connect it to the city’s economic opportunities. In addition to improving the conditions in the area and to add value to the housing units, parks on the banks of the Igarapés helped to prevent re-occupation and facilitate maintenance of hydraulic structures. The infrastructure included water and sanitation services and a sewerage system with collectors, interceptors and pumping stations.

The designation of Special Areas of Social Interest aimed to increase the supply of affordable land for residential schemes, allowing low-income families access to properly urbanized areas. Close collaboration with the community was facilitated by the creation of 32 associations to convey residents’ interests and concerns. Involving households in decisions concerning resettlement options greatly empowered the community.

Results

In its first two phases, an investment of USD 400 million was mobilized. By February 2012, the programme had benefited over 60,000 people in Manaus through the construction of over 7 km of roads and bridges that have improved citywide traffic flow; and 130 km of sewerage pipes that have prevented the direct dumping on Igarapés of about 3 million litres of liquid waste and 3,000 kg of household waste per day. Over 2,000 housing units connected to water, sanitation and electricity networks had been built.

The seven parks built, with a total area of 218,802 m², have contributed to developing civic pride and optimism. The Senator Jefferson Peres Park is now one of the city’s most valued assets. The integrated intervention has helped to reduce crime by more than 50 per cent.

The third phase is expected to further improve the access to surrounding neighbourhoods with new roads and bicycle paths. In addition, five parks, social facilities and a 50 km sewer network will be built.

How to build resilience and reduce climate risks

Building resilience enhances the reliability of a city's performance over time, making it better able to endure shocks. Climate change is the most determinant change factor of our time and cities must play a central part in addressing it. They are compelled to do so because the effects of climate change, which include rising sea levels, an increased frequency and severity of storms, heavy rains, floods, droughts, hurricanes, heat waves and other extreme weather events, will be felt mostly by people living in urban areas and because cities produce 75 per cent of greenhouse gas emissions globally. Creating cities that can cope with climate change requires building resilience into urban planning, taking advantage of mitigation opportunities and adapting to reduce vulnerability.



Embed resilience in urban planning

Integrate resilience in urban planning

Resilience depends on the capacity to anticipate and plan for the future. A plan that anticipates the effects of future shocks can help a city to withstand them and rebuild itself when necessary. Hence, resilience is greatly influenced by the quality of local management, its capacity to anticipate events and enforce plans, the availability of information, and the quality of the infrastructure and services that the city provides.

Assessments identify sectorial vulnerabilities and provide the basis for prioritizing spatial adaptation. Vulnerable groups are less able to adapt and have fewer resources. Their livelihoods tend to be precarious and fragile, and a lack of entitlement means no compensation for any loss. In addition to homelessness, extreme weather events cause

people to be forced out of their homes and others to migrate. Bangkok in Thailand has put in place climate change assessments that collect historic weather events information in risk maps in the Action Plan for Global Warming Mitigation 2007-2012. This aims to reduce emissions by 15 per cent of the business-as-usual emission levels projected for 2012.

Qualifying and quantifying risk

The Urban Risk Assessment, developed by the World Bank, the United Nations Environment Programme (UNEP) and UN-Habitat with the support of Cities Alliance, is a standardized tool to assess urban risk and identify areas and populations that are most vulnerable, which are typically those living in informal settlements. The Urban Risk Assessment provides a framework for both qualitative and quantitative assessments to enhance a local governments' capacity to identify hazards arising from disaster and climate change risks; assess exposure and vulnerability of specific assets and populations; analyze institutional capacities and data availability, and quantify city vulnerabilities through the application of a baseline-benchmarking approach to assess progress over time and space.

<http://www.kcccc.info>



Flooding in Bangkok, Thailand
© Flickr/Sasamon Rattanalangkarn

Resilience is not an add-on but an integral part of a city's plan. It can only be achieved if all components of the complex urban system are taken into consideration. Making a city resilient involves guiding development away from risk areas, addressing the expansion of informal settlements, and addressing the lack

of infrastructure and the degradation of the environment. These developmental constraints are the same that hinder resilience so, instead of seeing vulnerability as an additional concern to be addressed separately, cities will benefit from mainstreaming resilience into urban planning.

Integrate investment in resilience into broader urban investment

A resilient city is competitive and can sustain its advantage over time. By proactively increasing resilience, cities will be better positioned to absorb and respond to shocks. The primary purpose of urban investment is to enhance the functioning and performance of the relevant urban area. New investment for resilience will be more effective if, beyond mitigating risk, it intends to create competitive

urban areas with reliable system performance over time. Rather than a risk reduction cost, resilience investments should aim to create a development premium for an urban area.¹¹⁸

Inaction is expensive. Cities that have not been able to prepare themselves for the effects of extreme weather have suffered severe disruption that will take decades to overcome. No action means the expected costs to cities will be high. The cost of Hurricane Katrina on New Orleans and other affected areas in the United States was estimated at USD 100 billion. In Manila (Philippines), Bangkok (Thailand) and Ho Chi Minh City (Vietnam), costs to repair damage from climate change-related flooding are likely to be substantial, ranging from 2 to 6 per cent of regional GDP; a 1-in-30 year flood in Manila could cost between USD 900 million and USD 1.5 billion with the current flood control infrastructure.¹¹⁹

Funds for resilience should be aligned with urban fixed investments. Urban fixed investments should work for resilience. Since funds pledged for resilience in urban areas are only a small portion of the investments in fixed assets planned by cities, they can therefore only achieve significant impact if the overall investment in fixed asset is working for resilience. In order to use them optimally, they need to be aligned with the expected investments over the next two decades rather than being used for stand-alone risk reduction projects. In this way these limited funds can leverage much bigger benefits for a city as they can be used to improve the contribution to resilience of large investments.



Frequent floods in Manila, Philippines especially affect the most vulnerable © New Security Beat

Adapt to reduce vulnerability

Mainstream adaptation in land policies and building standards

In addition to loss of life, extreme weather events cause major damage to property and infrastructure, resulting in massive economic and productivity losses, including GDP shrinkage, investment retrenchments and higher business costs. The estimates of sea level rise for this century vary between 18 cm and two metres. Cities such as Kolkata and Mumbai in India, Dhaka in Bangladesh, Guangzhou in China and Ho Chi Minh City in Vietnam will be among the most affected. A 1996 study quantified the cost of a one metre sea-level rise in Mumbai at USD 71 million.¹²⁰ Much of Singapore's city centre is built on reclaimed land and would be affected by a rise in sea level putting the financial district and other multi-million infrastructural investments at risk.



House on stilts in Hong Kong
© Flickr/Ken Yee

Planning standards mainstream risk reduction into urban development.¹²¹

Vulnerable areas should be demarcated according to risk levels; for instance areas exposed to annual flooding, areas exposed to flooding once every 10 years and so on. Land use and building standards should be adjusted to each of those areas. For instance, areas exposed to regular flooding should be left vacant or reserved for parks and sport facilities; trees and vegetation should be protected to sponge up excess water and prevent occupation. Building requirements in areas exposed to periodic flooding can include construction over pillars or banning people from living on ground floors. Capacity building of planning staff and ongoing training for local builders and contractors, including informal ones, should be promoted.

Planning should guide development to non-vulnerable areas.

Urban settlements often develop in hazardous areas due to a lack of land in safer locations. Unaffordable land leaves no alternative to the poor but to settle next to jobs and transport, irrespective of how dangerous the site may be. A planned extension of at least twice the existing built-up area would avoid people speculating and thus would make well-located, affordable land more available.¹²² Within this extended growth area, planning can guide growth away from high-risk sites, such as flood plains, areas affected by sea level rise and drought areas, and encourage growth where it is safe. The layout of trunk infrastructure and rights-of-way, and public transport networks are major tools for achieving this.

Adapt infrastructure to climate variability

Infrastructure location and construction standards must be adapted to local risk factors

so that roads, bridges, power lines and pipes can cope with extreme weather events. Specific adaptations for flooding and sea level rise that focus on protective infrastructure could be one of the major gains that spatial planning can bring. Adaptation cannot be separated from fixing problems in the basic drainage, water supply and sanitation infrastructure.¹²³ Heavy rains can be devastating in informal areas that do not have proper drainage or where the system is clogged and not properly maintained. Shortages of drinking water can become more serious where there is a poor supply and can contribute to the spread of diseases.

Integrating infrastructure and spatial planning significantly contributes to building resilience.

Most coastal zone-related measures have centred on tackling floods through hard infrastructure. Regulating land use according to risk assessments is a proactive measure that can complement and improve the efficiency of such investments. Dhaka in Bangladesh has reinforced river and canal embankments and built protective walls, sluice gates and pumping stations, but has also worked on addressing encroachment on several city canals which has reduced canal-filling and drain-clogging. The programme proved effective in protecting over half of the city from major floods in 1998 and 2004.¹²⁴ Singapore's buffer zone development requires new land reclamations to be 2.25 metres above the highest recorded

tide level.¹²⁵ In Cape Town, South Africa, buffer zones establish more stringent set-back lines for developments and disincentives for development close to the shore.¹²⁶

Droughts and saltwater contamination create water supply shortages

in cities affected by dry weather and a rise in sea level. Common initial adaptation responses include economic incentives to reduce consumption, daily supply limits, temporary water tariffs, leak reduction, water pressure management, promotion of traditional practices for sustainable water use and awareness campaigns.¹²⁷ Supply can be increased by desalination of sea water, reuse, harvesting, expansion of rainwater storage, and removal of invasive vegetation from riparian areas. In Windhoek, Namibia, direct potable reuse already constitutes the city's main drinking water supply after education campaigns made this acceptable for the public.¹²⁸



Reinforced river embankment along the Brahmaputra River in Dhaka, Bangladesh © Leila Mead/IISD

Take advantage of climate change mitigation opportunities at the local level

Mainstream mitigation in spatial and transport planning

Efforts to reduce emissions start with knowing how they are produced. An inventory allows quantifying how a city generates emissions by disaggregating them by sector and by actor. It will provide policy makers with a baseline and identify opportunities to reduce emissions. It is important to set a clearly quantified GHG reduction target; most cities have established these as a percentage of improvement compared to the baseline year.¹²⁹ For example, the International Local Government GHG Emissions Analysis Protocol (IEAP) provides inventory categories for public-sector facilities and vehicle fleets, privately-owned residential, commercial and industrial buildings, and transport. Disaggregated emissions prevents double-counting.¹³⁰

Emission reduction should be embedded in spatial and transport planning. Dispersed patterns are associated with lower densities and larger home sizes which occupy more land, resulting in loss of forest and vegetation. This reduces nature's carbon dioxide (CO₂) uptake capacity. Compact city policies rationalize the use of land, which creates opportunities for compatible growth and the retention of open areas. Mixed-use reduces the need to travel and, if public transport could provide a time and cost advantage over private cars, car ownership would be discouraged, hence reducing emissions.

Cities take up 2 per cent of the Earth's land mass and generate between 30 and 40 per cent of the total emissions.¹³¹



An inundated settlement near Canal del Dique, Colombia
© UN-Habitat

Graph 5.1 How far does one tonne of CO₂ take a person?

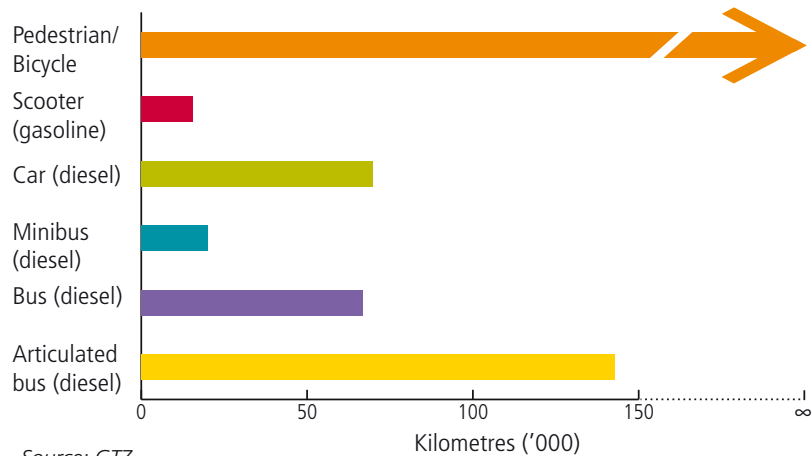
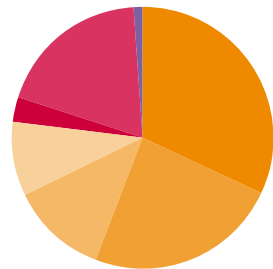


Chart 5.1 Emissions in New York City

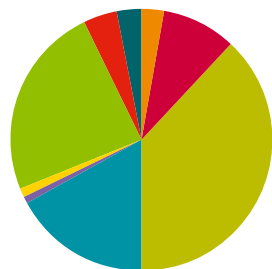
City-wide CO₂ eq by sector (2007)

Buildings		77%
Residential	32%	
Commercial	24%	
Industrial	12%	
Institutional	9%	
Transportation		22%
Transit	3%	
On-road vehicles	19%	
Other		1%
Methane	1%	



Total = 61.5 million metric tonnes

City-wide CO₂ eq by source (2007)



Diesel	3%
Distillate fuel oil	9%
Electricity	38%
Gasoline	17%
Kerosene	1%
Methane	1%
Natural gas	24%
Residual fuel oil	4%
Steam	3%

Total = 61.5 million metric tonnes

GTZ Sourcebook Module "Transport and Climate Change" (2007). Based on Hook / Wright, 2002

Buildings consume about one third of energy worldwide throughout their lifecycle. Rapid population growth is expected to lead to an increase in the building stock, which under the “business as usual” model will entail a greater energy demand. Building regulations at the local level aimed at energy efficiency can contribute to reduce consumption and GHG emissions. The choice of less energy intensive building materials can also contribute significantly to reducing emissions.

Industry can generate up to half of a city’s total emissions. Although some industries have invested in energy efficiency and offsetting technology, it is still an energy intensive sector and can be extremely polluting.

Transport is a high producer of emissions. Passenger cars, trucks and buses that use fossil fuel combustion engines are large contributors of emissions, especially passenger cars which produce about on average 125 grams of CO₂ per passenger-kilometre, which is only 5 grams less than planes.¹³²

Waste can generate up to a quarter of emissions, with the bulk of these stemming from burning of waste and disposal in uncontrolled sites. Waste generates 11 per cent of total emissions in Mexico City (Mexico), 20 per cent in Bangkok (Thailand) and about 25 per cent in Sao Paulo (Brazil).

Sequester carbon and capture the energy embedded in waste

Urban greening can be used for carbon sequestration to improve air quality and to reduce the heat island effect. Examples of greening are tree-planting schemes on roads, vacant land and new development sites; restoration and preservation of urban forests and other green areas, and green roofing. In the United States, carbon sequestration in forests has been estimated at a range between 1.5 and 6.5 metric tons of CO₂ per hectare. Carbon sequestration can extend between 90 and 120 or more years before these areas reach their saturation point, beyond which additional sequestration is no longer possible. Even after saturation, trees would need to be sustained to maintain the accumulated carbon and prevent its release back in the atmosphere.¹³³

Carbon credits can be a potential financing option. Waste-to-energy projects are eligible for funding through ‘carbon credit’. Delhi, São Paulo, Mexico City and Cape Town have tapped into this resource. By selling their credits, São Paulo’s Sao Joao and Christchurch landfills will earn USD 5.7 million and USD 3.5 million respectively at the end of their crediting periods. While technical requirements and administrative procedures for eligibility can be time consuming and unfamiliar to municipal staff, the fact that several cities are benefiting from it shows the potential of this option.

Captured methane in sanitary landfills can be used as an energy source to produce heat and hot water; as feed to power generators to produce electricity; and it can be reused as vehicle fuel. The city of Lille in France reuses methane extracted from its municipal landfill for fuelling a share of its public bus fleet. Methane

from São Paulo's Bandeirantes plant in Brazil generates 7 per cent of the city's electricity consumption, enough to supply a population of 600,000 for 10 years.¹³⁴ The Okhla composting project in Delhi (India) reduces around 1,600 tonnes of methane emissions per year, which is equivalent to 34,000 tonnes of CO₂.



Okhla composting project in Delhi, India
© Flickr/The Advocacy Project



A waste landfill in Sao Paulo, Brazil
© Flickr/Alex Steiner

Resilience as a guide for city expansion

Sorsogon, Philippines



Sorsogon, Philippines © UN-Habitat/Bernhard Barth

Sorsogon City is a trade and commerce centre with a population of 152,000 people. It is in the southernmost part of Luzon province on a 10 kilometre-wide strip of land that is exposed to the Pacific Ocean on both the east and west sides. An average of five tropical storms annually cause damage to properties and impede regular economic activity. Flash floods, prolonged dry spells, temperature increases and an accelerated sea level rise are among the risks to the city created by the changing climate.

A Vulnerability and Adaptation Assessment, carried out under UN-Habitat's Cities and Climate Change Initiative (CCCI), showed that 34 out of Sorsogon's 64 barangays (villages) in coastal areas are vulnerable to a sea level rise, storm surges, strong winds and tropical storms. Eight villages were identified as being highly vulnerable due to a combination of exposure to multiple hazards, poverty, overcrowding and a low adaptive capacity. The assessment estimated that the cost of damages in the event of two tropical storms in a four-year period would be about USD 20 million for transport, communication and energy infrastructure, and about USD 250 million for housing.

Solution

The assessment informed the formulation of land use strategies and development options. According to Mayor Leovic Dioneda, "...calamities became the entry point to Sorsogon City's openness to climate change adaptation and mitigation, prompting a review of local plans to make them risk sensitive". Sorsogon City's Comprehensive Land Use Plan (CLUP) and Comprehensive Development Plan (CDP) aimed to direct urban expansion to safer and inland areas while restricting the occupation of high-risk zones; and protecting existing built-up areas, prime agricultural land and environmental assets through the application of disaster risk reduction and climate change adaptation measures.

An important factor for success was the involvement of representatives from the local government, national government agencies, civil society organizations and barangay officials in the process of updating the plans. Stakeholders agreed on the need to raise the awareness of Sorsogon City's constituents on climate change mitigation and adaptation and to reduce greenhouse gas emission by cutting down energy consumption and using cleaner technologies. To raise awareness, climate change will be included in the curriculum for tertiary schools, while education and communication campaigns have been conducted through local radio and television stations. The campaigns motivated 100 city employees, 300 students from 5 schools, and 80 city scholars to provide input to the climate change action plan.

Sorsogon City's main mode of public transport is the tricycle (motorcycle with sidecar) and of the more than 3,000 of them on the streets, around 40 per cent have 2-stroke engines. To reduce GHG emissions, the City Council is finalizing an ordinance to replace 50 per cent of them with 4-stroke engines within five years. In addition, about 100 conventional street lighting fixtures have been replaced with energy efficient LED lamps.

Results

It is expected that about 22,000 families' vulnerability to the impact of climate change will be reduced over time as the land use comprehensive development plans are implemented. Adaptation measures for housing will improve the resilience of about 30,000 dwellings that are vulnerable to typhoon damage, thus saving about USD 3.3 million in housing reconstruction costs annually. Settlements in high-risk coastal zones will be incrementally relocated inland, either through local shelter relocation projects or through voluntary resettlement according to the city's Local Shelter Plan. To make urban expansion areas attractive to settlers and investors, safe, non-primary agricultural sites will be reclassified as neighbourhood development nodes that will be supported by infrastructure investments.

"Climate change and disaster sensitized local plans helped us create a guide for city development" Mayor Leovic Dioneda

According to Dioneda, "Climate change and disaster sensitized local plans helped us to create a guide for city development." Leading by example, the Sorsogon City Hall, which was destroyed by a tropical storm, was relocated to a low-risk urban expansion area. In the same area, the local government has allotted one hectare of land for the relocation of about 500 informal settler families, and there are plans to build residential units for 200 city employees in the vicinity of the city hall. A coconut juice factory that creates employment for up to 700 workers has been given planning consent within the area, creating opportunities for local economic development. The Comprehensive Development Plan also foresees the construction of a transport terminal, a convention centre and an education facility in the urban expansion area.

How to make a city safer

Lack of safety can be harmful to a city in many ways. Crime has significant socio-economic costs because it puts off investors and tourists, it inhibits local entrepreneurial spirit and damages social cohesion. Although violence in a city is a multidimensional phenomenon, there is evidence that poor urban design decisions result in a poor physical environment, which may increase crime. Making crime prevention a priority in the agendas across municipal departments may make a significant difference and coordinated policy and action in spatial planning, transport and urban design in particular can reduce fear, crime and violence.



Understand the impact of crime

Quantify the cost of crime in urban areas

Crime is a major barrier to socio-economic development. It deters inward investment, inhibits tourism and causes skilled people to leave, thus reducing the pool of qualified human capital; all of these have an impact on economic development. High robbery rates take a psychological toll on citizens, hampering their business spirit and lowering property values.

Crime statistics related to GDP costs enable municipalities to realize the magnitude of the issue. Such statistics are readily available at a national level. For example, the cost of crime over national GDP can be as high as 25 per cent. Domestic violence alone can cost up to 2 per cent of GDP.¹³⁵ However, to understand the situation at the local level, statistics should reflect costs compared to urban GDP.



Protests against crime in Mexico
© Flickr/Brenmorado

Engage the community

Safety audits are effective for preventing crime and give city planners first-hand information on which safety issues to address and women's audits identify where the potential for a crime is high or where women feel unsafe. Successful audits require partnerships between local authorities and community groups, and a commitment to implement them. This tool has been effective for containing crime in a number of neighbourhoods in Durban (South Africa).¹³⁶

Communities can be key partners in addressing crime. For instance, the municipality of Toronto (Canada) provides social development programmes in high-risk neighbourhoods to address citywide crime prevention. "Neighbourhood Action Plans" are prepared in collaboration with communities, the police, local education and social services agencies. These plans have financial and administrative resources to make them operational.¹³⁷



Community meeting in Itinga, Bahia, Brazil
© Flickr/Secom Bahia

Mainstream crime prevention in urban planning

Use urban planning to prevent crime

Urban planning has a key role to play in the prevention of crime. Using urban planning to reduce inequality and marginalization, and street level interventions in informal settlements are among the most crucial initiatives in the prevention of crime. Planning helps to identify root causes, establishes a local presence of the state and helps to build trust between marginalized groups and institutions, which is a key strategy for crime prevention. Although urban crime is a complex social phenomenon, urban planning interventions can have an impact by making space for formal and informal economic activities, recovering and maintaining public spaces for a diversity of users in a positive way, and making services and opportunities available to marginalized residents.



Children dancing capoeira in a favela public space
© Anneke Jong

Access to transport reduces the negative effects of segregation. Isolation produces negative socio-economic outcomes, which can lead to social unrest and crime. Areas with mainly un- and under-employed residents often cannot support businesses and community institutions, making the area spiral downward.

Mixing uses increases opportunities for active and passive surveillance. Combining residential, work and commercial places within neighbourhoods can reduce the exposure to possible violence in public transport and ensure more surveillance. Allowing commercial activities around the clock, for example shops open late into the evening or all-night cafes will attract pedestrian activity and provide passive surveillance.¹³⁸

Public space and the use of existing public facilities for occupational activities can reduce crime. Well-maintained public space develops a sense of identity and ownership in communities, which can be an effective crime deterrent. Local schools can provide much needed space for community activities in a cost effective way. Developing a curriculum of activities is key for effective policies. The “Children Programme” in Santos, Brazil, is an after-school programme providing education, health, and food for 5,000 children living in favelas.

Conflictive spots like vacant buildings can be transformed into vibrant community facilities.

Using abandoned buildings as community facilities sends a message of collective improvement when they are part of larger neighbourhood improvement projects. In Diadema, Brazil, a community-based intervention increased residents' perceptions of safety and deterred others from lingering,¹³⁹ reducing the murder rate by more than 44 per cent in 2002.¹⁴⁰

Extending police services to marginal areas can improve feelings of security and reduce crime.

In many cities, police stations only service formal areas and leave informal settlements and poor neighbourhoods to fend for themselves against criminals. Being close to police facilities gives reassurance about a permanent commitment to curb crime.

Prevent crime on public transport

Urban design and frequency of service prevents crime related to transport.

Most transport-related violence does not occur when people are using vehicles but when they are waiting in stations and at stops or are walking to and from them.¹⁴¹ Designing stations as 24-hour activity hubs can improve their safety by facilitating pedestrian flow and maximizing passive surveillance.¹⁴² Waiting areas, bus stops and taxi ranks can be attractive to offenders, particularly when they are in isolated spots.¹⁴³ Improvements include good lighting and clear direction signs. The location of stops should be near built-up areas and existing road and pedestrian networks.



Mobile police facilities enhance security, Bogotá, Colombia
© UN-Habitat/Laura Petrella



Bangkok pink bus
© Flickr/Philip Roeland

Several cities specifically address women's safety in public transport. In Canada, Montreal's "Between two stops" programme allows women to get off between two bus stops to be closer to their destination.¹⁴⁴ London's "Safer Travel at Night" initiative successfully reduced the numbers of rapes and sexual assaults occurring in unlicensed minicabs. It was a joint partnership between the Greater London Authority, Transport for London and the Metropolitan Police Service.¹⁴⁵ Women-only transport services are a way to address safety concerns. "Pink" metro cars are available during rush hours in Mexico City (Mexico), Rio de Janeiro (Brazil), and Tokyo (Japan). "Lady Bus" services have been tried in Bangkok (Thailand).

Reduce the risk of crime through urban design

Reduce crime through urban design

Urban design can reduce the incidence of crime in communities. Criminal activities tend to be more common where there is insufficient street lighting; near unpaved trails and paths that block access to police cars and other vehicles; in vacant lots, derelict buildings; and where few people are watching what is going on, such as on deserted streets, areas flanked with high blank walls, and in large open spaces.¹⁴⁶ Safe design manuals and guidelines distributed amongst property developers help to incorporate safety issues in projects, and crime prevention mechanisms can be a prerequisite for granting planning approval as in Bradford in the United Kingdom (U.K.).¹⁴⁷ A number of governmental agencies in Australia, the U.S. the U.K. and Singapore have made urban design an integral part of their crime prevention strategies.



A bus stop in Shrewsbury, England
© Flickr/Calotype46

Design should create a sense of human scale and ownership of public space. Adequately modulating building height to street width ratios can avoid creating confined passages or vast avenues with limited natural surveillance. The treatment of building façades and other architectural features could also create friendly spaces through window placement, commercial ground floor uses and restricting blank walls facing pedestrian routes.¹⁴⁸

There is a direct relationship between public space design and maintenance and the perception and incidence of crime. A sense of “no man’s land” can lead to deterioration.¹⁴⁹ Public space maintenance is paramount to prevent vandalism, which could exacerbate feelings of insecurity and entail disinvestment. The “broken window theory” provides evidence that derelict spaces tend to attract a higher number of offences than those that are properly maintained. Good maintenance can also reduce the need for funneling cash into new assets.



Public space in Lyon, France
© UN-Habitat/Laura Petrella

Urban design features that increase safety

- **Lighting** is one of the main ways to make open and public spaces feel safer. As a general rule, more light fixtures with lower voltages is better; pedestrian walkways, back lanes and access routes to public spaces intended for night use should be well lit so that a person with normal vision can identify a face from a distance of about 10 metres.¹⁵⁰ Lighting should be brighter and there should be more of it in car parks, building entrances or access paths to public transport stops and stations, while paths or areas that people are discouraged from using at night should remain unlit. Thought should be given to possible light obstructions such as mature vegetation or bushes, and proper maintenance of fixtures should be ensured.
- **Passive surveillance.** The design of public space and green areas should facilitate passive (i.e. by-passers) surveillance by maximizing the number of “eyes on the street”. This has a number of design implications on the orientation of buildings, placement of entrances, windows, parking areas and pedestrian networks, and ground floor uses. The installation of close circuit television (CCTV) surveillance equipment helps to reduce vehicle crime in car parks.¹⁵¹
- **Pedestrian paths** should avoid dead ends and concealed routes, such as underpasses and tunnels. They should be well lit and if possible provided with vandalism-resistant street furniture. Whenever possible they should be connected to the main street network and existing pedestrian itineraries. Unsafe routes should be discouraged by clearly signalling preferred alternatives.¹⁵²
- **Sight lines.** The inability to see what is ahead along a route due to sharp corners, walls, pillars, fences, and mature landscape and other blind spots can make people feel unsafe.¹⁵³ Designing with visibility in mind should anticipate these and other possible obstacles.

Integrating transport and social infrastructure

Medellín, Colombia



Medellin, Colombia © UN-Habitat/Laura Petrella

The population of Medellín tripled between 1951 and 1973 fuelled by the city's manufacturing industry, principally textiles. Rapid immigration led to the development of informal settlements on the city's steep hills. Because they were difficult to access, the settlements became disconnected from the valley where the formal city is located. The very limited number of public interventions in areas such as Santo Domingo and La Aurora resulted in informal, chaotic and under-serviced growth. These areas became notorious crime spots.

The government of Medellín prepared an integrated plan to address issues of accessibility, inclusiveness and security. A key factor in the integrated approach was the simultaneous implementation of Metrocable, a transport system, and social infrastructure such as libraries, schools, sporting facilities and public spaces adjacent to stations.

How can urban planning generate financial resources?

As rapid urban growth exacerbates pressures on municipal budgets, the lack of resources may result in chaotic spatial patterns. Without adequate financial means local governments are unable to undertake the capital improvements needed to keep up with urban growth, let alone guide urban development. The challenge to deliver urban services for all while keeping taxes at a level that does not push out individuals and businesses highlights the importance to reach out to a variety of sources. In this setting, a city with strong urban planning and an engaged civil society and partners would be more capable to mobilise a resource base; it will be more investible than a city without direction. Capturing the value released from city extension and renewal is a way for local leaders to avail their cities of every opportunity to strengthen resources.



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Diversify the local resource base

Assess all potential sources

The redistribution of centrally collected revenues is often insufficient. Transfers from the national government include grants; local share of taxes collected by national (including Value Added Tax) and in some cases provincial authorities; and earmarked funds for specific projects. Transfers from the central to the local level are usually insufficient to provide adequate funding, and cities tend to rely on these transfers to bridge the gap between their revenue raising capacity and local expenditures. Ideally, central transfers should be made available to municipalities in time to allow them to prepare their budgets. In many developing countries, this is unfortunately not the case. Central transfers fluctuate from year to year, forcing cities to make ad hoc revisions to their budgets during the fiscal year.

Property tax and taxes on economic activities are the main sources of local revenue. These include income, sales, excise and shared taxes, and user fees for services provided by the municipality. The efficient collection of taxes is

a daunting task that can be made difficult by a lack of up-to-date records, the prevalence of informal housing and unstructured or informal economic activities. When central governments are in charge of collecting property taxes, their records for rapidly growing cities tend to be outdated since it is too costly to update them regularly. However, when a part of the property tax revenue is distributed back to the city, the loss caused by outdated records can have a profound effect on the municipal budget. For municipal taxes, an effective collection system is essential; billing should be reliable and timely to allow households to plan, and convenient places to pay are important to eradicate a culture of non-payment.

A cadastre is a key tool for tax collection. A cadastre is a long-lasting tool that is essential for managing growth and collecting taxes. Without a cadastre, existing properties and formal economic activities may carry more of the city's tax burden while new, often affluent development, escapes taxation. A rise in private property values, which may be the result of public improvements, is rarely a benefit to

Table 7.1 Local government budget in intermediate cities by region (sample of 73 cities)

Region	USD per capita
Africa	27.9
Latin America	763.8
Asia	210.1
Europe	1,001.9
Lowest: Brazaville, Congo	1.6
Highest: Lausanne, Switzerland	6,254

Source: Carmen Bellet Sanfeliu and Josep Maria Llop Torne (2003), *Looking at other urban spaces: intermediate cities, discussion paper*, UIA-CIMES and University of Lleida, Spain

the city because of obsolete tax rolls and no capacity to revalue properties. A system of “addressage”, which allocates addresses to each building, can be an interim option and involves drawing a street grid and assigning a numbered address to each parcel of occupied land. For property tax purposes only, the width of the building’s façade is measured to estimate the tax level.

The Bogotá cadastre

In 1997, Bogotá’s Administrative Department for the District Cadastre in Colombia set about updating the cadastre which resulted in the update of 1,734,622 properties, 102,531 of which were categorized as incorporated-as-new. The cadastral base value was increased by 32 per cent and a calculation suggested the district would receive an additional income of USD 24 million in property taxes per year. The city spent about USD 4 million on the updating process, a cost-benefit that is especially positive because this investment is only made once and the resulting additional resources are permanent.

Source: Bustamante and Gaviria¹⁵⁴

Public land is a key asset for the resource base. Assessing and keeping updated records of the extent of land owned by the local government should be a priority. The control of planning regulations which affect land value and the ability to release land to the market in time increase the strategic importance of public land and development rights as valuable assets. Land can be used as equity for joint ventures,

sold or given in concession for a period of time. Cities that have had major transformation projects either had full control due to the public ownership of land, or had acquired land in advance to be able to influence development patterns.

User fees need to balance performance and equity concerns.

Users fees are often set below cost-recovery level because this will allow poorer people to access services and acts as an incentive to use certain services (such as public transport). To increase recovery and balance accounts, cross-subsidy schemes have been used, or increased incentives have to be matched by increased transfers to service providers. Extending the compliance and overcoming non-payment practices requires an efficient billing and collection system, minimized tempering, and awareness building.



Cadastral information is essential for transformative urban projects, Nairobi, Kenya © UN-Habitat

A clear plan of investments and transparent public expenditures increase compliance.

Collection of fees and other charges is much improved when residents can see how the money collected is used and when there is a clear link with locally significant improvements. Building clear mechanisms for deciding on public investments and allowing residents’ participation have resulted in greater compliance and better understanding of the significance of charges.

Draw on the financial market

Cities access to financial markets can be achieved through various mechanisms. The access to domestic and international finance is not easy for many municipalities, which do not always have borrowing power. Ensuring

sufficient recovery and returns on investments to repay debts may not always be simple. Credit rating for cities is also not always available and perceived risk may make borrowing expensive, however, several options exist for municipalities, and mechanisms have been developed to enable them to access financial markets.

Cities that are empowered to borrow and issue bonds should be fully aware of the risks involved, which can be substantial during economic downturns. Estimates of incremental tax receipts to be derived from the new developments may not materialize to the extent or time-frame anticipated. In this case, the local government may be forced to issue general obligation bonds to cover the shortfall, thereby incurring new debt. Meanwhile, the new project will place demands on public services requiring operation and maintenance costs that cannot be covered by the TIF bond proceeds. Imposing impact fees on developers will work at

Table 7.2 Typology of mechanisms for access to financial markets

Financial mechanism	Objectives	Characteristics	Examples
Special financial vehicles (independent, wholly-owned companies)	Large scale urban projects	Municipalities that have no borrowing power borrow through such vehicles from the financial market	China
Municipal Development Funds (MDF) and Municipal Finance Institutions	Capital investments	Central governments institutions that access financial markets and borrow to municipalities	Colombia (FINDETER)
Social Investment Funds (SIF)	Pilot projects aimed at social development and poverty reduction	Management companies and other organizations borrow to low income residents and businesses	Pakistan (Acumen Fund)
Tax Increment Financing bonds (TIF)	Finance front-end costs for the development of financially viable projects: mixed-use projects and industrial and office parks	To be repaid from the revenue from additional tax receipts from the project	Unites States

Source: adapted from various sources

cross purposes with the need to accelerate the pace of private investment. Cities in developing countries have been unable to use this source due to a lack of borrowing power or lack of credit rating.

Leverage informal contribution to resource base

The informal sector can contribute to the resource base. Municipalities are seeking ways to integrate the informal sector into the resource base because the informal economy is an important share of the local economy. Registering vendors and providing them with the right to operate will help to integrate this sector and allow the city to better monitor and promote its economic activities. A common mechanism is to apply flat fees for street

vending and market stalls that are collected from hawkers in informal areas and along the commercial streets.

Remittances can be used to finance basic infrastructure and community facilities.

Creating partnerships between the associations of expatriates, local authorities and community-based organizations can lead to funding targeted projects. For example, in the Philippines, the local government of Pozorrubio encouraged its large population living abroad to channel remittances towards public works projects. Pozorrubio is now one of the most developed rural centres in the Philippines and has one of the highest tax collections in the region.

Microcredit can enable informal residents and entrepreneurs to participate in urban improvement. Microcredit institutions can play an important role in upgrading informal settlements if they provide loans for home-based economic activities. In Ahmedabad, India, where 45 per cent of the population lives in slums, the municipality improved infrastructure for basic services, while SEWA Mahila Trust provided credit to households to cover their share of the house connection costs. Through this cooperation, in five years over 40 slums had piped water and good sanitation, which reduced infant mortality rate, and there was an increase in economic activity and a decline in crime rates in slum areas.



A licence fee is charged on this craft hawker market in Nairobi, Kenya @ UN-Habitat/Cecilia Andersson

Increase attraction in investment through urban planning

Create value for investors and households

Having a plan is an asset for investment

interest. A plan aims to create stable conditions for development and is a key instrument to managing development. By having a plan, a city can show that it has an efficient and forward-looking system of governance, which is invaluable when competing for investment. It can be used to promote the city when seeking support from partners and funders, and leaders with an urban development framework to guide urbanization and promote economic growth can use it to:

- Facilitate the progressive creation of cadastral records
- Market proof infrastructure needs
- Prioritize strategic nodes and understand what incentives can be given
- Prepare market materials that communicate the local development vision, which can be used to attract investors' long term attention
- Create a framework of regional coordination to avoid competition among municipalities. This can be formal, for instance through a regional development agency, or informal where jurisdictions meet on a regular basis to discuss needs and priorities

Cities need to be strategic and realistic in the use of incentives.

There is no undisputed evidence that tax cuts and sales tax exemptions automatically lead to investment¹⁵⁵ and incentives should avoid creating an artificial set of conditions which become the only

attraction for investment. Assessing the capacity to sustain incentives over time is critical to prevent investment migration. City leaders must cooperate with other cities to establish incentives because competition between adjacent jurisdictions for incentives can lead to falling land prices or labour standards. Market access, a stable socio-political environment, ease of doing business, reliability of infrastructure and utilities, and availability of skills are some of the most important elements in choosing where to do business. For example, corporations put a high value on being able to set up a single-office where they are offered inward investment, uncomplicated business licensing and assistance.

Spatial planning incentives

- Land consolidation into single-owner larger parcels to achieve critical mass for investor-led projects
- Infrastructure improvements, including telecommunications, roads, water and sanitation, and accessibility to ports, airports and train stations
- Industrial and business parks with appropriately priced serviced land, next to transport infrastructure and other specific needs of sought-after industries
- A supply of affordable workspace for start-ups in targeted industries, encouraging clustering, synergies and innovation.

Key success factors of Special Economic Zones in China.

Special Economic Zones (SEZs) have been key drivers of China's development since the country's 1978 Open Door policy which promotes foreign trade and economic investment. They are estimated to have contributed 18.5 per cent of total GDP in 2007, 60 per cent of national exports, 46 per cent of total FDI and 4 per cent of national employment. SEZs are defined by:¹⁵⁶

Flexibility and autonomy. Economic and political autonomy and legislative power allowed SEZs to pass a wide range of municipal laws and regulations, including adjusting tax rates and establishing labour markets that started to resemble those in open economies.

Single-counter service. Administrative autonomy allowed SEZs to ensure business permit approvals within 24-hours.

Incentives for investment. These were aggressive and included attractively priced government-owned land, concessionary tax rates, tax breaks, and generous exemptions for foreign investment (at 15 per cent instead of 30 per cent for domestic), rapid customs clearance, allowing repatriation of profits, duty-free imports and export tax exemption, among others. Virtually all of these policies were completely new in China and were implemented gradually.

An efficient infrastructure system including roads, ports, communication technology, water, energy and sewerage.

Location. Many SEZs were developed near ports for easy links with international markets, and were strategically located to capture investments from Hong Kong, Macao and Taiwan Province of China.

Use public investment strategically

Cities can reduce costs to investors and increase the value of assets through planning.

Rationalizing investment in public resources and controlling the release of land to the market creates positive conditions for a return on investment and ensure assets keep their value. Land use policies that ensure affordable housing, and infrastructure that gives access to employment and community services will improve social capital, promote cohesion and reduce the likelihood of civil unrest. Conversely, lack of planning can result in congestion and

public space neglect, which may lead to declining land values, deteriorating infrastructure, less tax income and disinvestment.

Improved accessibility has an immediate impact on land value.

Integrating policies in spatial planning with public investment in transport systems can substantially increase the value of land. The ability of customers and employees to get to shops and work plays a major role in location decisions and drives up the value and desirability of land. This added value can be used for infrastructure investments, allowing local governments to recover investment, pay for operations and maintenance, and, in some cases, expand transport networks.

Capture value from city extension and renewal

Understand how urban value can be captured

Developers can be required to pay for infrastructure in new areas. As developers acquire development permits, they may be requested to pay for the cost of infrastructure for the area. They will in turn recover costs through land sales. The developer may be asked to build the infrastructure directly or pay its costs as part of the development licence. This is widely used to meet city extension infrastructure needs. It requires clear planning regulation, delivery capacity by the infrastructure provider, and the capacity to link developer's infrastructure to public systems, such as roads and trunk utility lines. In Cairo, Egypt, the central government transferred 694 million square metres of desert to the New Urban Communities Authority (NUCA) to accommodate expected urbanization needs. In 2007, NUCA auctioned off land parcels with basic infrastructure services for USD 3.12 billion, more than recovering the cost of the infrastructure investment. Some of this money was to be used to build a highway connecting the new city to the Cairo Ring Road.

Land-value gain resulting from infrastructure projects can be taxed. “Betterment levies”

are a one-time tax on the estimated land-value increase associated with transport and road construction and improvements projects, a rise typically of between 30 and 60 per cent. These levies are difficult to administer, however, if increases are estimated on a plot by plot basis and are better calculated by area or city-wide, depending on the investment programme. In Bogotá, Colombia, valorización has financed more than USD 1 billion of public works, including 217 street, bridge and drainage improvements. It takes into account ability to pay, is payable over five years and is citywide, all of which have reduced public resistance.



In Bogotá, Colombia value capture has financed more than USD 1 billion of public works © UN-Habitat/Laura Petrella

Public land sales can capture the benefit of public investment.

Land surrounding major urban motorway projects can be transferred to a private-public development corporation, which then borrows against the land as collateral, finances the construction and then sells the land. This allows municipalities to realize major infrastructure project with no financial loss. In China, the city of Changsha created a publicly-controlled Ring Road Corporation to build a USD 730 million motorway and the municipality transferred strips of land totalling 3,300 hectares on both sides of the road. Half of the motorway cost was financed by the transfer of leasing rights and the other half was financed through borrowing against the future anticipated value of improved land. In cities where land is privately owned, this method requires the public sector to first acquire it. Reaching social agreement between occupants and other claimants is a key issue.

Selling development rights is an alternative to selling land.

Development rights on a plot depend on the provision of the urban plan. They are introduced with the conversion of rural land to urban use, and vary depending on the plan. In some places, they involve the right to build at greater density; that is, adding additional floor space than would normally be allowed. For example, São Paulo (Brazil) sold additional construction rights to help finance public investment surrounding designated growth poles in the city, such as transport nodes where higher-density development is appropriate. In Faria Lima Avenue, land value increased from USD 300 per m² before public investment to USD 7,000 per m² afterwards, and the municipality sold 2.25 million m² of floor space

rights within the 410-hectare development area at USD 630 per m².

Excises on property appreciation can fund neighbourhood improvement.

“Linkages” charge developers a fee on projects above a maximum level of commercial floor area, payable over a period up to 12 years, to fund social projects in poorer neighbourhoods. In Boston in the United States, the fee was used to subsidize the construction of affordable housing and to provide job training, with a requirement that 20 per cent of any linkage payment be reserved for use in the area surrounding the development project. Cuenca, Ecuador, launched a neighbourhood improvement programme funded by property owners who were charged based on lot frontage. The funds were used to pay the engineers and builders of the public works.

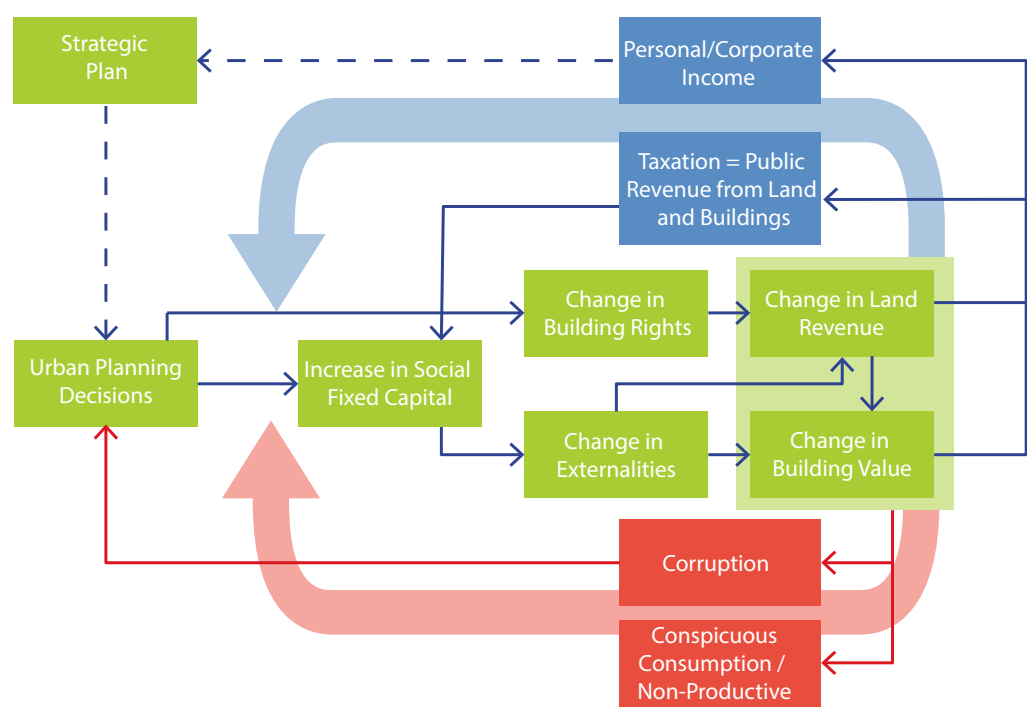
Set planning frameworks that enable value capture and sharing

Without a plan, capture of urban value is virtually impossible. Urban land values are determined by the location of land vis-à-vis the plan, the infrastructure and other valuable territorial assets (natural scenery for instance). Only in the presence of an urban plan determining land uses and the future developments in an area, and protecting natural assets and the common goods, it is possible to have a predictable market, determine the value of land, and establish a link between public investments and land values. Plans identify areas that are suitable for conversion from rural land to urban use and designate priority areas, where development can be accelerated by capturing land values and the procedures are transparent. A plan also provides the framework for setting transparent charges and standards, and the development/building permit process that can enable the collection of the charges. All forms of capture require a legal urban planning framework with rules that are enacted by the local legislature.

Enacting value capture needs sound planning frameworks. To tap into land value increments, the benefits from a specific investment or project need to be clearly spatially distributed in an area (called “benefit zone”). A well-designed city structure and land financing system reinforces the efficiency of urban land markets.

Capture modes need capacity and to realistically understand the market. The level and mechanisms of value capture need to be proportionate and feasible. They should not create a disincentive to development, and must pursue opportunities to synchronize the release of land to market needs. Capture methods can be sophisticated and need good management capacity. Value capture upfront of development may be jeopardized if there is lack of trust in the capacity of the public administration to follow through the plan and the investments.

Illustration 7.1 Virtuous cycle of land value creation



Source: adapted from Roberto Camagni

Spatial planning tools create a revenue stream

Hargeisa, Somaliland



Hargeisa, Somaliland © Flickr/Tristram Sparks

Hargeisa, the main city in Somaliland, is experiencing acute urban development challenges. The regulatory vacuum that followed the civil war in the 1990s led to disputes and violent conflict over land, while rapid population growth and the return of former refugees have considerably strained the city's infrastructure. The lack of information on land ownership and poor financial resources to deliver basic services hinder the municipality's ability to plan, which results in unplanned urban expansion.

Gathering and updating spatial and land ownership information, developing municipal capacity and establishing a tax revenue stream are critical to address unplanned urban development, to improve the conditions in informal areas and to develop land management information that helps to prevent land disputes, a priority issue for the local government.

Solution

To generate a municipal revenue stream that could be used for public works, the municipality of Hargeisa, with support from UN-Habitat, the United Nations Development Programme and the European Commission, began in 2004 to create a land and property database, and a methodology for classification and generating property tax invoices. The property survey, prepared over a period of a year, was done rapidly and cost effectively. Data was stored in a Geographical Information System (GIS) database for quick retrieval and mapping, allowing the local government to begin tax collections very quickly. The database consists of a large-scale map of all buildings, which was prepared using very-high resolution satellite images, and links data such as plot size and building floor area and use collected from field surveys and interviews with property occupants.

The database provides important information for urban planning, such as land use mapping and population estimates, using buildings as a proxy for calculation. It allows for the establishment of district neighbourhood boundaries that would facilitate plan implementation. Using the database, the planning office was able to estimate that 22 per cent of Hargeisa's 1.3 million inhabitants live in informal housing. Using the system, the local authority prepares hard copies of property tax bills – each of which has a photo of the property – and neighbourhood maps once a year and distributes them to each of the five municipal district offices. Trained municipal district staff continually verify bill information in the field, and the GIS support office updates the database as needed. Households get a receipt when they have paid. The property survey and GIS database preparation began in July 2004 and ended in March 2005. The preparation cost (excluding the equipment such as Personal Digital Assistants or PDAs, office computers and software, but including satellite imagery) was USD 48,500 (USD 0.82 per property).

The database is modular in the sense that it can be expanded into a full cadastral system. The initial module facilitates the levying of property tax very rapidly but cannot be used for legal applications and land disputes - it is a fiscal cadastre, not a legal cadastre. As a first step, its consolidation and expansion requires political will and institutional maturity to put in place municipal by-laws that enable enforcement, and a willingness to cooperate and exchange information to create robust plans. Among the critical hurdles to overcome was a widespread reluctance to tax schemes. Awareness-raising campaigns were useful in changing attitudes, but there is nothing more compelling than visible improvement, for example using taxes collected to upgrade the road network – a priority for taxpayers. A key challenge to overcome for the system's sustainability is to meet the cost of maintaining and updating the database. To ensure continuity, the municipality has to find ways to support tasks until municipal staff can run the system without being dependent on external expertise or funding. Rooting the process in municipal operations is essential to enable departments to use and expand the database.

Results

The spatial information database and the property tax scheme have enabled the local government to increase tax collections from USD 60,000 in 2008 to USD 282,725 in 2011.

Since 2006, when the GIS system became operational, the percentage of taxed properties has increased from 5 per cent to 45 per cent. Before the preparation of the database, the municipality had 15,850 properties on record. Now, the database consists of information for 59,000 properties over five districts.

More than 40 new roads have been built by the local government with the contribution and collaboration of the local community; eight new markets and two police stations have been built; and a land plot has been allocated to the Maternity and Health Centre.

How to allocate investment

Increasing urban revenue is one side of the equation. However, allocating local resources smartly, particularly when they are scarce and there are many needs, is crucial. To make an impact, cities need an integrated approach to urban investment from appraisal to assessment of outcomes – something to which urban planning can contribute. Uncoordinated sector projects, although they might be successful on their own, cannot generate the transformational impact which can be achieved by interlinking the projects through strategic, well-prioritized capital programming. The coordination between urban planning and investment programming, the systematic prioritization of projects, accountability and transparency, and the use of budgets as a catalyst for improved performance are essential to get the most out of citizens' contributions.



Coordinate urban planning and investment

Tap on urban planning for efficient infrastructure investment

There are significant advantages in approaching spatial and infrastructure investment together. One advantage is that it enables investment to respond to urgent needs while addressing long-lasting, cross-cutting issues. Infrastructure investments trigger and enable urbanization, while spatial planning provides proactive demand-side management. A city's spatial structure determines the location, concentration, distribution and nature of the demand that affects the design of infrastructure systems. Because it establishes the physical and economic parameters for infrastructure system design, capacity thresholds, technology choices and the economic viability of the various options, spatial planning would benefit from early interaction with infrastructure programming. The available budget for implementation will be used more efficiently, time would be saved and misalignments between supply forecasts and actual needs would be reduced.

Spatial plans can improve infrastructure cost-efficiency. The cost of providing trunk infrastructure is particularly sensitive to a city's spatial form.¹⁵⁸ Lower densities generally mean longer lengths of water and sewer pipes. Reducing the distance to service centres, thus shortening the length of transmission mains, will lower costs. Spatial plans provide valuable information on prioritization of delivery. The right decisions on density and land use policies can induce earlier amortization as investment

would be deployed where and when it is needed. In various locations in the United States, infrastructure costs (annualized capital and operating) were 30 per cent higher for development with 11 dwellings per hectare than for 32 dwellings per hectare.¹⁵⁹ In the United Kingdom, a density of 70 dwellings per hectare produced savings of 63 per cent compared with 22 dwellings per hectare.¹⁶⁰

Spatial choices that can help optimize investment

- Optimize density by redeveloping vacant, derelict or underused sites; maximize the capacity of existing infrastructure through management
- Ensure that greenfield development occurs in a compact pattern to minimize the amount of network infrastructure required; set density at an optimum value; consider the location of central facilities when determining new development areas
- Avoid discontinuous growth in areas lying outside the urban fabric, unless such nodes can be self-sustaining, which would require a balanced supply of jobs and housing.
- Promote a closely mixed pattern of land uses that minimizes road infrastructure requirements

Infrastructure networks influence spatial plans. Infrastructure can shape a city for decades, if not forever, and decisions on where to lay it out influence the direction of development affecting the desirability and land value of the areas served. Infrastructure planning should follow and not precede decisions on the optimal spatial structure.

Integrated spatial and infrastructure investment planning is an asset for investment recovery because it would facilitate capturing the increase of land value.

Make plans more implementable from the onset by upstreaming implementation knowledge

Early integration of implementation know-how into spatial planning can save time and resources.

In the chain of city planning and production activities, plans are theories that are carried downstream until they are faced with the realities of execution. Integrating implementation considerations from plan inception including technologies available, management options and financing resources may improve the fit between plan and execution, increasing relevance, cutting implementation time and reducing costs. Turku, in Finland, has partnered with the World Business Council for Sustainable Development, which groups a number of leading urban services enterprises. These have transferred knowledge on trends and success factors on key areas including transport, logistics and energy supply towards jointly developing new solutions and accelerating action.

Establish priorities and respond to demand

Establish a method for prioritization

Laying out clear rules is fundamental for prioritization. A framework detailing all aspects of the decision-making process should be defined and agreed on from the start. It would include:

- Assigning responsibilities for stakeholders in each step of the process
- Determining the eligible types of projects to be considered
- Assessing local budgetary capacity, identifying funding options

The City Infrastructure Investment Programming & Prioritization Toolkit

Developed by the Cities Development Initiative for Asia (CDIA), the toolkit helps municipalities throughout Asia to do a better and more structured job in urban infrastructure planning, prioritization and programming. It facilitates the first step in the process from a wish list to a shortlist of infrastructure projects ready to be presented to financiers and project developers.

Source: CDIA. <http://cdia.asia/wp-content/uploads/User-Manual-Generic-version-2010.pdf>

Prioritization facilitates the transition from wish list to shortlist.

A wish list contains all projects that are eligible for consideration. They should be pre-screened on their strategic alignment at a city level and vis-a-vis the local government budget capacity, and ranked by the number of criteria they satisfy. The input of stakeholders will significantly contribute to make the selection process market-proof.

Key project selection criteria

- Consistency with city development strategy
- Completion of on-going projects
- City obligations entailed
- Infrastructure requirements
- Impact and benefit assessment (social, economic and environmental)
- Recommendations by city departments, other agencies, communities, and stakeholders
- Possibilities of using off-budget sources of finance
- The needs of under-served communities

Incorporate a participatory approach in prioritization

Participatory budgeting aims to ensure that investment has a real impact. It considers both immediate requests by residents and longer-term investment identified by the municipality. Residents vote in community-level assemblies on the priorities in their area (i.e. housing, education, street paving), and they select delegates who, to make the process operational, will represent them. Delegates review requests and prioritize investments according to a set of criteria that weigh the degree of support obtained by each request along with infrastructure and service deficits. With this input, municipal departments prepare the final draft of the budget and present it for approval before the local authorities.

Porto Alegre (Brazil) has been a pioneer in participatory budgeting since 1989.

Key success factors include:¹⁶¹

- Political will and leadership - it is the mayor who initiates the process
- Strong community-based organizations and true civil interest in engaging and sustaining participation
- Laying out clear rules that are respected through each budget cycle
- Allocating human resources to run the participatory budgeting process.

Participatory budgeting can increase accountability and promote a more equal development pattern. It induces more

transparent management in cities where traditionally lower-income groups have had no voice. Even if participants only decide on the allocation of a share of capital investments, the system has proved to promote more equal development, leading to poverty reduction. If it is done transparently, this process can help reduce corruption; a peaceful and trust-based civic climate, as opposed to one that is based on confrontation, will make the city more attractive for investment.

Participatory processes in financial management require significant human resources and can be challenging to implement

because they tend to be permeated by local politics. The participatory budgeting process introduced in about 200 municipalities in Brazil covers all capital investments, which range from 5 per cent to 15 per cent of the total budget. This is made possible by a significant commitment of skilled human resources and a high level of managerial capabilities. There are numerous ways in which culturally-adapted public participation can be implemented. At the very least, small community meetings can decide on priority needs, explain the municipal budget, discuss proposed projects and establish priorities through discussions or by voting.

Participation can be used to explain the impacts of tax avoidance. It is an opportunity for local authorities to discuss with the community the lack of financial resources to meet all needs and why taxes and fees are critical to cover service provision costs. Whether in large public hearings or small community meetings, every opportunity should be taken to stress the negative impacts of tax avoidance and non-payment and address the causes of it (irregular and incorrect billing, poor collection process, instances of corruption and fraud).

Develop a capital investment plan

A Capital Investment Plan provides a detailed understanding of anticipated investments into capital assets such as bridges, roads, and water and wastewater systems. A list of unfunded priority projects from the previous year becomes the starting point for the following year and newly-identified projects are added to the list. Capital investment planning this way becomes “rolling” with each yearly revision of the plan. The city of Tshwane in South Africa has developed an extensive capital budget, which includes strategic objectives based on community needs that have been identified through a consultative process.

Benefits of a capital investment plan

- Allows matching the most important projects with the most appropriate funding sources
- Incorporates stakeholder’s inputs in the decision-making process
- Establishes a transparent and efficient process for allocating local revenue from all sources
- Sets a practical fiscal strategy integrating local finance into municipal management
- Underscores the interconnectedness of projects that should be planned and preferably implemented together

Cost and revenue accounting facilitates performance measurement. Most financial budgets and accounting statements in the world’s public sector are still prepared and reported on a cash “receipts and payments” basis that impairs their use in performance measurement. The use of accrual “income and expenditure” accounting shifts the focus from deposit and withdrawal transactions to finance (costs and revenues). Cities that have high technical and managerial capacities have introduced resource consumption as a criterion for prioritization.

Enhance performance through transparency and accountability

Accountability and transparency are assets for a performing city

Accountability is a cornerstone of good governance and places as much emphasis upon transparency as upon finance. Demands for greater accountability by voters and taxpayers have combined with the constraints on the financial resources available to the public sector to fuel political pressures for improving municipal financial management. Using simplified performance information to involve communities has helped to engage citizens in shaping their communities, notably São Paulo (Brazil) and Bogotá (Colombia).

Transparency in procurement is an asset for good performance and prevents infrastructure investment decisions from being affected by corruption and favouritism. A systemic approach would ensure a fair selection process, authentic monitoring and meticulous implementation. This would mean establishing procurement reforms and transparent contracting arrangements from the onset. Independent audits, public displays of tariffs and publication of annual activity reports, with specific mention of how services are being improved for the poor, are necessary once projects have been implemented.

Use budgets as a performance instrument

Keeping operational and capital expenditures separate is essential. Under-performing

infrastructure assets are a key issue in many developing cities so the condition of assets should be continuously monitored. Infrastructure deteriorates and becomes less efficient with the passing of time but if maintenance is attended to only when the situation reaches crisis levels, the functional efficiency of cities is impaired. Debt service often makes it difficult to keep up maintenance of assets so to adequately manage these responsibilities; all items in municipal budgets should be categorized as recurring expenditures in the operating budget (fixed costs, salaries, debt service if any) or as capital investment expenditure. This categorization is critical since their funding differs markedly.

Brazil's Law of Fiscal Responsibility

In Brazil, the privileged status of state and municipal governments under the 1988 Constitution strengthened the role of mayors and governors. However, these constitutional guarantees fuelled municipal mismanagement and the multiplication of municipalities. The passage of the "Fiscal Responsibility Act" in May 2000 mandated multiyear budgeting with fiscal targets, contingent liabilities and cost controls and introduced balanced budget principles and incentives for mobilizing own resources. The law caps expenditures on personnel at 60 per cent of the municipal budget and mandates expenditures on education at no less than 25 per cent. It limits borrowing to the financing of capital expenditures, and adequate reserves should be set aside to offset increases in long-term financial obligations. To ensure transparency, by law the public has to have access to fiscal and budgetary information.

Source: Serageldin, M. et al, Assessment of Participatory Budgeting in Brazil, 2003

Financing transformative plans

Shanghai, People's Republic of China



Shanghai, China © UN-Habitat/Julius Mwelu

The vision to transform Shanghai into a world finance and trade hub that would serve as the gateway to the global economy was formulated by the Government of the People's Republic of China in 1992. The extensive infrastructure investment required to fulfil this vision prompted the local government to tap into a range of financial sources.

In the two decades that followed, Shanghai went through an unparalleled urban transformation. Urban infrastructure was upgraded through investment in power generation, water supply and sewerage systems, and improved waste disposal facilities. Environmentally degraded areas were regenerated alongside urban renewal projects and the creation of large green areas.

Solution

The Comprehensive Plan 1999-2010 was the key to the holistic transformation perspective and the prioritization of investment. Following the City Planning Act (1990), planning became a statutory requirement for cities in China and municipal units were made responsible for the preparation and approval of planning regulations. The power to classify land to be urbanized, to authorize its leasing, to issue building permits and to enforce state and local laws enabled the local government to steer Shanghai's urban development. The Comprehensive Plan established five functional hubs within the central area, creating significant opportunities for mixed-use development. The reform of land use rights and flexible land classification made real estate soar. Satellite cities, designed to play an important part in absorbing rural migration, were created by the extension of suburban towns that had a significant industrial base or were adjacent to principal arteries. Shanghai has a long tradition of preparing urban development plans, which dates back to 1931 when the first plan was prepared. The local planning bureau has profited from this experience when preparing succeeding planning instruments. The preparation of the Comprehensive Plan began in 1992 and, after consultations and local endorsement, it was approved by the State Council in 2001.

The substantial investment required needed to be considered along with the reality of limited local finances. In 2008, the central Government's contribution was just 2 per cent of the fixed asset investment. State-owned enterprises (SOEs) were set up to raise funds for the construction of transport infrastructure and facilities for utilities. SOEs set up holding companies listed on the Shanghai Stock Exchange and were able to obtain loans from commercial banks. In the water and wastewater sector, the gradual reform of pricing since 1990 resulted in an increase of collected tariffs from almost zero to USD 1.5 billion by 2008. Investment in revenue-generating infrastructure, such as expressways, water supplies and wastewater treatment, was secured through concessions, leasing, joint venture agreements and other public-private partnerships. For example, shifting the toll expressway operating rights to private investors contributed USD 6.5 billion to the construction of the expressway network. Investment in energy and utilities was a priority to enable the development of economic activity. In 1990, the energy sector concentrated 60 per cent of the total infrastructure investment. Once an indispensable energy supply had been ensured, investment in the sector contracted progressively to 7 per cent of the total in 2008. Investment focus turned then to public transport networks needed to enable the urban expansion foreseen in the Comprehensive Plan. Out of the total investment in infrastructure, transport accounted for 48 per cent in 2008, up from 15 per cent in 1990. Investment on public works construction remained stable between 1995 and 2008 at around one third of the total.

Results

Shanghai's diversification of resources meant that by 2009 the municipal revenue was 14 times higher than in 1990. The local government was able to increase infrastructure investment from about USD 40 per capita/year in 1990 to USD 1,341 in 2008. Shanghai's international connectivity was substantially enhanced with the construction of a new airport in Pudong, the renovation of the Hongqiao Airport, and a deep-water port in Yangshan. The Shanghai Metro, opened in 1996, is today 425 km long, which makes it one of longest systems in the world. Intra-urban mobility was further improved through the construction of ring roads, elevated expressways, and bridges and tunnels across the Huangpu River. The length of road per capita doubled between 2000 and 2008. The length of the sewers system also doubled in the same period. Partnerships were leveraged to delivered wastewater facilities and sanitary landfills.

Attention is progressively shifting to environmental issues, including the improvement of air quality and the provision of green spaces. Suzhou Creek, once a polluted waterway in central Shanghai, has been environmentally recovered, and the area that is dedicated to public space has almost tripled.

How to create partnerships

Well-structured partnerships with people, the private sector and other levels of government are one way for cities to mobilize support and get the resources needed to implement local plans and deliver municipal services. Leveraging the resources of others brings access not only to funds, but also to technology and managerial skills that are needed for projects. Partnerships with community-based organizations can mobilize residents' energy and resources and make projects progress faster.



Partner with people

Get the participation basics right

Engaging residents leads to effectiveness.

Embracing participation and community engagement means accepting that effectively tackling urban challenges is an extremely complex task beyond the reach of any local government acting on its own. Citizens know the city where they live and have ideas on how to make things better. Experience has shown that tapping into this “social capital” can have a positive impact on business climate, poverty and service delivery, as well as transparency; however, importing successful practices from other cities need careful adjustment to the local characteristics.

Community engagement reduces the likelihood of planning mistakes. Failing to engage the community has resulted in

unsuccessful policies, poor planning decisions and failed investments. It has also meant that infrastructure and urban services deficits have not been tackled effectively. Inefficiencies, poverty and slums have negative effects on the image of the city leader as an efficient manager; they undermine public trust and plant seed for disagreement with the constituency. Urban planning benefits from ideas that have developed through participatory processes through:

- Demand-oriented policies that increase the impact of public resources
- Increased public trust in local government and awareness of its activities
- A more collaborative climate.

Institutionalizing participation facilitates monitoring and continuity.

Effectively incorporating a participatory approach requires resource allocation, including capacity building of staff. Once they have been tested and refined, institutionalizing processes would help to consolidate them and prevent disruption by partisanship and municipal election cycles. Participation manuals and checklists to coordinate action across municipal departments, documentation of successful practices and knowledge transfer, are additional resources to institutionalize participatory approaches.



Community participation has a positive impact on planning in Indonesia © UN-Habitat

Mainstream participation in spatial planning

City development strategies engage local actors and identify key actions. Strategic Urban Planning engages local actors in city-wide assessments to get a long-term vision and to identify key “strategic thrusts”; taskforces can put these thrusts into practice with action plans. Involving stakeholders can lead to inter-sectorial synergies that would otherwise go unnoticed and because consultations do not entail any delegation of a local government’s statutory powers. Some of the challenges presented by such processes are that they tend to be lengthy and require sustained commitment, and they can lose momentum, particularly in the implementation stages.

Mainstreaming gender in spatial planning has positive side effects. In developing cities, women are significant income earners yet their voices are seldom heard in public decision-making. Spatial and economic development initiatives from women’s perspectives have led to improvements for entire households. Gender checklists are a good way to mainstream women’s view; consultations, safety audits, social mapping sessions and design charrettes, or workshops, can be used to tap women’s knowledge and to come up with effective solutions.

A demand-driven approach can lead to improved shelter and services. Being flexible about upgrading processes will lead to the community buying into them, which ensures greater project impact. Engaging communities in upgrading works reduces costs and improves quality compared with traditional contractor-driven work. For example, community meetings in Mumbai, India, identified a need to separate men’s and women’s toilets and provide sanitation facilities with water connections. The new design added some community demands, such as special children’s toilets, separate urinals, private bathing places, a queuing space and a caretaker’s room.¹⁶²

Partnering with the community enables a better response to hazards. Communities exposed to risks typically have a detailed knowledge of how natural hazards affect their neighbourhood. Community organizations can do risk mapping exercises and use workshops to disseminate cost-effective actions, including identifying protected locations and recommending affordable materials to build sturdy shelters. Partnering with the community in high-risk settlements can increase the effectiveness of post-disaster relief. While social mobilization is not a replacement for relief plans, community outreach can help to reduce the death tolls and the levels of hardship endured by lower income population.

Partner with the private sector

Explore partnership modalities

Urbanization challenges cannot be addressed without an active private sector.

Private-public partnerships (PPPs) are an indispensable asset for infrastructure projects. There are a variety of models for these partnerships in which participants take on different roles regarding initial investment, maintenance costs, management, ownership and other considerations. Through a PFI (Private Finance Initiative), Birmingham, in the United Kingdom, has established a 25-year partnership with an urban services company to maintain 2,500 km of roads and 100,000 street light points.

Build-Operate-Transfer (BOT) is the most common model.

The private partner is responsible for design and construction, finance, operations, maintenance and also assumes the commercial risks associated with the project. The firm owns the project throughout the concession period and the asset is transferred back to the government at the end of the term, often at no cost; the public sector regulates and oversees the project to ensure it adheres to policy, regulation and socioeconomic goals. The benefit to the public sector in this model is not only the access to private capital, but also to the technical expertise and managerial efficiency of firms in the private sector.

The success of PPP structures comes down to understanding the impacts on governments, sponsors and users.

These include the cost of capital, which might be higher in developing countries; inflation, because high-growth markets tend to suffer from high levels of inflation; currency risk, because for many infrastructure projects revenues and expenditures are accounted for in local currency, which requires debt and equity to be raised in local currency as well; and demand risk, which might require government support in the early years of the project.¹⁶³

Partnering with the private sector requires a sound legal framework.

A necessary precondition for partnerships is to build a sound legal framework and create an enabling environment that would bolster investors' confidence, reduce risks and set the conditions for improved investment performance. This would allow municipal governments to access infrastructure funds for specific sectors. For instance, China's Qing Cao Sha raw water reservoir and distribution system in Shanghai attracted a CNY 2 billion insurance fund as part of a total investment of CNY 16 billion.

Partner with other instances of government

Pool with other municipalities

Groups of municipalities have been able to obtain pooled financing. The group's size and managerial capacity allows them to access funds on better terms than they would individually. When macro-economic conditions allow, cities in developing countries will find opportunities for joint access to capital sources; in emerging economies, central government involvement has enhanced local authorities' capacity to access to funding on favourable terms; in poorer countries, donor support serves as a catalyst by setting up development funds. Formalizing inter-municipal collaboration is challenging if there are no institutional and economic incentives to form strategic associations.

Wider area planning and coordination can help harmonise development and enhance revenue. Municipalities that agree to develop large scale plans in collaboration with neighbouring municipalities can better coordinate development decisions, harmonize charges and taxation mechanisms and, in some cases, they have been successful in limiting unnecessary investments and maximizing the impact of projects. In the Emilia Romagna Region of Italy, multi-municipal plans are used to identify key investment areas in the most appropriate way, rather than having competition among municipalities. Benefits in the form of charges or revenues are then shared through a special fund among the participating municipalities. In this way, collaboration rather than competition between municipalities is

promoted. This has led to a reduction in land consumption and increase in the average revenue from land development.

Partnering with other cities can empower individual local governments. While the financial tools available to a city are often largely determined by national or state legislature, municipalities can use regulations targeted to their needs. A union of cities can be an important strategy to empower individual local governments because it creates a collective voice useful at the national or regional level. The South Africa Local Government Association (SALGA), for instance, promotes local government interests by working to influence the legal framework to best fit the local development agenda. The Mancomunidad Zona Metropolitana Valle de Sula in Honduras, which groups 20 municipalities with a total population of 2.5 million people, enables them to access capital markets as credit-worthy units.



Participatory planning in Nepal
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Linking participatory budgeting and spatial planning

Belo Horizonte, Brazil



Participatory budgeting in Belo Horizonte, Brazil © Belo Horizonte Sec. Municipal de Planejamento, Orçamento e Informação

Planned as a garden city in the late 1890s, Belo Horizonte is today a dynamic urban area with 2.4 million inhabitants. Although some neighbourhoods have a high standard of living, informal settlements concentrate 20 per cent of the population into less than 5 per cent of the administrative area. These settlements are mostly in risk-prone areas and they are overcrowded, lack drainage systems and have limited access to infrastructure and services. In 1993, Belo Horizonte began to involve residents in participatory budgeting (PB) processes to increase the impact of planning in people's lives.

"Having a say stems from the right to the city," says Marcio Lacerda, Mayor of Belo Horizonte since 2009. He recalls: "We soon realized that we had to work out an incremental approach." This was reflected in the continuous monitoring of outcomes and in citizen feedback, which meant policies could be improved year after year, goals adjusted and actions aligned with the work of partners. The holistic approach we adopted was a key success factor," says Lacerda, "because it allowed us to pay attention to immediate issues." To institutionalize the approach, the local government integrated annual budgeting with mid- and long-term spatial planning departments, consolidating both under one councillor.

Solution

Among the first steps taken was to divide the municipal area into 81 Planning Units, which allowed policies to be fine-tuned for each area. Planning Units were defined in the 1996 Master Plan based on administrative regions established in the 1980s, physical barriers, land-use patterns and continuity of urban fabric. The urban quality of life index (IQVU), adopted in 2000, helped to distribute municipal resources spatially. The IQVU is a calculation based on planning units and data about access to the supply of goods, water supply, social assistance, culture, education, sports, housing, urban infrastructure, environment, health, urban services, and security. A Geographic Information System allowed progress to be monitored in real time and communicated to the public in an attractive and systematic way.

Participatory budgeting was divided into: 1. an administrative, region-wide participatory budget to address infrastructure and services investments; 2. Electronic Participatory Budgeting, introduced in 2006 to enable decisions to be made through internet voting on the investment on strategic public works; and 3. a housing-focused PB to decide on investment on social housing. Specific Global Plans, financed at the request of the communities in the context of the housing PB, are local micro-plans that seek the incremental improvement of favelas towards regularization and integration into the formal city. Key in the facilitation of the process is the “conforças”, a committee of citizens elected during the PB meetings, who monitor the implementation of agreed measures and select the infrastructures to be voted on in the Electronic PB; and the “caravanas”, tours of meetings across the city prior to a PB vote that increase on-the-ground knowledge.

“Administrative inertia was an obstacle to overcome during the first decade,” recalls Mayor Lacerda. Shifting from a top-down “planning for citizens” perspective to a “planning with citizens” perspective required reshaping internally. It was decided to change the annual cycle of participatory budgeting into a biennial one to improve the fit with administrative capacity, he says. Three actions were instrumental in doing so. “We needed to overcome the frustration that citizens have when they perceive that implementation runs slow; improve the coordination of municipal policies, taking into account the unequal development in different parts of the city; and increase the capacity of citizens to make proposals and to monitor project’s phases from conception to implementation.”

Results

Since 1993, the region-wide PB has had more than 373,000 participants; from 1996 onwards, the housing PB has produced 6,600 housing units, through the participation of more than 36,000 dwellers; and since 2006, more than 285,000 inhabitants have helped to set strategic choices for the city as a whole. Over 40,000 people participated in the 2009/2010 budget cycle. By 2011, PB had approved or executed 1,413 projects in basic infrastructure, social housing, public space and leisure areas, schools and cultural centres and health centres.

“Participatory budgeting has created a wave of positive energy across the city” - Mayor Marcio Lacerda.

Owing to the coordination between PB processes and spatial planning, 84 per cent of the population is less than 500 metres from a public investment allocated through PB. Specific Global Plans have benefited more than 300,000 favelas residents (71 per cent of the city’s total). “Participatory budgeting has created a wave of positive energy across the city,” says Lacerda. His political coalition has been re-elected for four consecutive terms, suggesting that good planning decisions can bring significant political benefits.

How to know if you are making an impact

Monitoring progress and documenting changes in conditions are important for knowing whether or not a city is on track to meet goals and for keeping constituents and partners engaged. This can be achieved through an evaluation of the relevance of an urban plan, and performance measurement focusing on efficiency of delivery. A set of indicators helps to determine if conditions are actually improving against a baseline, and monitoring brings about a significant opportunity to create and strengthen community commitment to a plan if the process is open and findings are reported impartially.



Set indicators

Determine what is being monitored

Establishing a qualitative and quantitative baseline gives the process a starting point.

Obtaining baseline information can be challenging, especially for cities in developing countries - many indicators, such as economic productivity and gross product are readily available at the national level, but not at the city level. A statistical department at the local level can be a luxury that not every city can afford. This further reinforces the need to be prudent in selecting the number of indicators.

Indicators relate to both how the plan is being implemented and its impact. Basic indicators measure plan delivery, including

land used, the number of building permits, resources invested, and the amount of infrastructure delivered. The outcomes of the plan can be measured by indicators such as density, mix of uses, the amount of land used for private and public uses, traffic conditions and taxes generated. Common impact indicators include those on economic activity (rates of employment or unemployment; vacancy rates; income per capita; productivity rates); social indicators (level of education; literacy rates; inequality measure such as GINI; environmental indicators (air and water quality; water consumption rates; levels of pollution). Perceptual indicators are all-important barometers of public satisfaction.

Table 10.1 Type of city indicators

Delivery	Outcomes	Impact
<ul style="list-style-type: none">• Urbanized land• Building permits• Budget allocated• Infrastructure built, length of transport and trunk infrastructure laid out• Land allocated to public use including streets• Gain (loss) of open space• Public housing built• Upgrading projects completed	<ul style="list-style-type: none">• Density• Mix of uses• Land consumption per capita• Built area per capita• Average residential area per capita• Street connectivity• Public transport use• Average speed• Pedestrian and bicycle space per capita• Public space and parks per capita• Change in proportion of open to built space• Percentage of people with access to services• Land value variation• Taxes collected• Waste recycled• Wastewater reused• Energy produced• Complaints	<ul style="list-style-type: none">• Population• GDP• Economic activity index• Social indicators including education• Health• GINI inequality index• Participation indicators• Quality of life surveys• Perception surveys• Housing affordability• Population living in informal settlements• Environmental performance indicators – emissions, quality of air, water• Consumption indicators, energy, water, waste generated• Crime rates

Source: Author

Create a supporting context for monitoring

Monitoring requires a solid foundation of data. Reliable and continuous inputs have to be transformed into readable information. Cities must not underestimate the amount of resources and trained personnel that need to be allocated to monitoring processes.

A limited number of indicators works better. It is better to set a limited number of indicators that can be realistically measured and easily understood by a non-technical audience. For example, New York City's PLANYC has 40 indicators grouped into 10 categories: housing and neighbourhoods, parks and public space, transportation, waterways, water supply, transportation, energy, air quality, solid waste and climate change.

Table 10.2 The UN-Habitat City Prosperity Index

Dimensions	Definitions/variables
Productivity	The productivity index is measured through the city product, which is composed of variables such as capital investment, formal/informal employment, inflation, trade, savings, export/import and household income/consumption. The city product represents the total output of goods and services (value added) produced by a city's population during a specific year.
Quality of life	This index is a combination of three sub-indices: education, health and public space.
Infrastructure development	This index combines two sub-indices: one for infrastructure proper, and another for housing.
Environmental sustainability	This index is made of three sub-indices: air quality, CO ₂ emissions and indoor pollution.
Equity and social inclusion	This index combines statistical measures of inequality of income/consumption (Gini coefficient) and inequality of access to services and infrastructure.

Source: UN-Habitat (2012) *Prosperity of Cities. State of the World's Cities 2012/2013*.



New York, USA has a set of 40 indicators to measure its physical functionality © Flickr/Erik Daniel Drost



Tracking energy consumption as an indicator for reduced emissions, Tel Aviv, Israel © Flickr/Feministjulie

Evaluate according to targets and milestones

Progress needs to be evaluated in the short- and long-term. Cities can use data to evaluate their progress towards a goal that may take many years to achieve and this progress can be defined by targets in 20- to 30-year periods. But leaders, constituents and planners need to know if progress is in fact being made to make the necessary adjustments in order to reach targets. This can be achieved by setting yearly milestones, which can give information on trends.

Evaluation enables cities to benchmark. Benchmarking compares the performance of cities against other cities. In addition to being a communications tool for successfully benchmarked cities, it provides a gauge of which areas need to be improved. Thoroughly analysed, benchmarking can provide a basis for developing policy that addresses areas with low scores.

Examples of benchmarking studies

- Demographia International Housing Affordability Survey
- Economist Intelligence Unit Quality of Life Index
- Economist Intelligence Unit Worldwide Cost of Living Survey
- GaWC World Cities Index
- Jones Lang LaSalle City Governance Index
- MasterCard Worldwide Centres of Commerce
- Mercer Quality of Living Survey
- Mercer Worldwide Cost of Living Survey
- Monocle Global Quality of Life Survey
- Siemens Green City Index

Table 10.3 Example of city targets and milestones, PlanNYC

Category	Metric	2030 Target	Milestone 2010/2011	Trend
Brownfields	Clean up all contaminated land in New York City	Decrease number of vacant tax lots presumed to be contaminated	1,500-2,000	Neutral
		Increase number of tax lots remediated in NYC annually	0	Neutral
Solid waste	Divert 75% of solid waste from landfills	75% of waste diverted from landfills	51%	Neutral
Parks and public space	Ensure all New Yorkers live within a 10-minute walk of a park	85% to live within a ¼ mile of a park	74%	Up

Source: <http://www.nyc.gov/html/planyc2030/html/theplan/sustainability.shtml>

Proposed Sustainable Development Goal: Sustainable Cities & Human Settlements

Overall Goal: To promote cities that are environmentally sustainable, socially inclusive, economically productive and resilient.

Targets

1. **National Urban Policies:** By 2030, increase to 50% the number of countries adopting and implementing inclusive national urban policies to coordinate ministerial and sectoral efforts at different levels of government for sustainable urban development, territorial cohesion and urban-rural linkages.
2. **Urban Sprawl:** By 2030, halve the rate of increase of global urban land cover.
3. **Public Space:** By 2030, increase by half the number of cities engaging in place-based, gender-responsive urban design, land use and building regulations to increase public space to 40% of urban land area.
4. **Housing & Slums:** By 2030, halve the proportion of people living in slums at the city level as part of incrementally achieving the right to adequate housing without resorting to forced evictions.
5. **Citizen Participation:** By 2030, increase the proportion of urban residents voting in local elections to 60% or more and increase the proportion of towns and cities using participatory approaches in public affairs.
6. **Urban Safety:** By 2030, halve the rate of urban violent crime.
7. **Urban Job Creation:** By 2030, increase by 50% the number of cities adopting and implementing specific and inclusive policies to improve the lives of urban dwellers through urban job creation focused particularly on youth and women.
8. **Urban Mobility:** By 2030, halve the average time and expenditure of urban dwellers on travel within urban areas, double the proportion with access to safe, affordable public transport and safe, attractive facilities for walking and bicycling, halve the number of traffic accidents resulting in death or serious injuries and halve the number of annual premature deaths from exposure to vehicle-source air pollution.
9. **Urban Energy:** By 2030, increase by 30% the share of renewable energy sources in cities, increase by 40% the share of municipal waste that is recycled, ensure sustainable energy access for all and improve energy efficiency in all public buildings by 50% and all residential buildings by 20%.
10. **Urban Water and Sanitation:** By 2030, achieve universal and equitable access to safe drinking water and halve the proportion of untreated waste water and unmanaged solid waste in cities.
11. **Urban Resilience:** By 2030, increase to 20% the number of cities adopting and implementing policies and plans that integrate comprehensive and multisectoral measures to strengthen resilience.

Note: The Sustainable Development Goals will replace the MDG's from 2015. The final version of the goals is under discussion at the time of printing.

Source: UN-Habitat (December 2012)

Feed back findings into the decision-making process

Evaluation must support decision-making

Evaluation informs leaders on what policies have had an impact and what resources might be needed. An evaluation needs to be well linked to both planning and budgeting to be meaningful; it allows plans to be responsive because it allows for decisions to be made about plans if an evaluation suggests expanding or redesigning them.

Monitoring can improve cross-departmental communication. A key hurdle to implementing integrated plans is the tendency to work in silos. This may result in possible reluctance to sharing information. An internal communication effort that describes the common good goals of monitoring in combination with cross-sector indicators can induce departments to be more open towards information sharing.



Effective inter-departmental communication enhances monitoring and evaluation, Nairobi City Council inter-departmental council meeting (Kenya) © Ndinda Mwongo

Committing to monitoring helps a city over the long term

Monitoring may pose challenges. Busy local governments may have no time (or the will) to learn about and embrace monitoring and evaluation. Monitoring may be regarded as an obligation imposed by external parties (e.g. national government) without consideration for local capacity to design and deliver them. It may be that monitoring is not the highest priority need for a local government, especially if there is no apparent application for monitoring and evaluation.

Commitment to monitoring has to be unrelenting. An evaluation can result in negative scores which could be a direct challenge to organizational leadership and its decision-making. In such cases, cities will benefit from leaders who are able to see the long-term benefits of a credible monitoring system over a short-term approach of hiding metrics.

Lack of support harms monitoring. The lack of commitment by decision-makers and staff often jeopardizes the introduction, and constrains the application, of monitoring and evaluation processes. Indeed, lack of political will and bureaucratic inertia explain the slow take-up and application of monitoring and evaluation in many cities. Monitoring processes may end up being abandoned because of neglect from city leaders and, in such cases, citizens would see monitoring as a failed effort. Once it has this stigma, it is very difficult to re-introduce the process.

Build credibility through evaluation

Credibility in local politics is based on performance evaluation. In competitive local politics, performance may be used to criticize policies implemented by opposing parties. There can be many perspectives from which to look at hard data and it is very important for the credibility of a monitoring process that the people responsible for it retain their independence. Also, ensuring continuity over administrative cycles contributes to build credibility in the measurement. This in turn creates trust in leaders and certainties on their constituency.

Long-term goals and short-term impact

PlaNYC, New York City, USA



New York, USA © NYC Department of Parks and Recreation

In 2005-2006, Mayor Michael Bloomberg recognized that an integrated strategic plan for New York City was needed for several key reasons: the population was rising (in contrast with population declines that shaped planning in the fourth quarter of the twentieth century); the city's physical infrastructure was not being maintained to a standard which would keep up with that rise; and the city needed to respond to climate change. The mayor's recognition of these points and his leadership was essential to get a number of disparate agencies to work together towards the launch of PlaNYC in 2007.

PlaNYC focused on improving the city's physical functionality. It established specific long-term goals and short-term milestones in ten areas: housing and neighbourhoods; parks and public spaces; brownfields; waterways; water supply; transport; energy; air quality; solid waste; and climate change. For each of these, the plan determined the agencies that were responsible for implementation, their partners and the funding sources.

Solution

“You can’t manage what you don’t measure” says Bloomberg. Key to the success of PlaNYC is that specific goals were clearly set for each area of interest. “New York City is dedicated to taking accurate measurements as we tackle major challenges, and PlaNYC is guided by a variety of metrics so that we can track our progress toward major goals – and ensure we are implementing the most effective strategies.”

In housing and neighbourhoods, the goal is to create homes for almost a million people. In parks and public spaces, it will ensure that all residents live within a 10-minute walk of a park. Reusing brownfields by cleaning up all contaminated land; improving the quality of waterways, restoring coastal ecosystems and providing space for recreation; ensuring a high quality and reliability of the water supply system; expanding public transport choices and ensuring their reliability; reducing energy consumption and making energy systems cleaner and more reliable; achieving the cleanest air quality of any big city in the United States; redirecting 75 per cent of solid waste from landfills; reducing greenhouse gas emissions by more than 30 per cent; and increasing the resilience of communities, natural systems and infrastructure to climate risks are PlaNYC goals.

These goals have associated Sustainability Indicators to track progress towards achieving them. While the plan will take 20-years to complete, performance is measured annually. Tracking progress ensures being on target to meet long-term goals and realizing what must be done in the short-term. Annual reports show milestones that have been reached and those that need more effort. This reinforces accountability and creates transparency. PlaNYC was developed from early in 2006 until its launch on Earth Day in 2007. The 132 initiatives in PlaNYC were created by all the relevant agencies of city government in consultation with stakeholders who collectively outlined responsibilities, milestones and budget commitments. An Annual Progress Report is published each April.

Results

The impact of PlaNYC has been substantial. Over 97 per cent of the 127 initiatives were launched within one year of its being started and almost two thirds of the milestones in 2009 were achieved or mostly achieved. Over 141,000 units of affordable housing have been created or preserved. Planning regulations adopted for over 20 transit-oriented schemes will make more than 87 per cent of new development transit-accessible. More than 200 acres of parkland have been created, with over 525,000 residents now within a 10-minute walk of a park. Over 600,000 trees have been planted. New public spaces for pedestrians have been created, including one in Times Square, which has attracted tourists and residents and reduced pedestrian fatalities.

Greenhouse gas emissions have fallen 13 per cent below 2005 levels. Laws to make existing buildings more energy efficient have resulted in over 100 energy efficiency retrofits on city-owned buildings in a bid to reduce their greenhouse gas emissions by 30 per cent by 2017. Over 30 per cent of the taxi fleet is now “green” and regulations to phase out dirty heating fuels have been enacted. PlaNYC progress reports openly acknowledge what needs to improve. The most critical obstacles to municipal action are in policy areas where federal or state laws and regulations prevent the city government from being innovative. While the city government works closely with the federal and state governments, and generally has similar objectives, there are areas, such as transport funding, energy supply regulation or storm water management standards, where federal or state bodies’ authority ranks above the city’s. Local law requires that PlaNYC be updated every four years, which ensures varying degrees of continuity and updating by future administrations. Implicit in the requirement for updates is a recognition that circumstances will evolve. This ability for the plan to evolve actually makes PlaNYC stronger. Future mayors will need some latitude to shape PlaNYC for their times.

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Urban Planning for City Leaders is a valuable source of information, inspiration and ideas on urban planning that is designed for city leaders and decision makers at a critical moment in human history. Predicted human population growth over the next 50 years will have immense consequences for all cities, in particular intermediate cities with populations of up to two million people. Developed countries will need to double the amount of urban space they have by 2050 to accommodate the expected numbers of people, whereas developing countries will need to expand their urban space by more than 300 per cent.

Other issues that affect cities and how we manage them are climate change, depleting resources, environmental degradation and limited budgets - serious problems that will not go away just because they are ignored. Most cities will simply not be able to cope with the impact of population growth and other issues if they do not start preparing for them now. This means planning, designing, financing

and implementing ideas for housing, transport, waste disposal, business areas, parks, security, road systems and much more. This guide is a start towards making those plans. It focuses on the key role that proactive urban planning can have in shaping the future of a city and it outlines practical ways to create and implement a vision for a city that will better prepare it to cope with growth and change. At the centre of this vision is the creation, protection and enhancement of commons (such as natural resources, the climate, public health, safety) and the development of adequate urban assets (for example, public space, infrastructure, the right mix of activities and people, adequate housing), both of which are needed for people to develop and for businesses to thrive.

This guide includes several “how to” sections on all aspects of urban planning, answers many of the questions that leaders are frequently asked, and features numerous examples of cities where urban planning made a significant, positive difference.

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