URBAN PATTERNS FOR A GREEN ECONOMY
LEVERAGING DENSITY

UN HABITAT
FOR A BETTER URBAN FUTURE

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HS/048/12E
ISBN (Series): 978-92-1-133398-5
ISBN (Volume): 978-92-1-132463-1

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Cover photo:	The main square in Uberlândia, Brazil preserves public amenity while allowing the infill and densification of other sites in the city's relatively compact core ©UN-Habitat/Alessandro Scotti

ACKNOWLEDGEMENTS

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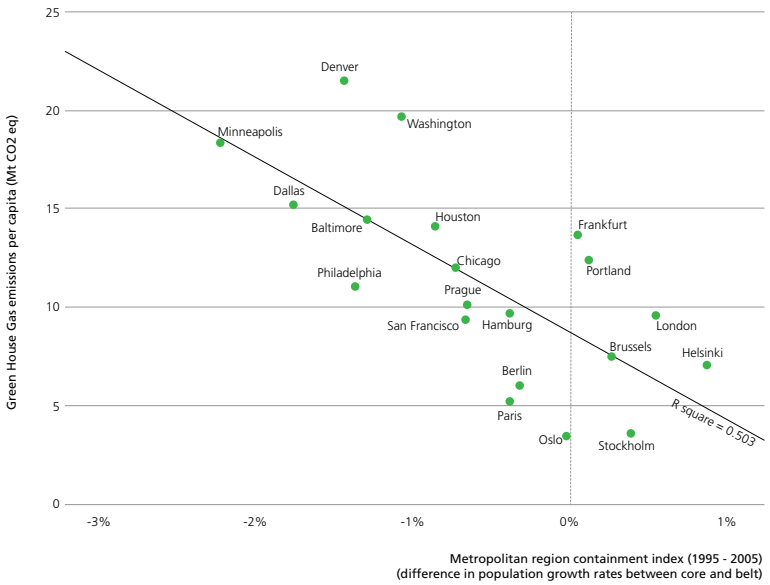
Printer:	UNON, Publishing Services Section, Nairobi, ISO14001:2004-certified

Foreword

The city is one of the highest pinnacles of human creation. Concentrating so many people in dense, interactive, shared spaces has historically provided distinct advantages, that is, agglomeration advantages. Through agglomeration, cities have the power to innovate, generate wealth, enhance quality of life and accommodate more people within a smaller footprint at lower per-capita resource use and emissions than any other settlement pattern.

Figure I: **Greenhouse gas emissions and containment index for selected metropolitan regions**



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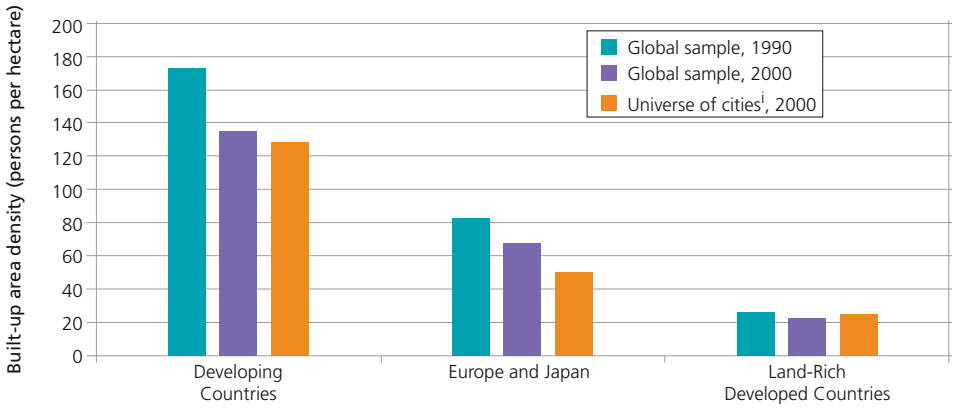
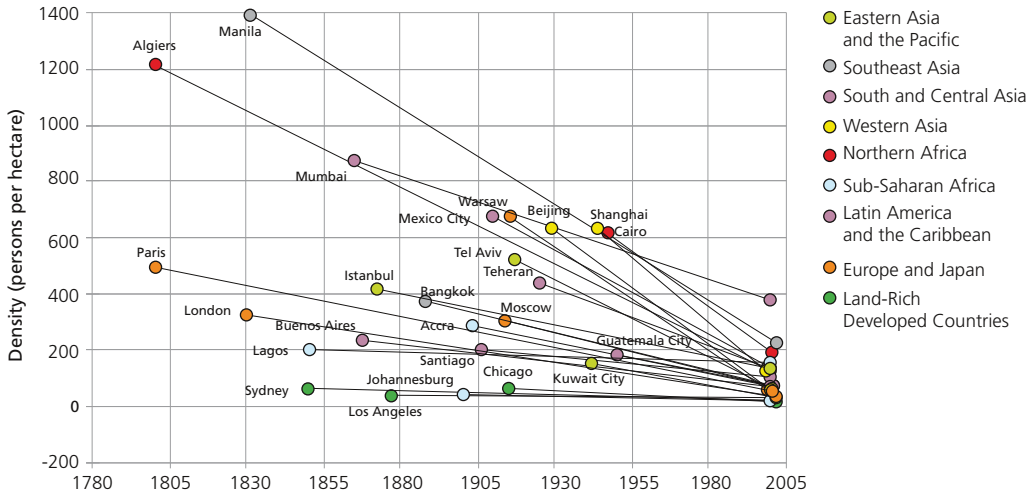
Or so they could. Increasingly, cities are forfeiting many of the benefits that agglomeration has to offer. Two meta-studies of urban land expansion have shown that over the last two decades most cities in the world have become less dense rather than more,[1,2] and are wasting their potential in ways that generate sprawl, congestion and segregation. These patterns are making cities less pleasant and equitable places in which to live. They are also threatening the earth's carrying capacity. And they are most

Figure II: **Average Built-up Area Densities in Three World Regions**



Source: Making Room for a Planet of Cities, by Shlomo Angel, Jason Parent, Daniel L. Civco, and Alejandro M. Blei. © 2011. Lincoln Institute of Land Policy, Cambridge, MA.

Figure III: **The General Decline in Built-Up Area Densities in 25 Representative Cities, 1800-2000**



Source: Making Room for a Planet of Cities, by Shlomo Angel, Jason Parent, Daniel L. Civco, and Alejandro M. Blei. © 2011. Lincoln Institute of Land Policy, Cambridge, MA.

i This refers to 3,646 large cities with a population of over 100,000 or more.

acute in fast-growing cities, particularly those with the lowest institutional capacities, weakest environmental protections and longest infrastructure backlogs.

Increasingly, city managers wish to learn by example. Rather than more theory and principles, they want to know what has worked, what has not, and which lessons are transferrable to their own contexts. There is much information available, but little time. UN-Habitat has developed these "quick guides" for urban practitioners who need condensed resources at their fingertips. The aim is to suggest patterns that can help cities and city-regions regain these inherent advantages in a time of increased uncertainty and unprecedented demographic expansion.

More than half the global population now lives in towns and cities. By the year 2050, UN-Habitat research projects that that figure will rise to two-thirds. This rapid, large-scale concentration of humanity in the world's cities represents new challenges for ingenuity, and numerous opportunities to improve the way in which human habitats are shaped. Most of this population growth will be in the cities of developing countries, which are expected to grow by an additional 1.3 billion people by 2030, compared to 100 million in the cities of the developed world over the same period.[3]

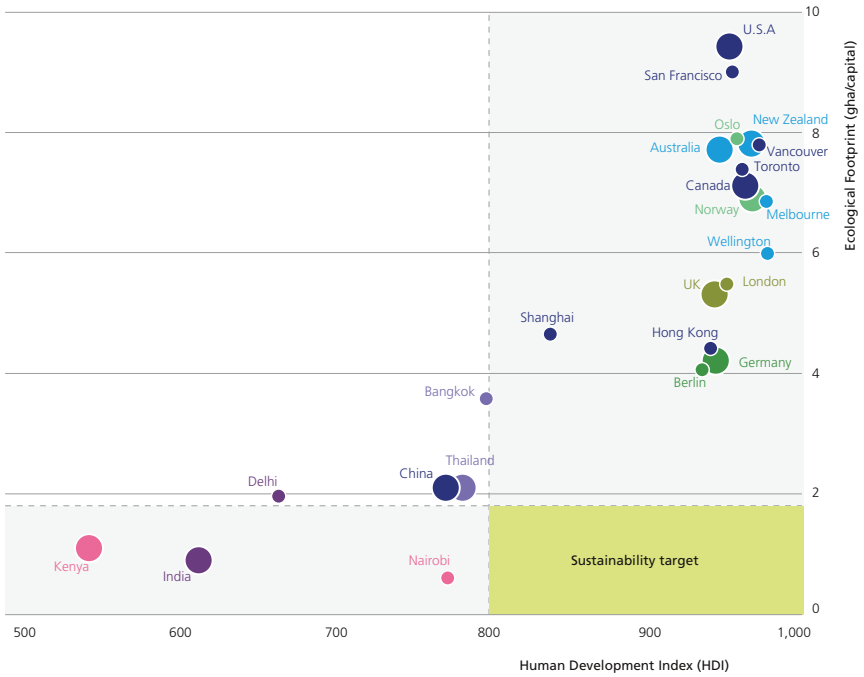
While urban population growth rates are stabilizing in regions which are already predominantly urban (such as Europe, North, South and Central America and Oceania), regions with a higher proportion of rural population (such as Asia and Africa) are likely to see exponential rates of urban population growth in the coming years.[4] Most urbanization is likely to occur in cities relatively unprepared to accommodate these numbers, with potential negative repercussions for quality of life, economic development and the natural environment.

Although the percentage of the urban population living in slums worldwide has decreased, the absolute number of people living in slums continues to grow.[5] No less than 62 per cent of all urban dwellers in sub-Saharan Africa live in slums, compared to Asia where it varies between 24 per cent and 43 per cent, and Latin America and the Caribbean where slums make up 27 per cent of the urban population.[6] If these growing cities are to be socially sustainable, new approaches will be required to integrate the poor so that the urbanization process improves inter-generational equity rather than entrenching socio-spatial fragmentation. Privatized models of service delivery that discriminate between consumers based on their ability to pay threaten to worsen inequalities,[7] and require carefully considered parameters to ensure that the poor are not disadvantaged.

According to a recent World Bank study, urban population growth is likely to result in the significant loss of non-urban land as built environments expand into their surroundings. Cities in developing countries are expected to triple their land area between 2005 and 2030, with each new city dweller converting an average of 160 metres2 of non-urban land to urban land.[8] Despite slower population growth, cities in industrialized countries are likely to see a 2.5 times growth in city land areas over the same period due to a more rapid decline in average densities when compared to their developing country counterparts.[9] As built environments become less dense and stocks of built up land accumulate, the amount of reproductive and ecologically buffering land available for ecosystems and food production is diminished, reducing the ability of city-regions to support themselves.[10]

While international trade has made it possible for cities to meet their demands for food, water and energy with imports from faraway lands, it is becoming increasingly

Figure IV: **Ecological Footprint and Human Development Index for selected countries and cities**



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apparent that the appetite of the world's growing and increasingly affluent population is coming up against limitations in the planet's ability to support human life on this scale. It is estimated that our addiction to oil will result in a peak in oil extraction within the next decade, leading to dramatic increases in the costs of fuel, mobility, food and other imports. Greater demand for potable water, combined with changing rainfall patterns, the depletion of aquifers and pollution of groundwater, is likely to see increasing competition for scarce fresh water resources, raising the possibility of conflict in the near future.

The ability of ecosystems to continue providing biotic resources like wood, fish and food, and to absorb manmade wastes - commonly referred to as the earth's "bio-capacity" - is also diminishing. Comparing global ecological footprints to the earth's available capacity shows that, at current rates of resource use, we are exceeding bio-capacity by 30 per cent,[11] and approximately 60 per cent of the ecosystems we depend on for goods and services are being degraded or used in an unsustainable manner .[12] We are living off the planet's natural capital instead of the interest from this capital, and there are already signs of the devastating effect this will have on our societies and economies in depleting fish stocks, loss of fertile soil, shrinking forests and increasingly unpredictable weather patterns.[13]

The global population is reaching a size where cities need to start thinking beyond their immediate interests to consider their role as nodes of human consumption and waste production in a finite planet that is struggling to keep pace with humanity's demands. If cities are to survive, they must acknowledge the warning signs of ecosystem degradation and build their economies in a manner that respects and

rehabilitates the ecosystems on which life depends. If cities are to prosper, they must embrace the challenge of providing shelter and uninterrupted access to water, food and energy and improve quality of life for all of their citizens.

The way in which city spaces, buildings and infrastructural systems are planned, designed and operated influences the extent to which they encroach on natural ecosystems, and locks them into certain modes of consumption from which they struggle to deviate. Urban activities have direct and indirect consequences for the natural environment in the short, medium and long term, and their scale of influence typically extends far beyond the boundaries of what is typically considered to constitute "the city". Managing the indirect, distant and sometimes obscured impacts of city decision making in an increasingly globalized world requires appropriate governance mechanisms that improve cities' accountability for the resources they rely on.

As nexuses of knowledge, infrastructure and governance, cities represent a key opportunity to stimulate larger scale change toward green economies. In a world where cities are increasingly competing against each other economically, where weather patterns are unpredictable and low resource prices can no longer be assumed, cities need to proactively shape their economies and operations in preparation for an uncertain future. To manage risk in a democratic manner, a balance will need to be struck between deliberative decision making processes and centralized master planning. This can be done by empowering planning professionals to respond quickly and effectively to evolving developments without compromising longer term shared visions of a better city[14].

This guide is one of a set of four aimed at inspiring city managers and practitioners to think more broadly about the role of their cities, and to collaborate with experts and interest groups across disciplines and sectors to promote both human and environmental prosperity. The guides are based on the outputs of an expert group meeting hosted by UN-Habitat in February 2011 entitled *What Does the Green Economy Mean for Sustainable Urban Development?* Each guide focuses on one of the following cross-cutting themes:

Working with Nature

With functioning ecosystems forming the foundation for social and economic activity, this guide looks at how built environments can be planned to operate in collaboration with nature. It looks at how to plan cities and regions for ecosystem health, focusing on allowing sufficient space for natural systems to continue providing crucial goods and services like fresh water, food, fuel and waste amelioration.

Leveraging Density

This guide looks at the relationship between built and natural environments from the perspective of cities, and considers how their impact on ecosystem functioning might be reduced by making best use of their land coverage. Planning the growth of cities to achieve appropriate densities and providing alternative forms of mobility to private vehicles help to slow urban expansion onto ecologically sensitive land, and can reduce citizens' demand for scarce resources by sharing them more efficiently.

Optimizing Infrastructure

Considering urban infrastructure as the link between city inhabitants and natural resources, this guide looks at how infrastructural systems can be conceived differently in order to help all city residents to conserve resources. It introduces new concepts and approaches to the provision of infrastructural services, such as energy, water

and waste treatment, and demonstrates how infrastructure investments can act as catalysts for urban sustainability.

Clustering for Competitiveness

Taking a broader perspective, this guide looks at city regions and how they can be more optimally planned to achieve economic objectives in a manner that does not waste local resources. It looks at how competitive advantage can be achieved at a regional scale by encouraging cooperation between cities with complementary areas of specialization. It also considers how innovation for green economic development can be encouraged through the clustering of industries, and through collaborations between government, the private sector and academia.

Glossary

Each guide contains a selection of case studies from around the world that demonstrate how cities have approached sustainability challenges in a manner befitting the realities of their unique context. Showcasing a wide range of options, the case studies are not aimed at prescribing solutions, but are rather intended to inspire the considered development of contextually relevant approaches in other cities to enhance their sustainability.

Activity route / corridor: It is a continuous route, which connects main nodes or centres, along which public transport operates and where residential, commercial, industrial and recreational activities occur in close proximity.[15]

Activity street: It is a lower order route that typically would have high volumes of non-motorized (pedestrian) movement and a range of local retail and public facilities.[16]

Brownfield development: Describes the redevelopment of land that has previously been developed. It often involves abandoned or underused military, industrial or commercial facilities (see figure below).

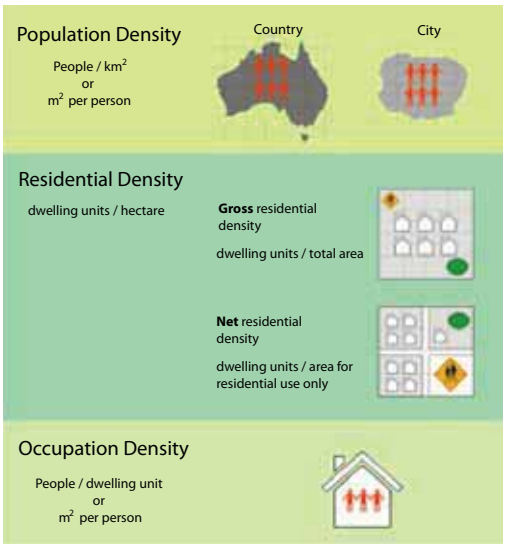
City region: The area in which the connections between one or more cities and the surrounding rural land are functionally (economically, socially, politically and geographically) connected. These areas are typically 80-100 km across and occupy up to 10,000 km^2.[17]

Density and how it is measured: Urban density can be explained as the number of people in a given area or space. Measuring urban density consists of three components: population, occupancy and residential density, which are interrelated and mutually dependent.[18] See figure VI.

Ecological footprint: Is a measure that converts the flows of energy and matter

A 303 hectare brownfield redevelopment project of derelict industrial waterfront land in San Francisco, United States © Todd Quam, Digital Sky / Mission Bay Development Group, LLC

Figure VI: **Different methods of measuring urban density**



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to and from any defined economy into corresponding land/water area required from nature to support them. The measure is usually given in equivalent hectares to support one individual of a given economy (footprint size).

Greenfield development: A term used to describe land that has not been developed or used for urban uses before. This sometimes occurs around the edges of existing urban areas, but can also be in complete isolation.

Metropolitanization: The conversion of rural land into urban uses and the engulfment of adjacent municipalities by large cities to constitute new metro-areas.[19]

Migration: The physical movement of people from one place to another.

Peri-urbanization: The urbanization of former rural areas on the urban fringe, both in a qualitative (e.g. diffusion of urban lifestyle) and in a quantitative (e.g. new residential zones) sense.

Polycentric region and polycentric city: A region with more than one city / town, all more or less equal in dominance and importance. A polycentric city has several dominant centres, whereas a monocentric city consists of only one centre.

Satellite city / town: A concept that refers to smaller metropolitan/urban areas, which are located somewhat near to, but are mostly interlinked with, larger metropolitan/ urban areas.

Slum: 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 (not more than three people sharing the same room), structural quality and durability of dwellings and security of tenure.[20]

Suburbanization: Since the 1920s, the growth of suburbs on the urban periphery has been a global occurrence. The availability of oil as an energy source has both promoted and allowed the emergence of this low-density, mainly residential, car dependent sprawling urban form. This urban form is often costly to service and has often led to socio-spatial fragmentation of cities.

Transit-orientated development (TOD): A concept that involves the restructuring of urban areas to maximize access to public transport through concentrating mixed-use nodes around public transport stops or stations (train station, metro station, tram stop, or bus stop). These public transport stations are normally surrounded by relatively high-density residential development with progressively lower-densities spreading outward from them. (See figure in Section 4.) Transit-oriented developments generally are located within a radius of 800 m from a transit stop, which is considered a comfortable walking distance.[21]

Urban agglomeration and its economies: An urban agglomeration can include a central city and bordering urban areas without regard to administrative boundaries. These concentrations of people, services and facilities provide opportunities for socio-economic development and for optimizing scarce resources through economies of scale.[22] The advantages derived from such spatial concentrations of economic activities are generally referred to as agglomeration economies - the productive advantages of being in an urban area, which, in turn, are influenced by the existence of effective labour markets within these.[23] Companies also group together because of access to large labour pools, social network relationships and knowledge spillovers.

Urbanization: The term used for the physical growth of urban areas as a result of global change in population location. The "pull" of the city has always been based on the benefits of urban agglomeration because living in cities permits the individual to take advantage of the opportunities of proximity, diversity and marketplace competition.

Urban node: A concentration of urban development at accessible locations such as modal interchanges and the intersection of public transport routes. A mix of uses and services as well as higher residential densities dominates urban nodes, the range and intensity thereof ranging between the size and importance of the node, creating a hierarchy of nodes throughout a city.

Urban sprawl: A spatial phenomenon where a city spreads outwards, even beyond its suburbs to its outskirts. Urban sprawl is also referred to as irresponsible and, often, poorly planned development (often due to a lack of regulation) that destroys agricultural and natural land and systems.

Woonerf: This concept originated in the Netherlands. It is a street where pedestrians and cyclists have priority over motorists. The boundary between the street and sidewalk is blurred through creating a streetscape with innovative paving and landscaping. It has none of the usual lane markers, curbs or zebra crossings and other obvious boundaries denoting spaces between road users. This design has actually made streets safer because motorists are forced to slow down to safer speeds and to make eye contact with other users to decide who can proceed.[24]

Contents

Extremely high densities, as in Hong Kong, work because of an intensive system of supportive infrastructure © UN-Habitat/Alain Grimard, 2009

Introduction 1

Many complex factors influence the sustainability of urban forms and patterns. The scale at which such forms and patterns occur is crucially important when responding to urban challenges in pursuit of sustainability. In support of the "green economy", the concept of the compact city is presented here as a key part of achieving sustainable settlements and green growth.[25] Urban compaction is not a magic bullet. Creating compact, integrated and liveable cities that support the "green economy" is one part of the solution to achieving sustainable settlements. Re-planning and re-developing already dense informal and dilapidated areas can also bring real economic, social and environmental benefits, especially in developing countries. To foster sustainable urban settlements governments face the challenge of directing urban growth patterns in a manner that will work with broader strategies aimed at greening the economy and underpinning sustainable development.

This guide shows how the compact city concept and planned (versus unplanned) urban extension can support sustainable urban patterns that benefit the functioning of developed as well as developing world cities. Properly managed and appropriately applied, compaction efforts can positively enhance the life of the city dweller and support related strategies aimed at promoting a green economy and sustainable urban settlements.

Section 2 of this guide examines the specific challenges within the city realm, looking at current forms and directions of urban growth and highlighting factors that are influencing this urban expansion at a city region and city scale. The central proposition of the guide - the compact city notion and its benefits within the developed and developing worlds' contexts - is explained.

Section 3. What is meant by planned extension and what the forces are that shape it are also covered in this section.

From the outset, it is acknowledged that all cities are different and operate under unique circumstances when it comes to development conditions, infrastructure, institutional frameworks, assets and

challenges. This guide, therefore, outlines how to plan and manage for compaction and planned extension through the provision of a set of broad principles (Section 4). This is substantiated with strategic spatial interventions (action steps) that can be implemented and adapted to the local context (Section 5). What works for one city might not necessarily work for another, but the eight case studies in Section 6 show how these principles and actions can achieve a range of objectives on the way to urban sustainability and can inspire others to adapt the same principles to their contexts. The case studies were chosen to illustrate the sustainability benefits that can be achieved through an urban compaction strategy:

- In **Freiburg, Germany,** military land was converted into an eco-village with a strong pedestrian focus and car free living area. It incorporates 'plus houses' (which generate more energy than they consume), medium to high-density housing (approximately 133 people / hectare) and a variety of job opportunities, all within 38 hectares.

- **Medellín, in Colombia,** implemented the world's first modern urban aerial cable-car public transport system, which is relatively cheap and provides a sustainable solution to the inhabitants of the hilly low-income informal settlements in the city.

- In **Bangkok, Thailand,** evidence is pointing to a city shifting from traditional car orientated urban planning to providing mass public transport options. The introduction of the urban railway system as mass transit choice was a turning point for the city. Its ridership has steadily increased and has had a noticeable damping on the pace and scale of suburbanization.

- In **Cairo, Egypt,** the Government of Egypt started to develop planned extensions (new urban communities and settlements) around the already densely populated Cairo. The aim was to accommodate the projected population increase and to offer alternative planned urban solutions to informal settlements (in parallel with improving slums and informal settlements).

- In **Ouagadougou, Burkina Faso,** a massive urban restructuring programme succeeded in its objective to drastically reduce the number of informal settlements that occupied 71 per cent of this city's urban footprint to only 7 per cent. However, this radical approach failed to supply adequate infrastructure to many of the newly created portions of land at the time of subdivision and it also led to urban sprawl and land speculation.

- In **Rio de Janeiro, Brazil,** a slum upgrading programme provided much need services (sanitation, hard landscaping, widening of roads and upgrading of public spaces) in areas threatened by environmental hazards.

- In **Isfahan, Iran,** the government intervened by conserving agricultural land that was fast being consumed by residential development. The Najvan & Sofeh Parks Management project successfully addressed the land use conflicts on the city's fringe by curbing the often illegal urban sprawl. This was done by establishing a green corridor that links the city with its periphery.

- In **Newcastle, Australia,** a brownfield redevelopment project, the Honeysuckle Urban Renewal Project, has been successful in utilizing derelict, inner city land to provide high density, affordable housing and has generated significant investment within a mixed use environment.

Section 7 concludes the guide with a summary of the key lessons from this guide.

A residential area in the city centre of Hunchun, China © UN-Habitat/Alessandro Scotti

The Challenges of the City

2

Context-specific issues within the developed world range from environmental pollution, entrenched industry interests, perceived space and privacy entitlements, population decline and urban shrinkage, large ecological footprints and an ageing population.[26]

Developing world cities face specific challenges affecting urban form and spatial land use patterns. These challenges have been grouped into issues affecting the current forms and direction of urban growth and those aggravating the patterns of uncontrolled expansion.

2.1 Current forms and directions of urban growth

2.1.1 Urban sprawl

Urban sprawl is the term most commonly used for uncontrolled expansion of urban areas; in other words, it is the unmanaged consequences of growth and the physical location of this growth on the urban periphery.[27] Inappropriate or ineffective planning is more often than not to blame for it. Urban sprawl, regardless of it being planned or unplanned, has a number of consequences:

- Sprawl is a large consumer of land (natural, rural or farm land) and, in doing so, sprawl contributes to environmental degradation, including the loss of tree cover and wildlife habitats, as well as polluting drinking water (from urban run-off as a result of an increase in hard surfaces). Increased car usage goes hand in hand with urban sprawl as people live further away from work. In addition, business districts in the suburbs are often not within walking distance from residential areas. This not only entrenches the reliance on fossil fuels, because low densities cannot support mass transit, but it also increases traffic on highways and residential streets. It has also caused higher levels of smog and air pollution through greenhouse gas emissions.

- These sprawling settlements are mostly low density, mainly residential in nature and situated in remote locations and therefore cannot support a range of urban activities due to the cost of providing infrastructure and maintenance.

Urban sprawl can take on different forms at different scales, metropolitanization in Asia and Latin America, and suburbanization in North America or peri-urbanization in Africa and parts of Asia. At a "city region" scale, mega-urban regions are developing along major transportation routes considerable distances away from the traditional city core, and rapid urbanization is the driver. The Shanghai mega-urban region (with associated satellite cities), which covers an area of 6,340km², is an Asian example. Cairo and Alexandria in Egypt are other examples. It is predicted that these two cities will eventually merge to form a gigantic Nile metropolis, despite being 200 km apart and despite Cairo's high compactness levels.[28] Many cities will therefore require a dual strategy, i.e. compaction and containment efforts.

Mexico, DF © UN-Habitat/Julius Mwelu

2.1.2 Declining densities

There is evidence of a global pattern of declining urban densities, despite rapid urbanization, suggesting that urban growth is becoming less compact.[29,30] In other words, people moving into cities are not necessarily accommodated within existing urban footprints. Cities are spreading horizontally to accommodate this influx, either through formal expansions or through informal urban sprawl. A study conducted in 2011 showed that across a sample of 292 cities (equally distributed across the globe and measuring <100,000 km^2 in extent), over the last three decades (1970 – 2000) urban land expansion rates are higher or equal to urban population growth rates.[31]

Another study done by the World Bank in 2005 compared the urban densities of a sample of 3,943 cities with populations greater than 100,000. It used the population density of the built-up area instead of the administrative area to ensure accuracy, see the table below. The average built-up area population density for the developed world cities was found to have declined from 3,545 people / km^2 in 1990 to 2,835 people / km^2 in 2000, a change of -2.2 per cent per

annum. In developing countries, the study concluded that the average density also declined from 9,560 people / km^2 in 1990 to 8,050 people / km^2 in 2000, a change of -1.7 per cent per annum. Within the developing world cities studied, there was an average 125 m^2 of urban land per person added, compared to 355 m^2 in developed country cities.[32,33]

Table 2.1: **Declining urban densities (1990 – 2000)**

City Category	1990 (people/ km^2)	2000 (people / km^2)	Annual % change
Developing countries	9,560	8,050	-1,7%
Developed countries	3,545	2,835	-2,2%
Europe	5,270	4,345	-1,9%
Other developed countries	2,790	2,300	-1,9%
East Asia and the Pacific	15,380	9,350	-4,9%
Latin American and the Caribbean	6,955	6,783	-0,3%
Northern Africa	10,010	9,250	-0,8%
South & Central Asia	17,980	13,720	-2,7%
Southeast Asia	25,360	16,495	-4,2%
Sub-Saharan Africa	9,490	6,630	-3,5%
West Africa	6,410	5,820	-1,0%
Low Income	15,350	11,850	-2,5%
Lower-Middle Income	12,245	8,820	-3,2%
Upper-Middle Income	6,370	5,930	-0,7%
High income	3,565	2,855	-2,2%

Source: Adapted from Angel, S., Sheppard, S. and Civco, D. (2005). The Dynamics of Global Urban Expansion. Transport and Urban Development Department, Washington D.C.: World Bank

2.1.3 Peri-urbanism and the land use conflict on the edge

At a city level, populations of traditional city centres are shrinking while peripheral areas are growing, which is referred to as "peri-urbanism". The challenge here is that much of the growth is informal (slums), unserviced and fragmented. Growth often consumes agricultural or rural land and normally falls beyond the boundaries of municipal governments. The city core continues to attract investment and services, but the resulting rising prices drive the poor to the periphery. These new informal settlements are extremely difficult and expensive to service in conventional ways due to distance to, and availability of, bulk infrastructure.[34]

This pattern is especially evident in cities in India, where slum populations have increased significantly in the suburbs and outskirts leaving the urban poor living on the "urban edge". As a result they are marginalized, having lost the advantages of both urban and rural living.[35] This conflict between land uses on the city's fringes has been addressed in the city of Isfahan in Iran.

Case study: The Najvan & Sofeh Parks Project in Isfahan, Iran

The Najvan & Sofeh Parks Management Project managed to curb the, often illegally built, urban sprawl by establishing a green corridor that links the city with its periphery. A land management framework was set up which protected the city's peripheral agricultural land from being converted to urban uses. This was done through purchase agreements with existing landowners, with the state purchasing land at fair market value. This gave the government land to implement their ambitious greening project. Respective landowners were then assisted with sourcing alternative land zoned for construction. (Full case study in Section 6.)

Example: Mumbai, India, as an example of peri-urbanism

Figures from the Indian Census 2011 indicate that within Maharashtra, a formerly middle class satellite suburb of Mumbai, slum populations have increased exponentially since the last census count a century ago. This suburb is 43 km north-east of Mumbai and hosts 9,84 per cent of the country's people, that is 11 million people. While Mumbai city proper has shown a growth rate of -5,75 per cent over a decade, this suburb has shown a remarkable 36 per cent growth over the same period.[36]

2.1.4 Urban development in hazardous areas

If uncontrolled urban expansion is not ballooning along cities' peripheries, it often takes place on land unsuitable for urban development, that is, on land prone to natural hazards. Such areas can include steep slopes, floodplains, seismically active zones and the foot of volcanoes or pathways of tropical cyclones. These environmentally sensitive areas play an important role in the broader urban biodiversity, because they provide valuable ecosystem services to the city, such as natural drainage, regulating urban temperatures and they are natural air cleaners[37,38.]

2.1.5 Informal urban growth

Informal urban growth (slum formation) in developing countries is generally dense, poorly serviced and this type of growth often houses vulnerable populations that governments are reluctant to grapple with. Historically, formalization efforts often resulted in destroying livelihoods and shelter and worsened the social exclusion and poverty. Creative ways of working with informality are required from urban planners and managers.[39] The case studies of Rio de Janeiro's largely successful "favela" upgrading programme and Cairo's planned extensions provide key lessons in dealing with informality.

2.2 Factors aggravating patterns of uncontrolled urban growth

2.2.1 Ineffective planning and limited institutional and professional capacity

The negative impacts of urban growth are reinforced by a lack of (or inappropriate) planning and/or the absence of a regulatory planning and land management system. This is exacerbated by limited institutional and professional capacity.[40] In addition, many local urban planning decisions are still taken by central government and not as part of a broader community participatory process. Outdated or inappropriate land management and urban planning systems have crumbled under the pressures of urbanization. Whilst there is a danger that top-down planning can lead to excessive and artificial separation of land uses (between, for example, different income groups or between residential and other land uses, often in the form of gated communities),[41,42] in some instances this at least ensures that urban infrastructure is in place ahead of growth.

2.2.2 Spatial poverty trap

The combination of informal growth (especially on the periphery), the increasing number of poor people living in cities and ineffective urban planning (misdirected growth) can widen the physical and social gaps between rich and poor neighbourhoods - a spatial poverty trap. This can exacerbate social exclusion, inequalities and marginalization for the poor because of lack of access to urban advantages, insecurity of tenure, neighbourhood stigma, severe job restrictions and a high incidence of crime.[43] For developing countries, China excluded, the percentage of urban poverty increased from 15.9 per cent in 1993 to 16.3 per cent in 2002.[44]

2.2.3 Rural migrants

In Africa and parts of Asia, people moving between urban and rural bases are common. This allows households to reap the benefits of urban agglomerations where some members of a family live and work in urban areas while other members remain in the rural areas allowing them to still maintain a social safety net. China's "floating population" is estimated to involve 90 million to 125 million migrant workers. This phenomenon has implications for urban planning and accommodating these transient populations.[45]

2.2.4 Car-orientated infrastructure planning

The influence of modernist planning in all parts of the world, and in particular developing countries, had a dramatic impact on the shape and form of cities. Planning ideas were often imported and adopted regardless of local context. This included car-orientated infrastructure planning as

well as zoning-style land use controls. Urban planning practices (supported by historic low fuel costs) have, in certain cases, actually entrenched the need for a car. Consequently, many cities are still planned around the private car and car ownership is still regarded as a universal necessity despite rising fuel prices.[46]

Case study: Shifting urban development from private vehicles in Bangkok, Thailand

The city of Bangkok in Thailand is infamous for its crippling congestion, which is largely due to the Thai Government traditionally focusing on developing car-orientated infrastructure. During the 1990s, when the country's economy was booming, traffic congestion was at its worst. It was during this time that a local ration station, Radio 100FM, did more than the usual traffic updates; they also handed out "Comfort 100" packs, which consisted of a bottle and an adult diaper for commuters to use in case of emergency.[47] Today the government, after realizing that it could not construct its way out of congestion, will not approve the construction of more roads and expressways. The shift from car-orientated to rail-based transport happened with the introduction of the first urban railway, the Bangkok Transit System (BTS), in 1999. This system offers commuters modal choices and it currently caters for about 500,000 rider trips per day. (Full case study in Section 6.)

2.2.5 Access to land: land/ property markets and complex tenure systems

The demand for well-located urban land has led to increased land values, which often stifles the financial viability of development. In addition, the location of new commercial development and/or middle to high-income housing estates on peripheral urban land often undermines efforts to reinforce a containment edge (urban edge). Complex traditional tenure systems, evident in many African countries, are intensifying this challenge. Land is not transferable when governed by such systems. Instead, it is collectively owned by a community, clan or family and is not treated as a resource to be sold or transacted in the open market. For example, 80 per cent of Ghana's land is administered and governed by such tenure systems, where chiefs or family heads hold all interest over the land under customary law. In many instances, these chiefs have been accused of alienating land for urban expansion and withholding the granting of long-term leases to investors, thereby effectively controlling the direction of urban growth themselves.[48] Planners are therefore not only required to understand land markets, but also required to intervene innovatively.

A block of a public housing complex built in the late 1980s in Johor Bahru, Malaysia
© UN-Habitat/Alessandro Scotti

A Compact City 3

3.1 What is a compact city?

Urban compaction aims to increase built area and residential population densities; to intensify urban economic, social and cultural activities, and to manipulate urban size, form and structure and settlement systems in search of the environmental, social and global sustainability benefits, which can be derived from concentration of urban functions.[49] Within both the developed and the developing world, the benefits of a compact city have been proven to be:

- Greater efficiency in the use of land and so a positive impact on a city's spatial and ecological footprint, which also means
  - Reduction in reliance on cars,
  - Lower impacts of urban growth on rural and agricultural lands, and
  - Lower non-renewable resource consumption per household.[50,51]
- Higher population and economic thresholds, which also means
  - Increased accessibility to services and amenities as higher economic thresholds are achieved within any given area,
  - Viable and effective public transport provision based on sustainable population thresholds to support the service,
- Harnessing of agglomeration advantages (for example, shops benefiting from the customers generated by each other),
- Reduction of time and cost spent travelling due to shortened distances to destinations,
- Increased social inclusiveness and reduction in social segregation through designing quality mixed-use areas.

Barcelona, Spain as an example of a compact city © UN-Habitat / Laura Petrella

Example: Compact development reduces the need to drive

Three studies recently undertaken have produced empirical data that indicate how compact development can reduce the need to drive and therefore reduce greenhouse gas (GHG) emissions. One study, Driving and the Built Environment, concluded that by doubling densities the number of vehicle miles travelled (VMT) can by reduced by between 5 and 12 per cent and if combined with an increase in mixed uses and improvements to the transit system, by as much as 25 per cent. The other study, Growing Cooler, concluded that compact development reduces vehicle miles travelled by 20 to 40 per cent.[52,53]

The promotion of the compact city as a sustainable urban form might be easier in the developing world because many cities are already quite dense.[54] Many of these cities have not been planned and are not the result of a grand design; their compactness has emerged spontaneously. The advantages of this situation include:

- Poor people have greater access to employment and other opportunities to enhance their quality of life (often accessible through non-motorized transport) despite having less space to live in,[55]

- Many of the urban poor's survival depends on a self-generated income from small businesses. Urban compaction can be beneficial in promoting self-employment opportunities by establishing a human scaled street network, which provides for intensive, vibrant local markets,[56]

- Movement on foot is the only affordable mode of transport for a growing number of city dwellers within this context. Urban environments that operate efficiently at the pedestrian scale are essential to ensure social inclusiveness.[57]

Three ambiguous factors influence the merit of the compact city notion when applied to the context of developed and developing worlds:

- Cultural factors influence the level of socially acceptable space consumption, which varies widely across the globe. For example, the perception of compact living in Hong Kong (as an extreme) or Barcelona is vastly different to those people living in the sprawling suburbs of Johannesburg. It is, however, possible to change these perceptions. For instance, perceptions about high-rise, high density living in Hong Kong were altered by improving the maintenance systems of elevators, thereby eliminating resident's safety concerns.

- The way in which households use land also varies significantly. For many, land is not only a place to call home but their livelihoods depend on it from practising urban agriculture, keeping livestock, etc.

- The cost of infrastructure provisioning might well decrease with increased density in the developed world, but it might not be the case in a developing country with limited capacity. The existence of infrastructure capacity is crucial in delivering cost-effective development.[58]

3.2 The characteristics of a compact city

Urban compaction is about density, diversity, design, destination and distance to transit – the so-called 5 Ds.[59,60]

- Increased densities appropriate to context,

- A fine grain of mixed uses (diversity) – in other words, the promotion of the work-home-services relationship, which includes varying housing typology options, economic opportunities, multi-functional green spaces and social facilities,

- Interconnected streets and transport corridors with a focus on pedestrian, bicycle and public transport orientated design – i.e. "a walkable city",

- Concentrations of populations and/or employment – creating destinations with high levels of accessibility to services to reap the benefits of urban agglomerations,

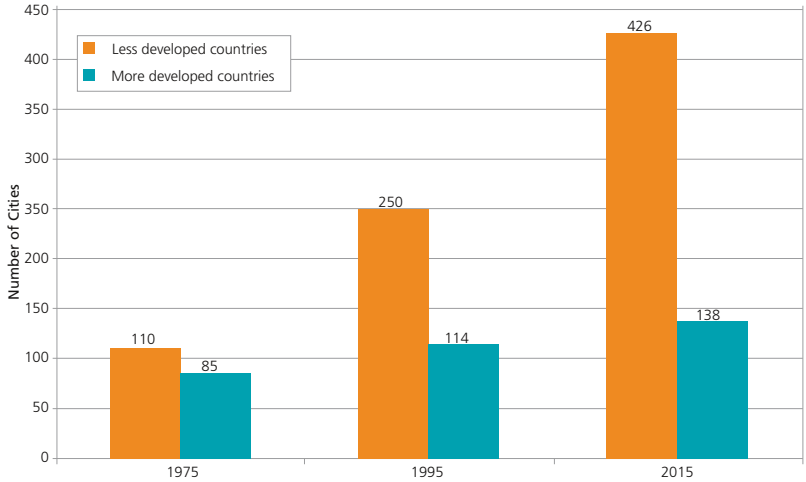
- Access and reduced distances (walkable) to public transport options, green systems and other public facilities.

3.3 What is meant by planned urban extension?

Spatial expansion of cities is an inevitable consequence of urban economic and population growth.[61] Despite historical attempts to rein in city growth, the figure below indicates that many large cities grew at a rapid rate during the last 30 years[62]. Not only are cities accommodating more people, densities within cities are also declining, which means cities are expanding horizontally, thereby increasing their ecological footprints.

The danger of urban areas expanding to accommodate this rapid growth without proper direction or planning is in, amongst other things, the inability of public services to meet the demands of growth, in particular the growth of slums.[63] Mexico City's uncontrolled expansion over the past 20 years resulted in 60 per cent of its 20 million inhabitants finding shelter in illegal and informal housing, with complex and often dire consequences.[64] The need to direct city growth to areas suitable for development is therefore a crucial component of a broader compaction strategy.

Figure 3.2: **Growth of cities larger than a million people between 1975 and 1995.**



Source: Bertaud, A. (2004) The Spatial Organization of Cities: Deliberate outcome or unforeseen consequences?

There are a number of forces shaping urban growth - and therefore types of extension - that include:

- natural environment (e.g. climate, slope, availability of water),
- demographics (e.g. levels of rural migration and natural population growth),
- economy (e.g. the level of economic development and exposure to globalization),
- land/property markets (e.g. availability of land and the cost thereof),
- transportation systems (e.g. access to and dependency on private vehicle use),
- consumer preferences (e.g. proximity to open space and home ownership) and
- governance (e.g. amount of metropolitan land in public ownership and the type and level of enforcement of development controls).[65]

Ose Central Market downtown Onitsha, Nigeria © UN-Habitat/Alessandro Scotti

Promoting a Compact Urban Form

4

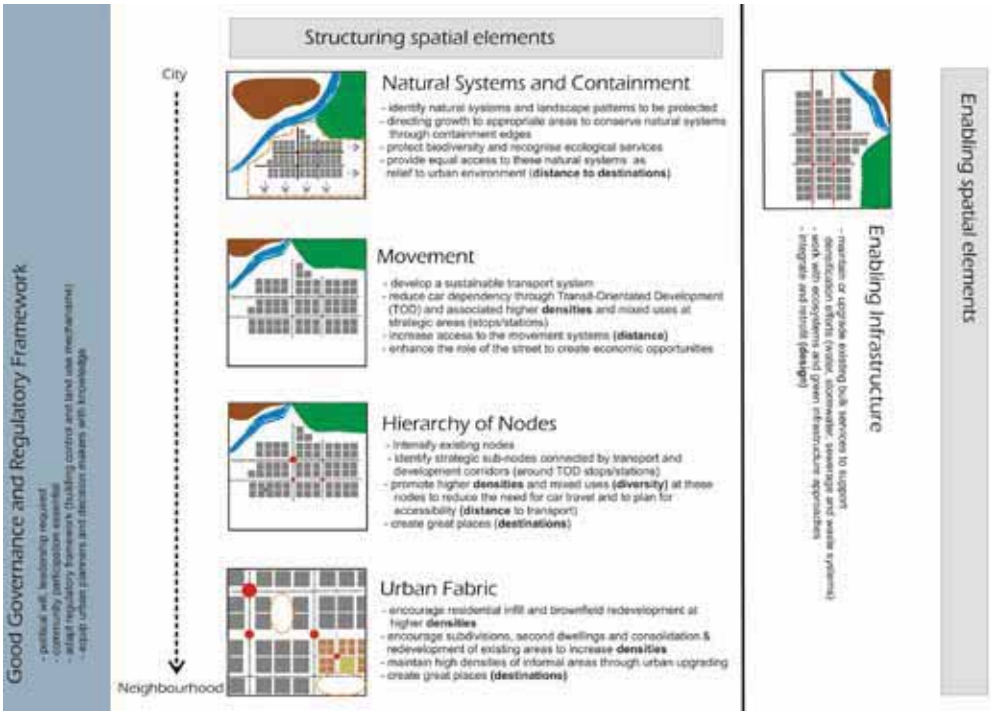
Urban compaction is a key part of achieving a sustainable urban form. The aim of planning for compaction and structured growth is to create better urban environments for people, and in doing so:

- create the integration of urban areas (from a land use and demographic point of view),
- reduce the dependency on private vehicle travel,
- increase the ability of city dwellers to use public transport,
- harness agglomeration advantages, and
- reduce the fragmentation of natural systems and reduce the spatial footprint of the city.

As a starting point, a holistic look is required at what constitutes a city – its spatial building blocks or structuring elements. How these elements interweave to form the urban fabric points to opportunities for spatial intervention at various scales. (See figure 4.1). A set of principles in pursuit of compaction and structured urban growth has been developed. These principles, combined with the non-spatial regulatory context in which development sits, create the foundation for effective planning. They include:

- Promote, preserve and open up natural spaces,
- Integrate and retrofit infrastructure to support higher densities in appropriate locations,
- Develop a sustainable urban transport strategy that focuses on non-motorized and public transport options,
- Identify and intensify urban nodes,
- Increase built area and residential densities to support nodes and public transit corridors,
- Enhance the role of the street as a multi-functional urban space that accommodates a range of activities and uses,

Figure 4.1: **Urban compaction principles and action steps**



© MCA Urban and Environmental Planners

- Promote mixed-use development and intensification of activities, and
- Practise good governance, knowledge sharing and cooperative approaches.

4.1 Promote, preserve and open up natural spaces

Growing cities have an impact on the natural environment, usually negative. The spatial patterns or forms of cities have different effects on the efficient functioning and sustainability of natural areas. Key to a sustainable urban form, therefore, lies in managing the human systems and natural systems to reduce the city's ecological footprint, and to maximize the benefits to be derived from the natural systems.[66]

Green systems within the city-region are a crucial element to foster "liveable" compact cities. A hierarchical, interconnected system of natural spaces, ranging from a regional greenbelt to a pocket play park, should, from a landscape ecology perspective, provide the main structuring elements of urban settlements. This principle reflects the importance of identifying natural systems and strategic landscape patterns, which protect valuable ecosystem services and biodiversity hotspots, and designing the city around these (i.e. linking these systems if fragmented) – see the "Working with Nature" guide. It thus makes it a priority to work with natural systems instead of against them. For example, in Dar es Salaam, urban agriculture has been identified as crucial to sustaining livelihoods as an income earner as well as a food source at household level. Urban agriculture has been recognized and is strategically managed as a formal land

use part of a broader compaction strategy. This strategy encourages vertical expansion (as opposed to horizontal expansion, which encroaches on valuable peri-urban land) to free up land for urban agriculture and green spaces. This ensures improved livelihoods and protects open spaces for use in urban agriculture rather than leaving it vulnerable to the encroachment of houses and city waste. (See the Dar es Salaam case study in the "Working with Nature" guide.)

Case study: Citizens contributing to urban sustainability in Vauban, Freiburg's eco-village, Germany

The redevelopment of an old army barracks in Vauban, Germany, is an example of planners and the community opting to work with natural systems. This landscape has been transformed into a walkable suburb, drastically reducing the reliance on cars, which, in turn, reduces noise levels and air pollution. The designers and community have further embraced the natural systems: existing trees have been preserved and five green areas between residential streets have been designed during community workshops. Food is also grown locally and is widely available to purchase in the area. A ditch system was designed to channel rainwater, allowing storm water to soak into the soil. (Full case study in Section 6.)

Quality open spaces (meaning those well integrated with public facilities and activities, and with a public transport system) provide relief from urban living and create important recreational opportunities.[67] These spaces can also provide aesthetic value and contribute to the broader urban biodiversity and ecological footprint of a city.[68] Green "patches and corridors" evident in cities are recognized as ecological assets that can provide valuable services with an economic benefit.

4.2 Integrate and retrofit infrastructure

This section specifically looks at the influence of bulk infrastructure services of energy, water, wastewater and telecommunications. Transportation is such a significant service in terms of directing urban growth it is discussed in detail in the section below.

Traditionally, major infrastructure systems (water, electricity, sewerage and telecommunications) and the "bulk elements" (water treatment works, power sub-stations, reservoir dams, etc) have structured cities spatially, although their direct impact is less obvious than that of transport.[69] The provisioning of these resource-intensive systems is increasingly costly to build and maintain.

The principle of integrating and retrofitting infrastructure, therefore, calls for the coordination of spatial planning and infrastructure investment – realizing the benefits of an integrated and strategic approach in aligning these systems. This is especially important given the typically long lifespan of infrastructure. Once a major infrastructure decision has been made and implemented, it commits cities to certain patterns of production and consumption for many years.[70] In this regard, rapidly growing cities that are yet to supply certain infrastructural services to their citizens have

Case Study: Citizens contributing to urban sustainability in Vauban, Freiburg's eco-village, Germany

The so-called "plus houses" in Vauban, Germany, are a best practice example. These houses have a high energy efficiency and are equipped with large photovoltaic cells that generate more electricity than the residents can consume. The excess energy is fed into the public grid. (Full case study in Section 6.)

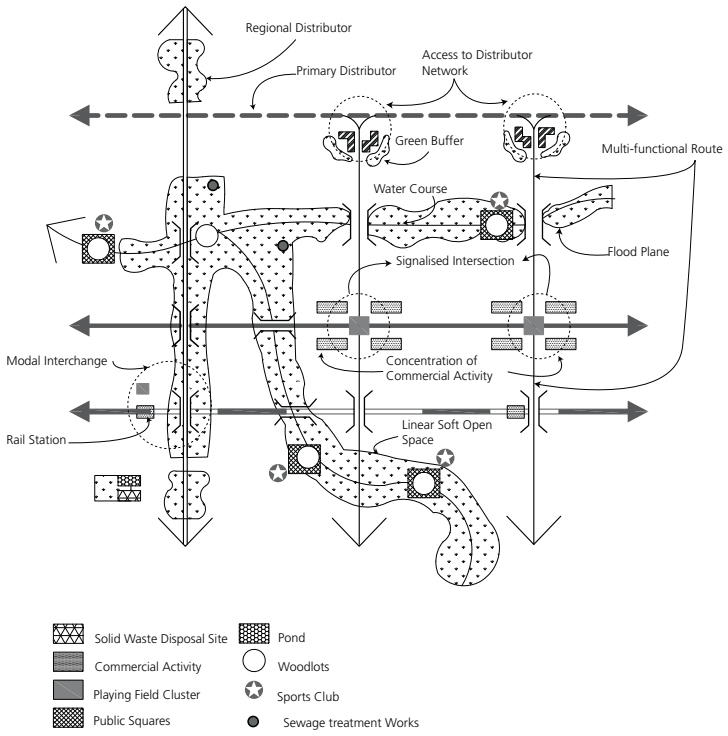
an opportunity to make choices that prevent them from getting locked into unsustainable methods of providing infrastructural services.

Innovative approaches are required to meet the needs of the people without environmental damage and impact (and in the longer term even improving the system).

Agglomeration economies from compact urban development create opportunities for infrastructural services and facilities to be shared, with resource efficiency as a result. Sustainable infrastructure needs to reconcile environmental interests with human interests, and this can be captured in two central concepts: eco-efficiency and social inclusiveness.[71]

- The term "eco-efficiency" can be defined as the delivery of competitively priced goods and services to satisfy human needs and improve quality of life while reducing resource intensity and negative environmental impacts wherever possible – getting more value with less impact. Examples include (1) the re-use of waste by-products and (2) the integration of open spaces with infrastructure services, such as integrating interconnected soft open spaces with storm water management systems and incorporating storm water retention ponds and sewage treatment works into the open space network. (See figure 4.2). See the Durban and Curitiba case studies in the "Optimizing Infrastructure" guide as best practice examples.

Figure 4.2: **Integrate open spaces with infrastructure services**



Source: Behrens, R and Watson, V. (1996). Making Urban Places. Principles and Guidelines for Layout Planning. Cape Town: UCT Press (Pty) Ltd. p. 93.

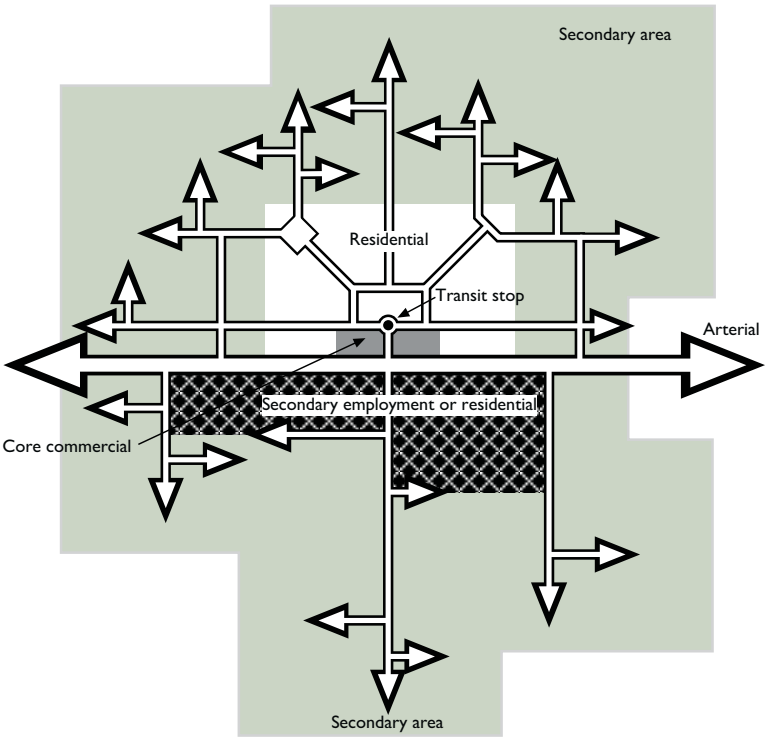
- Social inclusiveness requires that all city residents are treated equally in their access to employment and services such as fresh water and sanitation.

The degree and type of infrastructure investment and innovation will largely depend on the local context. Rapidly growing cities could well be focusing on investments in new infrastructure, whereas established cities might better achieve resource savings by maintaining, improving and retrofitting existing networks where possible. For example, cities in areas where water is scarce are not suited to the provision of sanitation services that rely on potable water, and need innovative approaches that use less or no fresh water. This has been achieved in the development of waterless toilets in informal settlements on the outskirts of Lilongwe in Malawi (see the Lilongwe case study in the "Optimizing Infrastructure" guide). Similarly, cities with sizeable numbers of unemployed people and inaccessible road systems may wish to involve the poor in the collection of household waste as a means of creating jobs, as has been done in Curitiba in Brazil (see the Curitiba case study in the "Optimizing Infrastructure" guide).

4.3 Develop a sustainable urban transport strategy

Transport is an integral spatial building block of any city. It gives shape and structure to it. Urban transportation acts as the veins of a city, carrying people and creating economic opportunities along its path. On the upside,

Figure 4.3: **Transit-Orientated Development concept**



this structuring quality of transportation, especially in the form of public transport, can be aligned to shape and direct growth towards nodes and corridors of development and compaction.

However, in many cities, transport investment is primarily structured around the private vehicle user, contributing to fossil fuel use and greenhouse gas (GHG) emissions. For example, in the United States, this sector contributes about one-third of the overall greenhouse gas emissions of the country. In line with the global agenda set through the Intergovernmental Panel on Climate Change (IPCC), the agenda for large cities now is to increase sustainable transport options in order to reduce traffic while reducing greenhouse gas emissions by at least 50 per cent by 2050.[72]

The focus should, therefore, be on sustainable transportation, in particular providing alternative modes of transport (other than the private vehicle), non-motorized transport (for transporting people and goods) and transit-orientated-development, as defined in the Glossary above. Curitiba in Brazil is probably the best-known case where transit-oriented development was implemented successfully. In this case, the concentration of mixed uses and higher residential densities at transit stops and along public transport corridors facilitated viable and effective public transport provision and created more compact and accessible environments.

Further reading: For a step-by-step illustrative animation of the concept of transit-oriented-development, please visit: http://www.asla.org/sustainablelandscapes/Vid_ActiveLiving.html

Example: Curitiba's innovative transit-orientated plan

Thirty years ago, the city of Curitiba in Brazil took a conscious step to review its modernist, car orientated, city plan. The concern was that this "modern" plan would lead to a city strangled by freeways, high pollution and poor quality of life. An innovative transit-orientated plan was developed based on encouraging high-density, mixed-use, linear urban development radiating from the centre along major transport routes with efficient, affordable public transport. This approach was implemented and over the years a vibrant city has emerged where one third of the population lives in the city centre, one third along the high density arteries and one third elsewhere. Amongst others, the success of Curitiba's world-renowned bus rapid transit system has been attributed to the fact that it is based on the principle of "economies of density". This means that the system does not just rely on dense residential development along these transit corridors to ensure its effectiveness, but the system is further capitalizing on the already huge infrastructure investment made by operating 10 specialized types of bus services along the same network. Consequently, a city dweller can get a bus within 500 m of anywhere in the city and he / she can do so every 60 seconds.[73]

Case study: Medellín's aerial cable-cars: Social inclusion and reduced emissions

Medellín's world-renowned cable car system not only resulted in major social and mobility benefits for previously inaccessible comunas (districts) but subsequent studies have indicated that a major reduction in greenhouse gas emissions occurred, compared to the "baseline emissions" that would have resulted from the use of the original modes of transport (full case study in Section 6).

Case study: Shifting urban development from private vehicles in Bangkok, Thailand

In Bangkok, Thailand, a conscious decision was made to shift urban development away from car-orientated transport, the biggest cause of the city's infamous traffic congestion. In an attempt to relieve this congestion, the government built more roads and the private sector responded with housing development along these routes, expanding the city's boundaries. Since the introduction of an urban railway system as an alternative mode of transport, the city has undergone significant change in its spatial structure. New residential developments, at higher densities, are now being located along the railway line and stations, and not on the outskirts of the city. A fundamental shift in mindset has also occurred. Property developers used to promote their projects by stating how close they were to higher order roads; now they boast the proximity to transit stations. Bangkok's streets still have some congestion, but the public transport system provides commuters with modal choices and is currently catering for 500,000 ridership trips per day (full case study in Section 6).

4.4 Identify and intensify urban nodes

The compact city should be structured through the conscious support and development of a hierarchy of nodes located on the major public transport axes in the city.

Within the city region, nodes may refer to satellite cities, which can vary in scale and function, ranging from the independent polycentric city to the dependent satellite city. The creation and promotion of satellite cities to accommodate urban growth has been pursued with only a limited level of success. This is because it has been proven that jobs, wherever they are, attract people from all over the city.[74] Trip patterns could result in longer trips with people commuting across the city to these satellite towns and not necessarily shorter trips as in the ideal situation of people living and working in these towns (see figure 4.4). These interventions rely on effective transport linkages and government leadership and drive. From a city growth perspective, the danger lies with satellite cities spreading beyond their metropolitan boundaries along these main transport routes. To prevent this, strong government-led approaches and growth containment strategies are vital.

Example: China – Liaoyuan as satellite city for Changchun

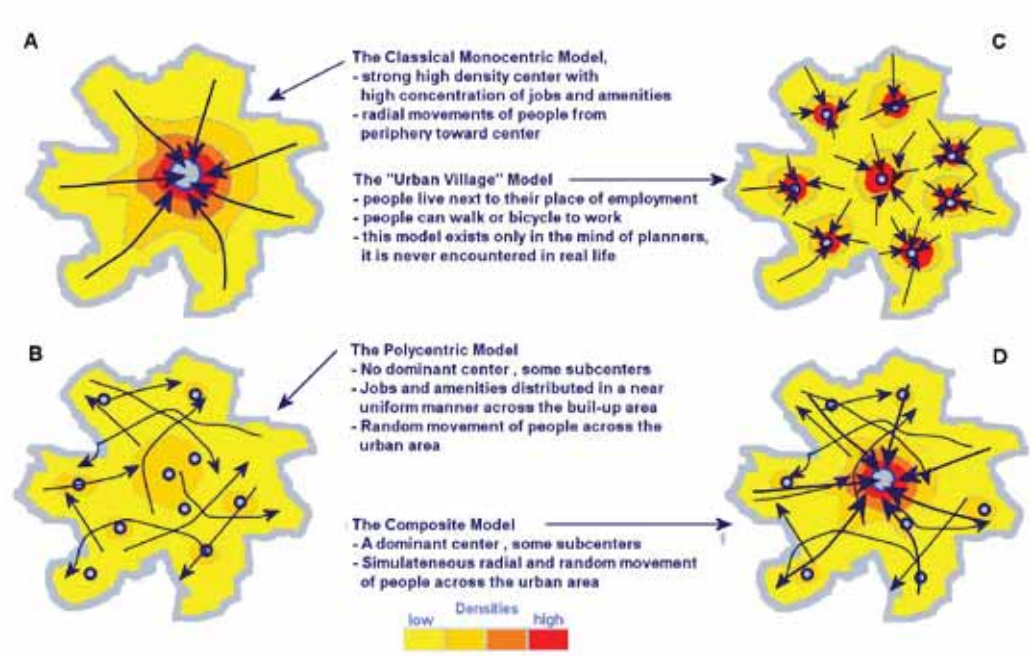
The Chinese Government approved the concept of turning the city of Liaoyuan into a satellite city for Changchun, situated 100 km away, in 2009. Through government support, a new railway and highway was built connecting the two, shortening the journey between the cities to an hour. The Chinese Government also offered incentives to local investors by streamlining local residency permits and making industrial land available at reduced rates. The development of Liaoyuan was based around supporting the economic growth of the "mother city" and the city has subsequently attracted more than USD 150 million in foreign investment.[75] However, the sustainable value of this city growth model is questionable, especially within poorer developing countries, because there is not necessarily a correlation between those living and those employed in these areas – people might live in Changchun and commute daily to Liaoyuan to work, which is not a sustainable transport choice.[76]

However within the city, the identification of strategic sub-nodes connected by transport and development corridors, and the promotion of a concentration of mixed

uses and higher residential densities at these nodes, provide the central strategy to enable compaction, especially in peripheral areas.

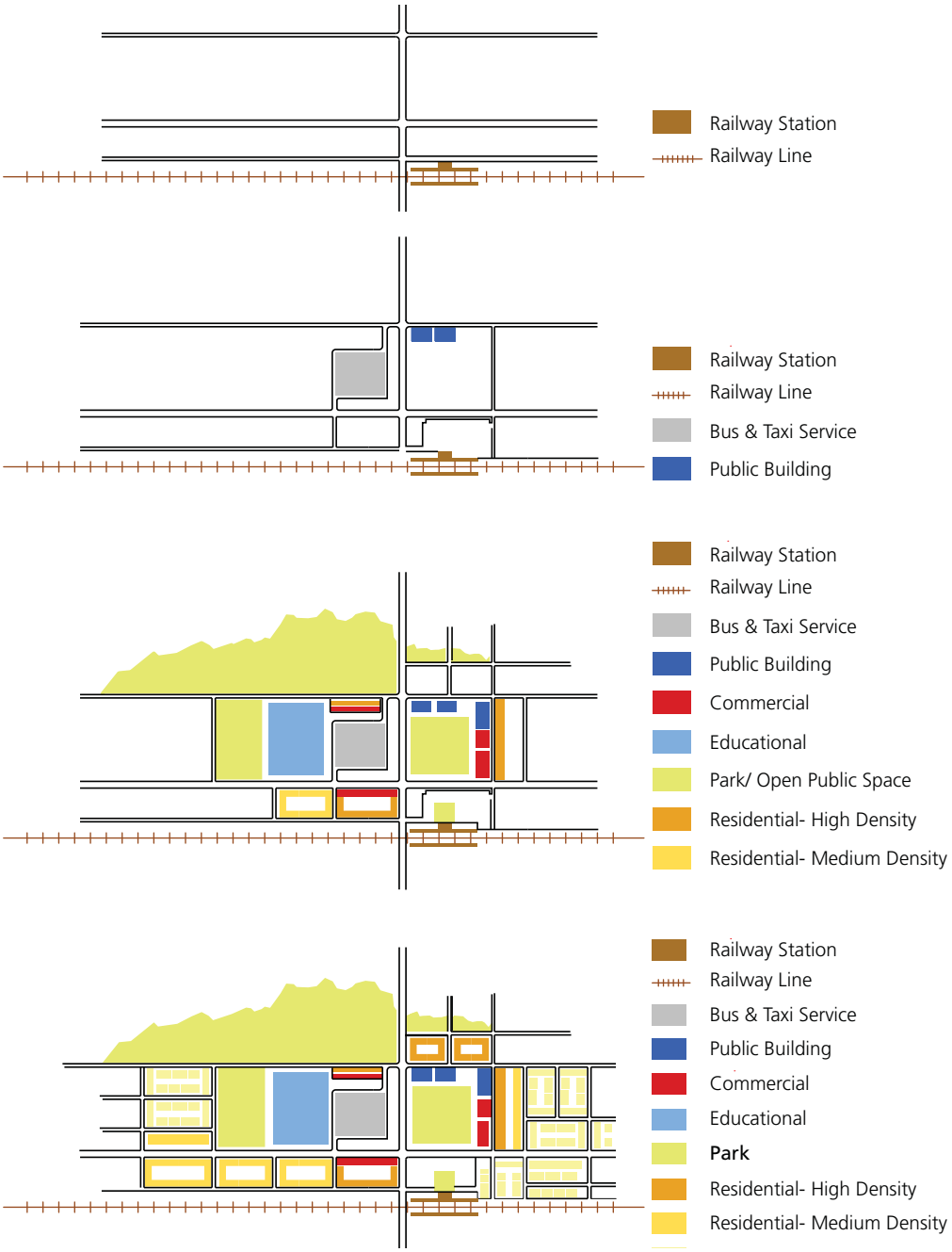
Strategically located, mixed-use, compact urban nodes can yield economic opportunities. If the land uses work well together, they offer "positive externalities" – they mutually support each other's objectives.[77] To this end, not only is the number of users increased (quantitative), but also the grouping of the land uses facilitates maximum economic returns (qualitative). Figure 4.5 illustrates how nodes can develop around public transport stops/stations. These underlying principles of intensification and densification are further discussed in the sections below.

Figure 4.4: **Common Urban Spatial Structures**



© *Alain Bertaud*

Figure 4.5: **Growth of a node**



Source: MCA Urban and Environmental Planners. (2007). Settlement Restructuring: An explanatory manual in terms of the Western Cape Provincial Spatial Development Framework.

4.5 Increase built area and residential population densities

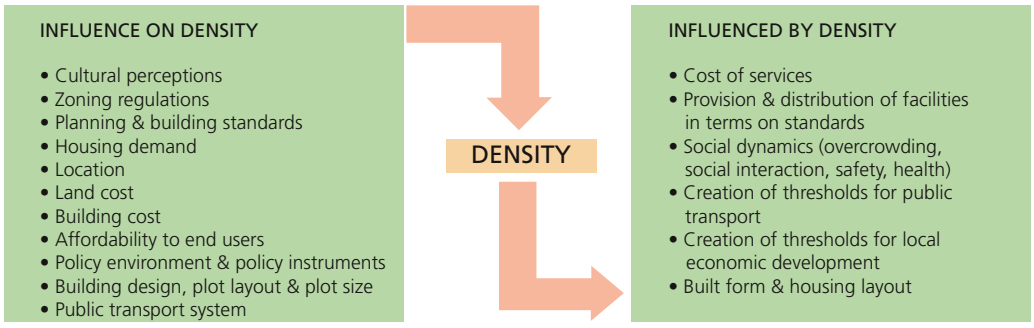
A compact city is not only a dense city but is one with quality public spaces, amenities and opportunities. However, density and its various dimensions and interrelationships with other public and private spaces are integral to urban compaction.[78,79] Massive variations in residential densities exist across the world. What is considered to be high density in one city might not be appropriate or acceptable in another. In determining the proper level of density for a given city, it must be assessed whether such density ranges encourage and enable the positive aspects of density, as discussed here, to be realized. Urban planners need to see densities as calories and vitamins – right amounts are the right amounts because of how they perform.[80]

This performance will be subject to the various interrelated dimensions of density, such as the acceptable built-up area, the land available or to be provided for essential public services, and subjective perceptions around density within a given urban environment (often believed to be that dense areas lead to overcrowding, poor services and air pollution). This was recognized in a recent study initiated after the Government of Maharashtra, India, decided to restrict the amount of residential floor space to 5m^2 per person in Mumbai during their slum rehabilitation scheme. It highlighted the importance of space requirements per person for public use (roads, schools, hospitals, footpaths and parks).[81]

Figure 4.6 shows an exhaustive list of factors influencing and influenced by density.

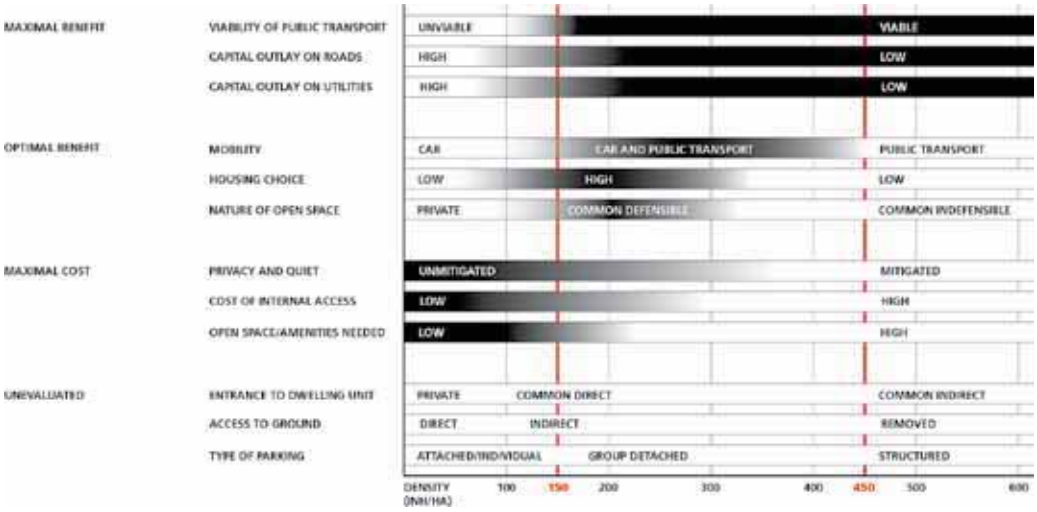
There are clear relationships between ranges of densities necessary to create viable thresholds for certain components of the urban environment. The figure below sheds light on these linkages and suggests the trade-offs required to achieve an optimum balance. Based on this, an optimum gross density range of between 150 to 450 people per hectare (approximately 150,000 and 450,000 people per km^2, or 30 to 90 dwelling units per hectare) is suggested.[82] It also indicates that public transport is only viable above 150 people per hectare.

Figure 4.6: **Factors influencing density and implications of density.**



Source: Development Action Group (2008) Sustainable medium-density housing: A resource book – by Anzabeth Tonkin

Figure 4.7: **Density parameters**



Source: based on Senior, B. J. (1984). Factors affecting residential density: A search for the Zen of Density. Unpublished Doctoral Thesis. Faculty of Architecture, University of the Witwatersrand, Johannesburg and Tonkin, A. (2008) Sustainable medium-density housing: A resource book. Development Action Group, Cape Town

Population densities

Generally, on a city scale very high average population densities are evident in cities in South East Asia as measured in 2003.[83] Medium average population densities are evident in many European cities and low average population densities are observed in most of the American cities studied as well as some African and South American cities.[84] A study conducted in 2011 of nine so-called "Urban Age" cities across the globe provides an indication of the disparities between average population densities in cities, and between various areas within these cities, as shown in the tables below.[85] It is clear that the city of Johannesburg, South Africa, (average of 20 people per hectare) has a low average population density compared to that of Mumbai, India, (average of 253 people per hectare). Istanbul, Turkey, is a good example of density disparities within a city – it has a low average population density (average of 24 people per hectare), but has a high inner city density (average of 201 people per hectare) and a very high density (average 773 people per hectare) in the city's most populated neighbourhood (Güngören).

Table 4.1: **City scale: Comparison of average population density of a sample of world cities**

City	Average population density for city (people / km2)	Average population density for city (people / hectare)	Range (note: authors' own demarcation)
Mumbai	25,316	253	high
New York	9,272	93	
São Paulo	6,832	68	
Mexico City	5,786	58	
London	4,497	45	
Shanghai	3,136	31	
Berlin	3,737	37	
Istanbul	2,380	24	
Johannesburg	1,963	20	low

Adapted from source: Living in the Endless City [86]

Table 4.2: **District scale: Comparison of inner city population density of a sample of world cities**

City	Inner city population density (people / km2)	Inner city population density (people / hectare)	Range (note: authors' own demarcation)
Mumbai	45,021	450	high
Shanghai	23,227	232	
Istanbul	20,128	201	
New York	15,353	154	
Mexico City	12,880	129	
Sao Paulo	10,376	104	
London	8,326	83	
Berlin	6,683	67	
Johannesburg	2,203	22	low

Adapted from London School of Economics & Deutsche Bank's Alfred Herrhausen Society. (2011). Living in the endless city. London: Phaidon Press Limited

Table 4.3: **Neighbourhood scale: Comparison of the population density between the areas within these cities with the highest densities**

Area within city with highest population density	Highest density within city (people / km2)	Highest density within city (people / hectare)	Range (note: authors' own demarcation)
Kamathipura, Mumbai	121,312	1213	very high
Güngören, Istanbul	77,267	773	
Luwan, Shanghai	74,370	744	
Upper East Side, New York	58,530	585	
Molino de Santo Domingo, Mexico City	49,088	491	
Berea, Johannesburg	42398	424	
Santa Cecilia, São Paulo	29704	297	
Schillerkiez, Berlin	24186	242	
Novtting Hill, London	17324	173	medium to high

Adapted from London School of Economics & Deutsche Bank's Alfred Herrhausen Society. (2011). Living in the endless city. London: Phaidon Press Limited

It is important to note that these cities only represent a sample. Higher population densities exist in South-East Asia. For example, the Hong Kong Metropolitan Area has an average population density of 6,160 people per hectare while the district of Mong Kok has an extremely high density of 116,000 people per hectare.[87] This very high-rise, high density form in South-East Asia can be viewed as sustainable because it yields short journeys to work, provides easy access to services, has widespread mass transit, supports the development of self-contained new towns and consists of an adequate provision of public space (a third of Hong Kong's urban area is open space). However, the resultant high levels of pollution, and the fact that a different cultural attitude about density evolved, could make this urban form unacceptable elsewhere in the developing world.[88]

Residential densities

Residential densities (dwelling units per given area) also vary across cities as the number of people per unit (occupancy density) varies. In India an average of five people per unit is accepted whereas the average of an area in New York is 1.7 people[89]. Although there are no clear definitions for low, medium and high residential densities, an accepted range for medium residential densities of between 40 and 100 dwelling units per hectare (gross) has been applied to the South African context. Achievable housing types at this range include: semi-detached housing, row housing and three to four storey walk-up flats.[90] In New Zealand, medium density housing is classed as housing between 30 and 66 dwelling units per hectare.[91]

For the purposes of this guide, within the context of developing country cities, the following residential density ranges are proposed (see table 4.4):

Table 4.4: **Residential density ranges**

Range	Residential density: dwelling units / ha (net)
Low	< 15
Low to medium	15 – 40
Medium	40 – 120
High	120 – 500
Very high	> 500

Tables 4.5 and 4.6 provide spatial density guidelines relating to certain areas and illustrate how the potential built forms could look like relating to these density ranges:

Table 4.5: **Spatial location criteria - density guidelines**

Areas to be targeted	Specific locations	Density guidelines
Development / activity corridor	Particular points, namely:	High density
	Points of direct access	e.g. 120 - 375 du/ha (net)
	Transport intersections / interchanges	
	Places of intense mixed use development	
Activity route	At all points along the route, especially:	Medium to high density
	Public transport stops/stations	e.g. 100 - 375 du/ha (net)
	Route intersections	
	Mixed use areas	
	Commercial nodes	
Activity street	At all points along the route, especially:	Medium density
	Public transport stops/stations	e.g. 100 - 375 du/ha (net)
	Route intersections	
	Mixed use areas	
	Commercial nodes	
Urban core (major economic opportunity area)	Generally within and abutting the defined higher order node or central business district	High density
		e.g. 120 - 375 du/ha (net)
District and local nodes	Generally within and abutting the defined higher order node	Medium to high density
		e.g. 50 - 250 du/ha (net)
Metropolitan, district and local parks	Generally abutting parks, especially large and/or multifunctional parks	Medium to high density
		e.g. 50 - 250 du/ha (net)
Specific residential areas	Within areas of focused public sector investment, e.g. subsidized housing areas	Medium density
		e.g. 40 - 120 du/ha (net)
All single residential areas		Strive to increase existing average density through methods discussed in this section.

Adapted from City of Cape Town. (2009) Cape Town Densification Strategy: Technical Report

Table 4.6: **Residential densities and built form**

Development, scale and location	Average residential density	Built form
Neighbourhood in Cape Town, South Africa	± 12 du/ha (gross)	
Housing development in Adelaide, Australia	30 du/ha (net)	
Housing development in Port Elizabeth, South Africa	75 du/ha (gross)	
Amsterdam Old quarter (Neighbourhood), The Netherlands	75 - 100 du/ha (net)	

Residential block in London, United Kingdom	125 - 200 du/ha (net)	
Housing development in Johannesburg, South Africa	192 du/ha (net)	
Residential area (neighbourhood) in Singapore	> 500 du/ha	

© Elzette Henshilwood

The Strategy

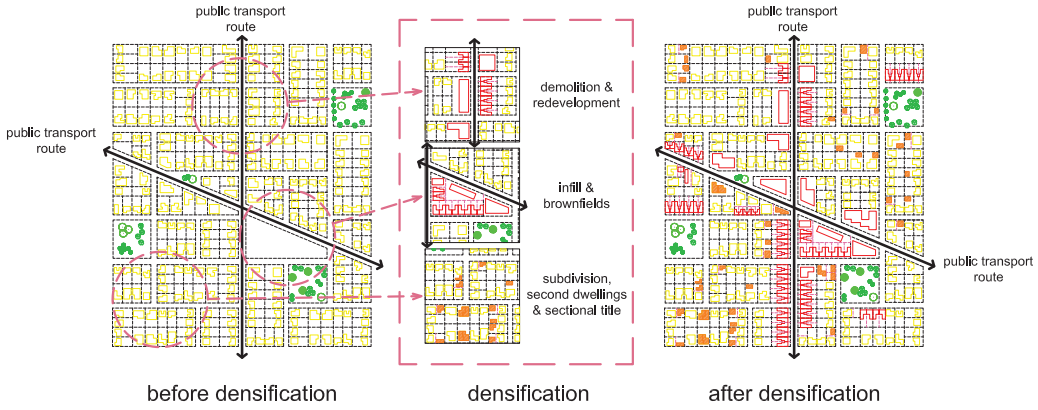
Within the urban realm, densification is a complex process whereby densities are increased in a planned and sustainable manner without adversely affecting the quality of life of established communities. The focus is therefore on strategic (where) and appropriate (scale) densification with good public transport as the enabler, supported through sufficient infrastructure capacities and provision of social services.

Where should densification occur?

Within towns / settlements, higher densities should be concentrated (see table above):

- along public transport trunk routes in order to support public transport thresholds,
- in and around urban nodes and modal interchanges/public transit stops,
- on the periphery of open spaces to increase surveillance,
- within areas of focused public-sector investments, and
- in selected areas of high private sector investment (e.g. around commercial hubs).

Figure 4.8: **Methods of Densification**



Source: MCA Urban and Environmental Planners. (2007). Settlement Restructuring: An explanatory manual in terms of the Western Cape Provincial Spatial Development Framework

Example: Medium-density housing of Sakhasonke Village, Port Elizabeth, South Africa [92]

Sakhasonke Village, a medium-density subsidy housing initiative in Port Elizabeth, South Africa, is viewed as a flagship project in sustainable human settlement development in that country. Post apartheid housing policy and laws advocate the densification of existing residential areas, but this has often not happened. The land on which the village was established is well located for services and access to work opportunities. There was a focus on pedestrian movement with communal parking areas rather than providing on-site parking spaces. A public-private partnership was the driver and the community was actively involved in the planning phases as well as in the construction phase – skills were transferred to members of the community and a socially transformed community is the result today.

The role of densification in creating quality urban environments and a more efficient, safe and cost effective urban system can be achieved through a range of methods:

4.5.1 Infill development and brownfield redevelopment

Infill development is the process of developing vacant or underutilized parcels of land within existing urban areas that are already largely developed. Most cities have significant vacant land within city limits, which, for various reasons, have been neglected in the normal course of urbanization.

Good placemaking design features are essential for successful infill development. The difference between infill development and brownfield redevelopment is that infill development could still involve greenfield sites whereas the latter refer only to the redevelopment of land that has already been developed, often originally for industrial purposes, then later abandoned.

Case study: The Honeysuckle Urban Renewal Project, Newcastle, Australia – A snapshot of leading urban revitalization and brownfield redevelopment

The Honeysuckle Urban Renewal Project in Newcastle, Australia, is another example in which unused land and dilapidated structures around the existing port have been redeveloped into a vibrant mixed-use development. Government intervention and funding was seen as the major catalyst for the first four years of the project's lifespan, thereafter private investment far exceeded government funding. Subsequent studies have proved that this redevelopment reversed the decline in population, jobs and investment in the central business district and improved the environment and attractiveness of the inner city (full case study in Section 6).

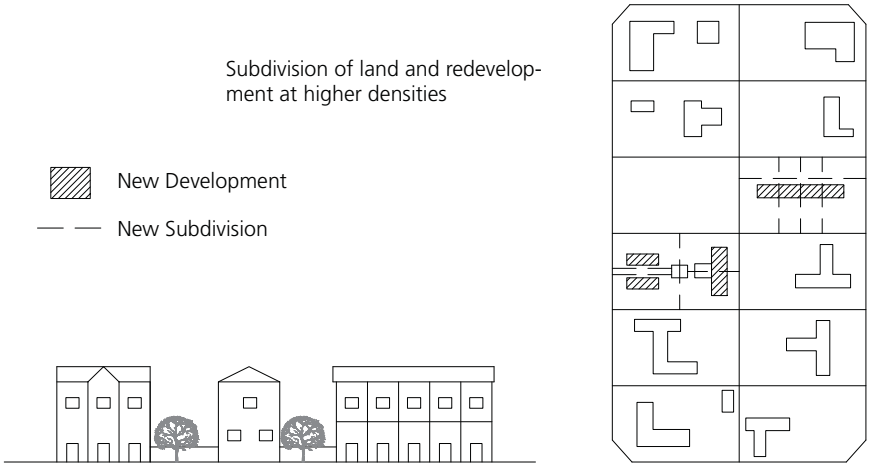
Case study: Citizens contributing to urban sustainability in Vauban, Freiburg's eco-village, Germany

The Vauban eco-village in Vauban, Germany, displays an innovative approach to sustainable redevelopment. In 1992, a master plan was drawn up for the transformation of an area (38 hectares) about 3 km from the city centre, which formerly housed army barracks. Today, this district houses 5,000 people (at a fairly high density of 131 people per hectare), provides 500 jobs, has ample green space where food is grown locally and, as a district, it generates surplus energy that is fed back into the public grid (full case study in Section 6).

4.5.2 Subdivisions, second dwellings and consolidation & redevelopment

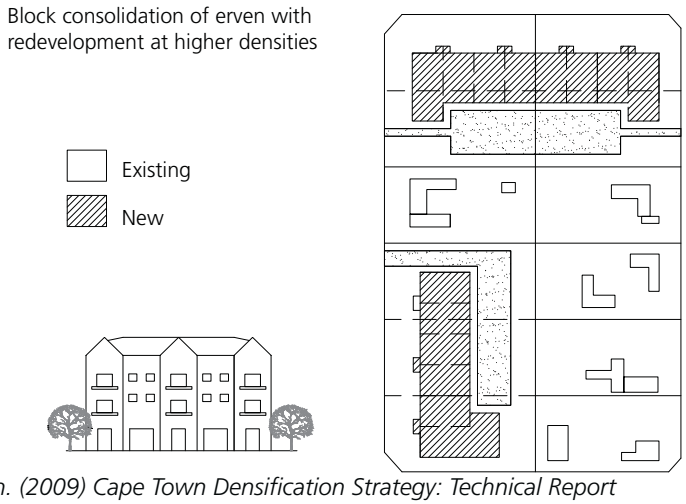
On a local scale (site specific) a densification strategy could involve demolition of existing buildings on a single portion of land and its redevelopment at a higher density (see figures 4.9 and 4.10). This strategy is potentially best suited to areas that are well located and in close proximity to existing social facilities and services, public transport and traditional employment areas. However, caution must be practised in cases where the reduction of plot sizes could lead to stripping the urban poor of their means of survival because they rely on such "excess" land to sustain life (urban agriculture, keeping livestock etc.).[93]

Figure 4.9: **Subdivision of land and redevelopment at higher densities**



Source: City of Cape Town. (2009) Cape Town Densification Strategy: Technical Report

Figure 4.10: **Consolidation and redevelopment at higher densities**



Source: City of Cape Town. (2009) Cape Town Densification Strategy: Technical Report

4.5.3 Maintain high densities of informal areas through urban upgrading

The issues surrounding urban poverty, slums and informal city living are complex. Ultimately, the goal for every city ought to be to develop without slums. In the meantime, upgrading these areas can contribute to good quality urban places.

Urban upgrading can improve life in informal areas through improving infrastructure and services (water, sanitation, garbage collection, stormwater drainage, street lighting, improving footpaths and streets). By upgrading these already dense "walkable" living environments, the densities are maintained and other sustainability gains can be achieved towards environment sustainability, economic growth and poverty reduction.[94] Other advantages include working with the existing built form, involving the residents to assist with the actual upgrading and maintaining the social networks. The extent of community involvement can often help them to organize themselves (community-driven solutions).[95] The role of the government is crucial in upgrading programmes because innovative regularization efforts are required to secure tenure.

If these areas were located on sensitive land (for example, floodplains and steep slopes), an appropriate response would rather involve making suitable land available through infill or planned extension than merely entrenching existing degradation of such sensitive natural areas and hazardous areas.[96]

Case study: The "Favela Bairro" Upgrading Programme in Rio de Janeiro, Brazil

The "Favela Bairro" Upgrading Programme in Rio de Janeiro (1994) aimed to upgrade existing favelas (slum settlements in Brazil) and also encouraged the use of vacant land (infill) for low-income housing. The programme stressed the importance of creating public spaces to encourage community interaction, included recycling initiatives and, instead of providing formal ownership, supplied tenure security through its use of the concession of right to use. In 2000, six years into the programme, 90 favelas had been upgraded (full case study in Section 6).

4.5.4 Planned urban extension at higher densities (Greenfield development)

Planned urban extension provides planners with the opportunity to create compact developments from the outset – honouring the 5 D's of compact development (density, diversity, design, destinations, distance to public transport) in order to realize sustainability gains. Ensuring that these extensions happen at higher than average densities is only one element of the overall aim.

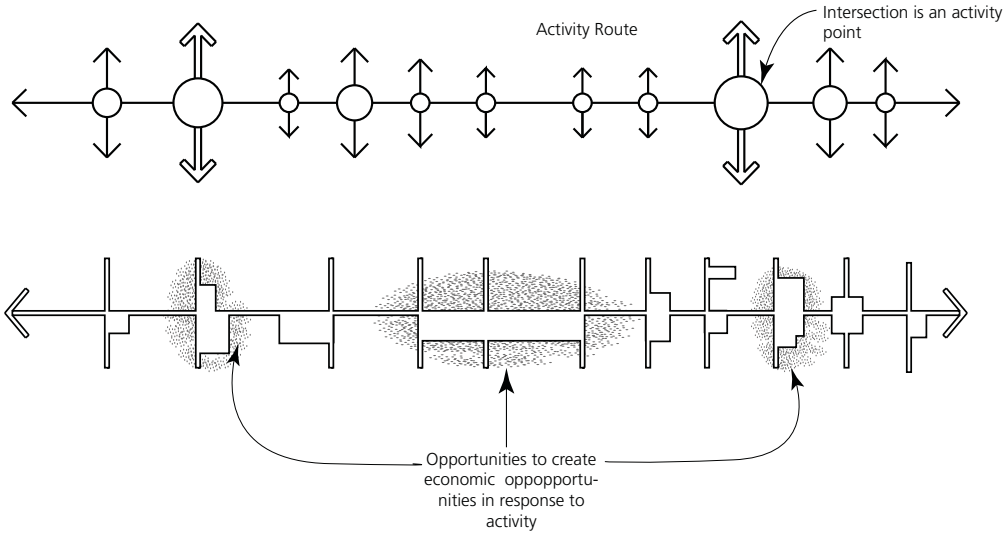
Case study: Directed urban extension in Cairo, Egypt

The city of Cairo is home to about 18 million people. The city is characterized by high densities and crowded slums. The Government of Egypt started to develop planned extensions (New Urban Communities) around Cairo in 1970 with the goal of providing alternative planned urban solutions to the slums (in parallel with improving slums and informal settlements). These new towns (mixed use) are planned and implemented on the government-owned desert land (essentially greenfields) on the outskirts of Greater Cairo. Vast public investments were made to develop the urban infrastructure – roads, electricity, water, sewers, public spaces and street furniture. (Full case study in Section 6).

4.6 Enhance the role of the street

People tend to congregate where there is movement. This principle, therefore, advocates the need to accommodate and/or capitalize on this natural tendency in line with a broader hierarchy of multi functional roads within a city. The higher order "activity route/corridor" and lower order "activity street" offer the prime locus for public intervention. At intersection points, along these routes, opportunities exist for nodes to develop in response to the stopping and starting of traffic and the higher traffic volumes at these intersections.

Figure 4.11: **Activity corridor/street**



Source: MCA Urban and Environmental Planners. (2007). Settlement Restructuring: An explanatory manual in terms of the Western Cape Provincial Spatial Development Framework

Other key considerations when it comes to street design within compact developments are:

- Within a compact environment, a human-scaled street network is essential as it causes traffic to slow down and makes walking and cycling more attractive;

- The amount of activity on a street is relative to its function – hence the hierarchy of multi-functional roads. The level of compaction efforts (i.e. densification and intensification) should, therefore, be aligned with this hierarchical system;

- The way in which the adjacent buildings "meet" the street (interface) will determine how pedestrian-friendly and vibrant a street can be;

- The informal sector is active in areas that are used the most, i.e. along busy movement routes. In these cases, the challenge is designing these movement paths to accommodate people, public transport and business;

- The Dutch woonerf concept and the "car free" streets in Vauban, Germany, are examples of multifunctional pedestrian friendly local streets – streets to live in – which discourage private vehicle usage and parking. (See figures below.)

Vauban's car-free streets © Steve Melia

Example of the Dutch woonerf © Annalise Reichert, UC Davis Sustainable Cities class touring blog; Professor Jeff Loux

4.7 Promote mixed-use development and intensification of activities (diversity)

Land use management patterns are key to urban sustainability. To this end, the mixed-use and mixed-income city is crucial in promoting social sustainability and inclusion, through equal access to facilities, economic opportunities and transport options.[97]

The principle of providing urban diversity has two aspects. Physical diversity refers to the location of different land uses and/or income groups within a delineated area (such as at a node), whereas socio-economical diversity should be regarded as an important characteristic of physical integration and refers to physical proximity of different socio-economic groups in an area so as to create a cohesive (home-work-services) community. This establishes accessibility to a wide range of housing options and services to all income groups. An integration / intensification strategy could be a component of a broader densification strategy, whether it is within the existing city limits (infill, redevelopment etc) or as part of planned urban extensions.

Design strategies for diverse places include:[98]

- Mix – providing a mix of land uses, housing typologies, and services and facilities;
- Connection – enhancing connectivity through delineating safe places to cross existing streets, calming traffic or establishing better pedestrian pathways;
- Security – if people and functions are mixed and connections enhanced, security needs to be enhanced, for example through fronting houses onto parks to increase natural surveillance.

4.8 Practise good governance, knowledge sharing and cooperative approaches

Compaction efforts in cities are about people – the people driving the change, the people implementing the change, involving and planning for the people in need of change and convincing people to capitalize on the change.

This principle is therefore twofold; advocating the need for these "drivers" (governments) to take a stronger lead in promoting change agendas in moving towards sustainable urban forms and equipping those responsible for implementing the change with adequate education and knowledge. Being able to design holistically and strategically and implement change in cooperation with local communities (and where decision-making is consultative) are key building blocks towards sustainable solutions.[99]

Medellín's system of cable cars is a best practice example of how an innovative idea with political support resulted in large-scale environmental and social benefits.

The various aspects of this principle include:[100]

- strong management and political support for public authorities' visions,
- focus on people-centred strategic planning approaches, which talks to a common vision with grassroots community participation and sequenced interventions at a metropolitan scale,
- adopting appropriate building control and land use mechanisms,
- creating and availing a database of best practice and applicable policies, and
- raising public awareness.

Case study: Twelve years of "massive urban land restructuring" in Ouagadougou (1983 – 1995)

In Burkina Faso, a massive urban land restructuring programme succeeded in its objective of drastically reducing the number of informal settlements in the capital, Ouagadougou. Between 1983 and 1995, the area of the capital's urban footprint occupied by settlements was reduced from 71 per cent to only 7 per cent. A change in legislation led to the subdivision and reallocation of land (the policy of "lotissements", or self-help developments, implemented between 1983 and 1990) to the recipients (residents and the resettled) of new plots through a transparent and participatory process throughout the upgrading programme. In just two years, the government distributed three times more plots than had been distributed in the past.[101] But the programme did not cater for an adequate infrastructure supply and, in some cases, basic utility services were only supplied years later. (Full case study in Section 6.)

The main square in Uberlândia, Brazil preserves public amenity while allowing the infill and densification of other sites in the city's relatively compact core © UN-Habitat/Alessandro Scotti

Implementing Sustainable Urban Practices

5

The focus of this section is on how the principles might be applied in practice and it outlines a series of action steps at the disposal of the urban planner and local decision maker, who have a crucial role to play in managing change and urban growth. As discussed above, sustainable ways of managing this growth involve the promotion of a compact urban form and directing, supporting and structuring urban expansion.[102]

Given the complexity and diversity of cities, different levels of intervention are possible. This guide is not intended to provide a one-size-fits-all solution. An ambitious spatial restructuring plan linked to infrastructure development might be a viable option for one city, while a realistic option for another might merely involve the upgrading of public places. However, both cases have merit within the broader goal of achieving a sustainable urban form.

The following action steps provide examples of strategic intervention within the urban realm:

- Secure leadership, political will and an enabling policy environment,
- Engage the communities early on – participatory planning,
- Equip planners with knowledge,
- Adopt a strategic spatial planning approach,
- Invest in sustainable transport options and in appropriate infrastructure,
- Develop an urban densification strategy and delineate containment edges to prevent uncontrolled urban sprawl,
- Activate the street and plan for accessibility,
- Plan for informality,
- Pursue brownfield development – practise the notion of re-use and retrofitting,

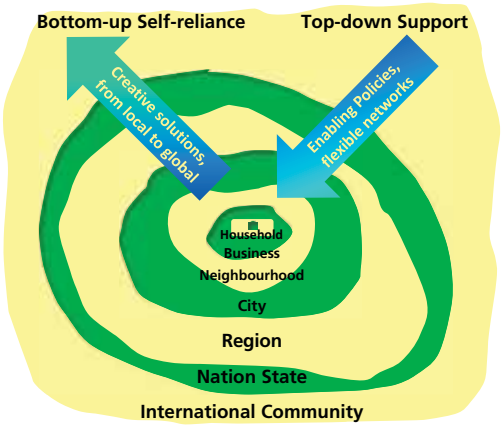
- Respond to climate change risk areas,
- Create great public places – place making.

5.1 Secure leadership, political will and an enabling policy environment

Strong leadership and political will have been identified as essential components to successful public interventions. Without an enabling, supportive, institutional and regulatory environment, many intervention efforts fail. The following are, therefore, proposed:

- Identify champion(s)/visionaries (leaders) and secure their sustained commitment, ultimately for a more sustainable city, but also for the objective of individual interventions. Strong leadership is required to bring the various groups and stakeholders together.
- Initiate a process for collaborative decision-making and adopt a city-based integrated design approach – a simultaneous bottom up and top down approach. (See figure 5.1). For innovative actions, initiated from the local level, to be successful top-down support is vital in enabling implementation.
- Review and adapt existing planning legislation and regulatory planning controls. This could include relaxing land use/zoning controls (building lines, coverage, etc) and/or removing restrictive obstacles, such as parking provisioning requirements and minimum density policies.
- Introduce a programme of fiscal measures to support compaction efforts and interventions – especially in cases where the private sector is driving development. These could include density bonus systems (granting additional land rights for commitment to social or infrastructure investment), transfer of development rights and land swops, development taxes (widely used in Brazil and South Africa, where developers have to pay the cost of infrastructure provision, which encourages development on infill sites), land banking, and consolidation and financial incentives. To this end, it has been advocated for cities to create their own sustainability currencies, also called "sustainable development rights". This could relate to biodiversity credits, greenhouse reduction credits, affordable housing credits or anything else that a community can create a market for in their city.[103]

Figure 5.1: **The "city based approach"**



Source: The World Bank. (2010). Eco2Cities. Ecological Cities as Economic Cities. Synopsis Brochure, Suzuki et Al

Case study: The "Favela Bairro" Upgrading Programme in Rio de Janeiro, Brazil

A revised government policy was instrumental in the practical implementation of the "Favela Bairro" Upgrading Programme in Rio de Janeiro. Extensive public engagement was undertaken and leeway was given to planning policy processes; for example, the favelas were all declared zones of special interest and thereby made exempt from planning regulations. The process of granting freehold titles was also avoided by coming up with innovative alternatives, which included granting long-term rights of use. (Full case study in Section 6)

Case study: The aerial cable cars in Medellín, Colombia: Social inclusion and reduced emissions

In Medellín, the ambitious cable car initiative was made possible through the combined technical foresight of the city's publicly owned Metro company and the political will of the newly elected mayor. Following the installation of the cable car system, a strategy to integrate mobility, environment, housing and public space within previously economically depressed areas were set into action through the formulation of a new policy. This introduced a participatory budgeting system, which allowed local communities to collectively decide on the use of 5 per cent of the municipal budget allocated for these areas for investment. (Full case study in Section 6.)

5.2 Engage the communities early on – participatory planning

The benefits of planning and designing with and not for communities have been highlighted by numerous best practice examples and in this guide. The Rio de Janeiro, Freiburg and Medellín case studies all point to the advantages of engaging the communities throughout the process. Supporting such an approach can build learning and knowledge sharing platforms between stakeholders and communities, encourage communities to take "ownership" of finished products and reduce conflict between groups.

Further reading about participatory planning: Participatory planning is one of the UN-Habitat's focus areas and more information about this topic can be obtained at: http://www.unhabitat.org/content.asp?cid=7968&catid=575&typeid=24&subMenuId=0

5.3 Equip planners with knowledge

Urban planners need to be provided with knowledge about current trends and best practice, in order for urban planning to be effective in driving sustainable change within cities. Outdated planning regulations and laws of many developing countries should be revised and knowledge-sharing networks established between cities and countries. Additionally, urban planners should be made aware of existing networks and sources of information, especially contextual and empirical data aimed at socially educating them.[104,105]

Some of the existing knowledge portals available to planners:

- Cities Alliance – www.citiesalliance.org
- Sustainable cities collective www.sustainablecitiescollective.com
- UN-Habitat – www.unhabitat.org
- Membership-based organizations www.inclusivecities.org

- World Resources Institute www.wri.org
- World Bank – www.worldbank.org
- African Centre for Cities www.africancentreforcities.net
- Association of African Planning Schools www.africanplanningschools.org.za

5.4 Adopt a strategic spatial planning approach

The term "strategic planning" refers to a systematic decision-making process that prioritizes important issues and focuses on resolving them. It provides a general framework for action by identifying priorities, making wise choices and allocating resources (for example, time, money, skills) to achieve specified objectives.[106] All planning – spatial, economic, sectoral, environmental, or organizational – is more effective if it is strategic. Strategic planning has become an important tool for local governments in ensuring efficiency and effectiveness in policy design and implementation.

Strategic planning should enable the aspirations of different stakeholder groups to be included in a common vision that gets translated into objectives. These, in turn, provide criteria to select win-win policies. Strategic planning is an iterative process and requires updating and adaptation over time to ensure that it responds to changing circumstances and needs.[107] Strategic urban planners need to formulate such visions and to design alternatives to achieve it.[108]

Taking stock of what is happening within a city, examining the status quo (identifying strengths, weaknesses, opportunities and threats), sets the scene for strategic planning, by identifying areas suitable for urban expansion and for strategic intervention. Geographic information systems (GIS) and remote sensing are valuable tools for this purpose. Sub action steps could include:

- Map the natural systems throughout the city to determine opportunities for connecting areas of biodiversity significance and areas of sensitivity.
- Undertake an audit of existing infrastructure supply and capacities, transport systems, cultural and heritage landscapes and areas in order to determine which areas are most suited for urban expansion and where densification can be supported.
- Perform an audit of vacant and underutilized land to identify areas suitable for infill or brownfield redevelopment projects.

5.5 Invest in sustainable transport options and in infrastructure

The crucial link between spatial planning (land use) and infrastructure (transport included) planning has already been highlighted, because adequate infrastructure is needed to support compact urban forms and effective public transport systems have the ability to direct urban growth and expansion (in conjunction with interventions such as transit orientated design).

- Policies for sustainable urban development should include measures to reduce the need to drive and to provide for conditions that can enable sustainable transport alternatives.[109] If an area is compact, that is, the physical distance between activities is less, the need to travel with a car is likely to be lower and easily met by walking,

cycling or using alternative public transport options. The city of Portland in the United States has implemented a 20-minute neighbourhood concept to encourage people to walk or cycle instead of driving. This means locating a range of services and activities within a 20-minute walking radius. However, it has been suggested that the 10-minute neighbourhood should be the goal to actually succeed in getting people out of their cars.[110]

- If urban expansion is to be directed, the public sector must take the lead in planning and constructing sustainable transport options, mostly public transport routes and bulk infrastructure lines that will provide the structuring backbone for development. This will create the basis for private sector and individuals to invest.[111] To this end, appropriate infrastructural standards need to be developed because conventional engineering standards are often contrary to densification efforts (for example, parking requirements and width of roads).

- Reduce private vehicle dependency through the investment in sustainable modes of public transport (that is, bus, light rail, cable cars, etc.) and support or develop measures to encourage non-motorized transport options, such as pedestrian and cycling lanes. Vauban's car sharing schemes and congestion charges in London, England, are examples.

Countries with strong economies might be able to install such alternative transit systems themselves, but for others, sustainability gains might lie in the creation of public transport development zones, built with private finance through a system of development incentives.[112]

5.6 Develop an urban densification strategy and delineate containment edges to prevent further uncontrolled urban sprawl

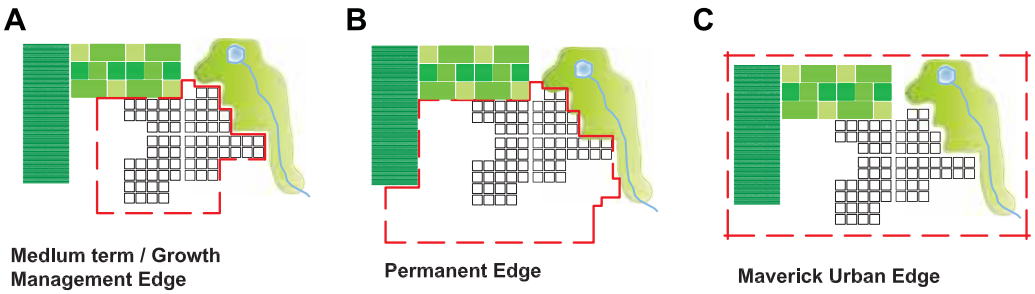
This action step is twofold:

(1) Develop a strategy to increase the built area and residential densities with the aim to ensure that densification plays a positive role in the creation of quality and sustainable urban environments, while assisting in protecting agricultural land and conservation areas.

Such a strategy should promote a nuanced approach to densification. A targeted, selective and strategic approach to densification – one which recognizes different levels and approaches to densification given the desirable development objectives and character of areas - works best. Densification should thus be pursued to ensure the maximum social, environmental and economic impact and result in improved urban environments. Once areas and types of densification have been identified, regulatory and other measures need to be developed. These can be control orientated (such as zoning controls) or work with incentives as discussed above.

(2) Delineate containment edges, i.e. urban or coastal edges, to establish limits beyond which urban development should not be permitted for an agreed period of time. These "edges" are demarcated lines with interrelated policies and guidelines (managing these line and areas immediately adjacent to it), which act as both a growth management tool (limit urban sprawl and direct growth) and a conservation tool (excludes sensitive natural areas for protection or preservation). Such urban

Figure 5.2: **Types of urban containment**



Source: MCA Urban and Environmental Planners. (2007) Settlement Restructuring: An explatory manual in terms of the Western Cape Provincial Spatial Development Framework)

edges need to be certifiable in that they exclude sensitive natural systems and other valuable resources and could be medium-term or long-term growth management tools. See figure 5.2 (A & B). A "maverick" edge is a wide edge that does not take cognizance of growth management and conservation goals. See figure 5.2 (C).

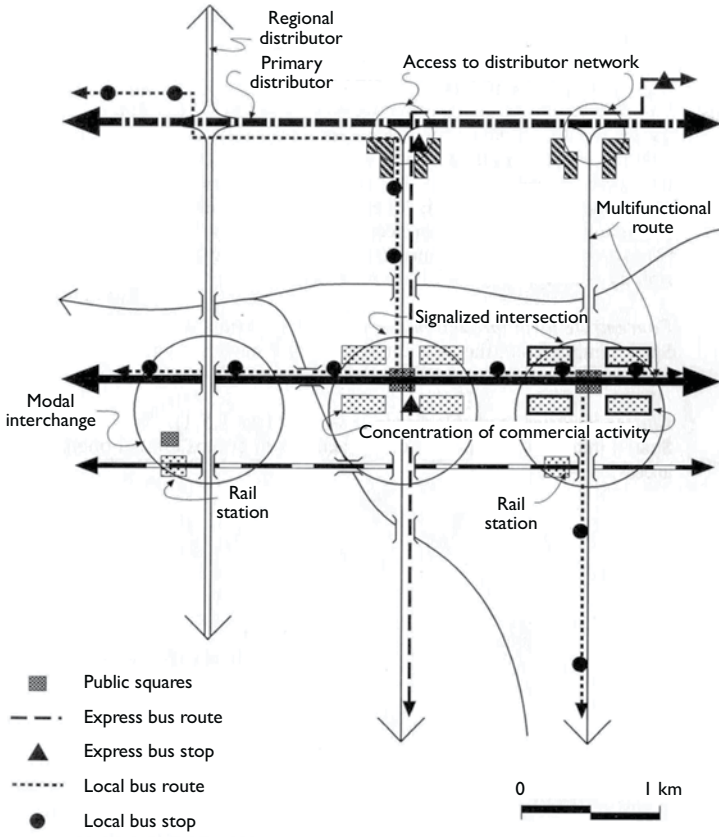
In delineating an urban edge, the following should form part of the process:

- Analyse existing spatial planning policies,
- Establish or confirm current needs and demands (i.e. land for commerce and housing),
- Identity demarcation criteria, i.e. areas to exclude (such as agricultural land, natural systems, rivers and floodplains, coastal zones, topography and slope, valuable landscapes, heritage resources, transportation planning, service networks and infrastructure), and
- Delineate the urban edge and develop management guidelines.

5.7 Activate the street and plan for accessibility

Identify strategic movement routes to be developed as multi-modal, integrated and mixed-use development corridors/streets (depending on the scale and function of the street) to optimize the integrating power of a movement route as a restructuring element. Of special importance is the notion of encouraging economic activity to the street to provide accessibility, and not only mobility, to a range of services. (See figure 5.3).

Figure 5.3: **Planning for accessibility**



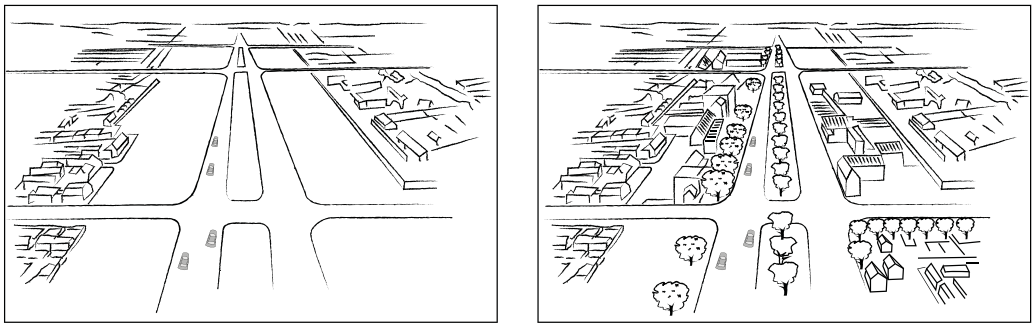
Source: Behrens, R and Watson, V. (1996) Making Urban Places. Principles and Guidelines for Layout Planning. UCT Press (Pty) Ltd., Cape Town.

The types of public-sector interventions required to develop activity streets could include the following:

- **Public transport –** Invest in public transport infrastructure and facilities along activity routes, for example, dedicated bus lanes, bus stops.

- **Re-design road reserves –** Often very wide road reserves are kept open along roads due to planners/engineers anticipating that the need will arise for it to get bigger – to accommodate more cars. However, within a compact city, private vehicle dependency is discouraged and walking encouraged. To this end, these spaces can present a number of opportunities, such as medium to higher density housing, higher order social, retail, commercial activities or pedestrian orientated spaces. (See figure 5.4).

Figure 5.4: Compacting a road reserve



Source: MCA Urban and Environmental Planners. (2009) Intervening at the level of physical structure through public-sector investment. For the TTRI's overview of Township Renewal Workbook

- **Landscaping and street furniture –** Urban landscaping improves the environment, which, in turn, has been shown to improve the potential for investment. It also aids legibility and contributes to the "sense of place" by making it identifiable, encouraging people to spend time there and thereby inscribing on their experiential / memory "map".

Further reading on "liveable streets": A great example of how a car orientated street can be transformed into a liveable street (multi-nodal, pedestrian friendly, landscaped, vibrant and supported by compact development) is described here: http://awesome.good.is/transparency/web/0904/livable-streets.html. Other sites to visit include: www.streetsblog.org, www.livablestreets.info or http://www.completestreets.org/

5.8 Plan for informality

Informal living and trading (informal entrepreneurs) are a reality in many cities in developing countries. The formulation of strategies that involve upgrading or formalizing/regularizing (best case scenario) of these areas and activities are promoted as alternatives to forced eviction. Ideally, cities need to adopt urban and housing policies that prevent the emergence of new slum areas.[113,114]

To this end, a strategy could include the following sub actions:

- Adopting revisions to policies, laws and regulations to facilitate informal-sector operations and living, such as tenure systems.

- Formulate an upgrading or construction of bulk infrastructure strategy (water supply, sanitation and waste management, storm water drainage, electricity, access roads and footpaths) with a strong community participatory focus. Security of some form of tenure is important in this process.

- Environmental hazards, such as contaminated water sources, usually imply that a natural system has been compromised in some way. Efforts must be made to restore natural systems and reintegrate them as assets in the design and plan for the area.

- Building urban wealth through the provision of affordable land and legal title.

- If removal is inevitable, a process of relocation to well-located and already serviced areas should be undertaken and efforts made to keep social networks intact.

Approaches to property rights in Africa
Urban land law in many developing countries are based on Northern systems, and it is the hardest component to change or adjust as it inherently confers rights – see http://www.wri.org/property-rights-africa/ for an educational tool on land tenure and property rights in Africa.

Further reading about slum upgrading and community self-organization:
The Cities Alliance's comprehensive guide to slum upgrading: www.citiesalliance.org/ca/About-slum-upgrading

UN-Habitat's Slum Upgrading Facility (SUF) newsletter available at http://www.unhabitat.org/pmss/searchResults.aspx?sort=relevance&page=search&searchField=all&searchstring=SUF+newsletter

An alliance of street vendors http://www.streetnet.org.za/ and a woman's organization within the informal sector www.wiego.org

5.9 Pursue brownfield redevelopment – practise the notion of re-use

A public-sector-led brownfield redevelopment project may well be an example of a catalyst project to attract private investment to an area. Proper integrated and strategic planning is required to ensure that such a project does not end up being a stand-alone project. This would entail a multifaceted approach with a strong participatory focus, and would combine short-term actions with long-term planning.

5.10 Respond to climate change risk areas

As a profession dedicated to the public interest, urban planning cannot ignore the warning signals of climate change projections and hence planners have a vital role to play in directing urban growth away from hazard-prone areas (for example, flood-prone areas or areas susceptible to mudslides) and to limit their human use.

Urban planners are also called upon to deal with uncertainty in the face of hazards (for example, natural disasters), which could mean assisting in preserving human unity and to mobilizing non-human infrastructure to that effect.[115]

This strategy could be stand-alone or could form part of the city's broader spatial planning.[116] Responses to climate change can broadly be categorized into adapting to changing weather conditions and mitigating greenhouse gas emissions.[117,118]

To this end, urban planning responses could include:

- Relocating human settlements situated within these hazard prone areas and adapting land-use zoning controls.

- Promoting densification and hard urban edge policies, and alternative transportation options, which can contribute to the reduction of greenhouse gases.

- Encourage development of protected biodiversity corridors.

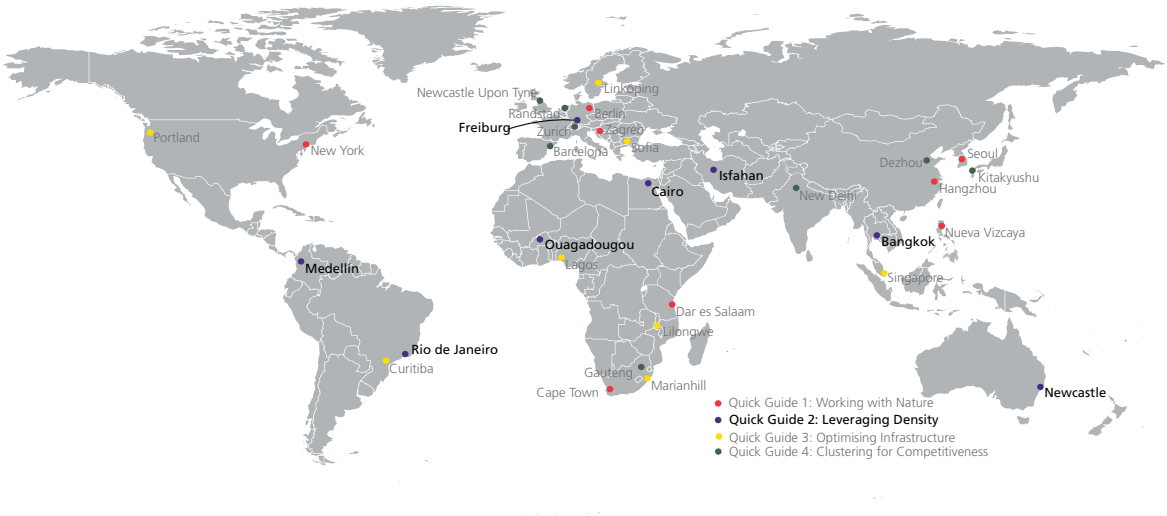
Example: The successful relocation of settlements in risk prone areas in Manizales, Colombia

This city has managed to limit low-income settlements from developing on dangerous sites, that is, those at risk from floods and landslides due to the steep terrain. People and households were removed from these areas and settled close by and most of the former sites were converted to eco-parks with a strong environmental education focus. This collaborative (communities, government, non-governmental organizations, universities) process resulted in not only reducing these communities' exposure to risk and improving their quality of life, but also adding valuable green space to the city's natural system. To prevent the problem from reoccurring, the government has implemented programmes to accommodate growth by identifying areas suited to urban expansion.[119]

5.11 Create great public places – place making

Any new development, such as a planned urban extension, development of a node, redevelopment (for example, brownfield or around a transit stop), infill or other spatial intervention in realizing a compact city, needs to be viewed as an opportunity to create great places in the public realm – to enhance the "sense of place". Place making has numerous social benefits, such as nurturing a high quality of life, creating a sense of belonging and building pride. Also, it can help to form vibrant and strong communities, can improve the local economy as it attracts investment, can decrease crime levels and can promote tourism.

The "Favelo Bairro" Slum Upgrading Programme in Rio de Janeiro pointed to the value of investing in public places to encourage community interaction.


Newcastle Upon Tyne
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Randstad
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Freiburg
Zurich
Zagreb
Sofia
Barcelona
Portland
New York
Isfahan
Cairo
Dezhou
Seoul
Kitakyushu
Hangzhou
New Delhi
Nueva Vizcaya
Bangkok
Ouagadougou
Lagos
Medellin
Singapore
Dar es Salaam
Lilongwe
Rio de Janeiro
Curitiba
Gauteng
Marianhill
Cape Town
Newcastle
Quick Guide 1: Working with Nature
Quick Guide 2: Leveraging Density
Quick Guide 3: Optimising Infrastructure
Quick Guide 4: Clustering for Competitiveness

Case Studies 6

6.1 Citizens contributing to urban sustainability in Vauban, Freiburg's eco-village, Germany

The planning of Quartier Vauban began in 1993 when the City of Freiburg (approximately 221,000 inhabitants) bought an area of land, which accommodated a former army barracks, from the German Federal Government to help address housing shortages. The original project included buildings with low energy standards, green spaces, dense urban design, public transport and a school. Additional goals, such as reducing car traffic and supporting co-building groups, were included during the planning process, which involved the participation of citizens. Their participation was made possible through Forum Vauban e.V, a non-profit organization established by a group of citizens and recognized in 1995 as the official organizing body for citizen participation in the project. After unsatisfactory results with the participation process in another district (which only highlighted issues of interest to future residents rather than fundamentally changing the masterplan) Freiburg went beyond legal requirements for participation in Vauban. Instead of only hearing from future inhabitants through a consultation process, Freiburg allowed them to play an integral role in the planning of Vauban by nominating Forum Vauban to organize the participation process in a professional way.[120,121,122]

Experts developed a set of measures to shape the concept of a "Sustainable Model District" formulated by Forum Vauban, together with the city authorities and other partners, in line with ecological, social and cultural requirements. These aspects were discussed with citizens and presented to city representatives, with special attention being paid to mobility and energy.[123,124] The forum also coordinated working groups and organized participation in individual projects such as the transformation of an old building into the neighbourhood centre. The European Union Life programme and the German Federal Environmental Foundation supported the project with an investment of USD 55 million. Life contributed mainly to transport and mobility issues, while utility companies invested in the network infrastructures (heating, water and energy) and public equipment was funded by the

local and regional authorities.[125]

Vauban's development plan specified an energy consumption standard for heating of 65 kWh/m^2 per year for residential buildings.[126] This was developed in accordance with the Low-Energy Housing Construction standard adopted by Freiburg in 1992 for contracts in which the City Council sold land.[127] Some developers however, have chosen to exceed this standard, constructing passive houses with energy requirements for heating of 15 kWh/m^2 per year or less. One emblematic project was the Solar Settlement consisting of 50 houses. These houses are referred to as "plus energy" houses due to their high energy efficiency and use of large photovoltaic cells that generate more electricity than the residents consume. Their surplus energy of approximately 9,000 kWh/m^2 per year is fed into the public grid. Also, solar collectors were installed in several houses for room and water heating. Another important achievement was the construction of a district woodchip cogeneration plant (combined heat and power) supplying the buildings in Vauban with room and water heating through a local heating network and electricity fed into the public grid.[128]

Solar PV panels on the rooftops of the "energy plus" houses © Gabriela Weber de Morais, 2009

The "solar ship" mixed use building in Vauban's solar settlement © Gabriela Weber de Morais, 2009

To reduce reliance on private cars, Vauban was designed to be a district of short distances. A combination of public transport (buses and a tram line completed in 2006), a car sharing scheme, cycling and pedestrian-friendly streets, as well as conveniently located amenities are available.[129,130] There are also two considerable incentives to reduce car use: the Parking Free residential streets and the Car Free Living scheme. In the Parking Free residential streets, cars are only allowed for the loading and unloading of goods and the speed limit is restricted to 30 km/h. These regulations, which were originally planned for three residential streets, were extended to large parts of the second and third building sections of the district. Visitors can park in the main street or in the two garages on the outskirts of the district. Car owners living in the parking free areas are expected to use the parking lots located in the district garages at a cost of approximately USD 26,000. If residents of the Parking Free areas choose not to own a car, they sign a contract and become part of the Car Free Living scheme,

paying a single fee of around USD 4,800. Regional legislation allows for the provision of car parking spaces to be decoupled from housing projects, but this is seldom implemented. Vauban's approach to traffic management is innovative in the scale at which the reduced car concept has been applied.[131,132]

People-friendly streets
© Gabriela Weber de Morais, 2009

To make housing more affordable, co-building groups formed and four old army barracks were renovated by a group of future residents themselves. Representatives of each co-building group met regularly under the coordination of Forum Vauban to discuss technical questions, and to support each other.[133] Many trees were preserved and five green areas between residential streets were planned in community workshops.[134] A ditch system was designed to channel rainwater, allowing it to soak into the soil and regenerate ground water.[135] Organic and locally-grown food is also widely available for purchase in the weekly farmers' market and in the neighbourhood co-operative organic food shop.

Certain aspects of Vauban's context have acted in favour of its sustainable development. As Freiburg is a university town, most of its residents are well-educated young families with knowledge of how to lobby effectively. They also seem to be more likely to embrace progressive ideas, as demonstrated by the 2009 elections for the German Federal Parliament in which 39 per cent of the voters in Vauban supported the Green Party.[136] The city has a long history of support for public transport and was home to Germany's first citizen's movement against nuclear energy in the 1970s.[137,138] Also, there are plenty of forest resources in the region and Freiburg is the sunniest city in Germany, with 1,800 hours of sunshine per year.[139] The existence of environmental research institutes allowed residents to test environmental innovations relevant to this context.

Neighbourhood market
© Gabriela Weber de Morais, 2009

One of the key elements of Vauban's success was the participation of future residents in the district planning, as well as in other collectively organized initiatives, such as the co-building groups. Under the umbrella concept of a sustainable model district it was possible to test sustainability concepts in several areas. The average number of motor vehicles in Vauban is half the national

average for Germany at 250 cars per 1,000 residents, and low energy housing adopting passive houses standards in 270 residences is estimated to reduce CO_2 emissions by 2,100 tonnes per year.[140,141]

Certain challenges have limited Vauban's ability to optimize its sustainability. The obligatory connection to the electricity grid and its tariff structure has made some measures for energy demand reduction unviable.[142] Likewise, in spite of affordable housing being available to the lower income population through the owner cooperatives and rental units (also with public subsidies), an earlier plan to incorporate 25 per cent of social housing into the district had to be reduced considerably because of cutbacks in the state housing programme.[143] Residential streets could also work better if there were more enforcement from the municipality to discourage free riders by fining cars parked where they are not allowed to.

Originally planned to be finished in 2006, Vauban was almost fully completed in 2008 and hosts a population of around 5,000 inhabitants and 500 jobs within its 38 hectare area.[144,145] Residents reveal that they enjoy living there due to lower noise levels and air pollution, safer streets for children to play, shorter distances that favour the elderly and greater interaction with neighbours when commuting on foot instead of by car.[146] These insights reinforce the notion that sustainable lifestyles are not only advantageous for the planet, but can be socially desirable too.

6.2 Medellín's aerial cable-cars: social inclusion and reduced emissions[147]

In 2004, Medellín, Colombia's second largest city, implemented the world's first modern urban aerial cable-car public transport system. As a relatively cheap, clean and highly visible response to urban transport problems, it has attracted widespread attention from city authorities throughout Latin America, Europe and Asia. The audacious application of proven ski-lift technology to densely populated and hilly low-income informal settlements was subsequently followed by major neighbourhood upgrading. This comprised of new social housing, schools and other social infrastructure, as well as support to micro-enterprises. The combination of these two sets of interventions has helped upgrade and integrate large areas that were marked for years by severe poverty and violence, into the city's fabric.

Medellin's aerial cable cars: social inclusion and reduced emissions Metrocable Line K with the ParqueEspaña library in the background
© Julio D. Dávila 2010

The addition of aerial cable cars (known locally as Metrocables) to the public transport infrastructure in this city of three million inhabitants was an imaginative leap. The Municipality of Medellín, with an urban population of 2.2 million in 2005, comprises 16 comunas (districts). The first Metrocable system was built in the poor and inaccessible north-eastern comunas. This area is the largest and richest of the

nine municipalities that comprise the Medellín Metropolitan Area, which had a combined urban population of 3.1 million in 2005. This area is also marked by a difficult, steeply sloping terrain broken by deep smaller valleys carved by the numerous streams running down the hillside to the Medellín River. Developed through informal settlements and land invasions in the 1950s and 1960s, by the end of the twentieth century it was the most densely urbanized part of the city, with over 400 dwellings per hectare. Minimal road infrastructure made access difficult, although the area was relatively well served by conventional buses and limited numbers of taxis.

The first line was made possible through the combined technical foresight of the city's publicly owned Metro Company and the political will of a newly elected mayor. It arose from the desire to promote social development in a deprived area, and to increase passenger numbers for an underutilized over ground mass-transit metro system.

There are currently three aerial cable-car lines in operation (with three more planned), two of which are urban public transport systems (Line K inaugurated in 2004 and Line J in 2008) and a third (Line L) introduced in 2010 to connect with Line K as a tourist route to a nature reserve on the edge of the city. Although the first line has been highly successful and runs at full capacity (approximately 30,000 passengers per day), the impact of the second cable-car line suggests that, to be economically and socially significant, cable-car systems require specific minimum conditions in terms of urban morphology and population density, as well as careful integration with the existing mass public transit network.[148]

Cable-car systems are relatively cheap and quick to construct because little land needs

Metrocable Line K with the Medellín river in the background © Julio D. Dávila 2010

to be publicly acquired and the technology is well-tested. Medellín's cable-car systems are a public sector project, financed jointly by the municipality and the Metro Company. Low construction costs make public sector capital borrowing feasible; in Medellín's case all three lines were financed through capital investment budgets. The cost of the first line was close to USD 24 million and the second USD 47 million, with costs per kilometre comparing favourably with bus rapid transit (BRT) and rail systems. However, due to technical limitations, aerial cable cars are generally not considered to be mass-transit systems as they cannot transport significantly more than the maximum projected demand of 3,000 passengers per hour.[149,150]

Under a new municipal administration, starting in 2004, the area around the first cable-car line became a prototype for social interventions in some of the poorest sectors of the city. This followed a policy of integrating the cable-car systems into the urban fabric through urban upgrading, in a strategy combining mobility, environment, housing and public space, and with the goal of creating new dynamic centres in previously economically depressed areas.

Metrocable Line J © Julio D. Dávila 2010

Municipal interventions across the city also involved increasing and upgrading the stock of social infrastructure, such as schools and public libraries, including the construction of distinctive buildings designed by well-known national and international architects. The Parque España Library is one such set of buildings, located close to the first cable car line, and has become a distinctive landmark for the city in a neighbourhood where fear of violence would have kept outside visitors from venturing in.[151] Another distinctive feature of the urban interventions is that the use of local manual labour was made a feature of all public work contracts, while the introduction of participatory budgeting has allowed local communities to collectively decide on the use of some 5 per cent of the municipal budget allocated to these areas for investment.

Although the original drive for implementing the first aerial cable car hinged on social and mobility considerations rather than environmental ones, potential environmental impacts were considered in the planning stages.[152] Since 2003, the Metro Company has sought to formally measure and evaluate the environmental contributions of this intervention through the use of internationally accepted criteria. Under the aegis of the Clean Development Mechanism (CDM) framework, in 2003 the Metro Company prepared a Project Design Document (PDD), which was examined by the CDM Executive Board in 2005.[153] The PDD proposed a baseline and a methodology to monitor the reduction in greenhouse gas emissions arising from the implementation of aerial cable cars around the world.[154] The proposed methodology was submitted to the United Nations Framework Convention on Climate Change (UNFCCC) in 2007 and validated in 2009.[155,156]

Baseline emissions were defined as those that would have resulted from the use of other modes of transport to cover the required origin and destination distances. In the case of Medellín, the modes available were minibuses, taxis and jeeps using fossil fuels such as petrol and diesel[157]. According to this baseline, the replacement of the fossil fuel operating vehicles by a system of hydroelectric-powered aerial cable cars was projected to contribute to a reduction of up to 121,029 tons of CO_2 (tCO2) between 2010 and 2016; a reduction of 62,4 per cent.[158] The calculations contemplated the existing three lines and three additional lines projected to begin operations in 2011. Additionally, the CDM report states that volumes of trans-boundary air pollutants (mainly carbon monoxide and sulphur dioxide) drop as baseline modes of transport are replaced with a system relying on electricity generated in Colombia, predominantly through the use of renewable resources.[159]

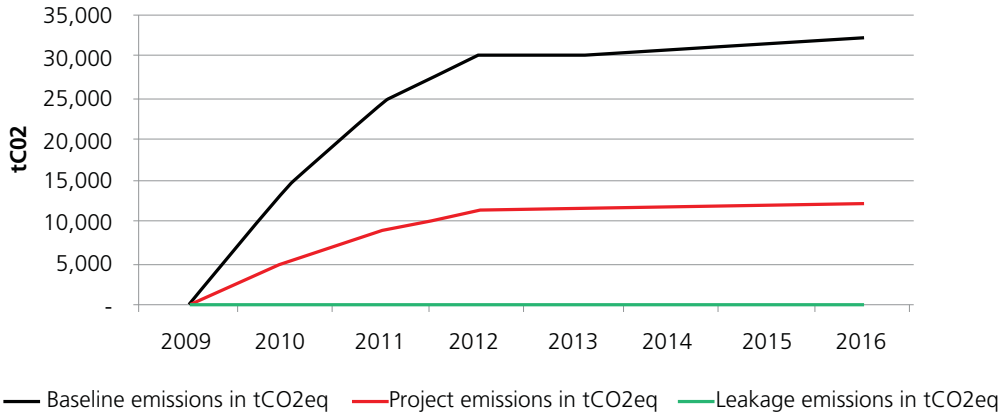
Although measurement of the social and economic consequences of the Metrocables is fraught with difficulties, from an environmental and social perspective the impact of the aerial cable cars can be said to be largely positive. The system has helped to improve the quality of life of the urban poor

Table 6.1: **Medellín: Projected emission reductions from six aerial cable-cars**

	2009	2010	2011	2012	2013	2014	2015	2016	Total
Baseline emissions in tCO2eq	-	14,005	24,434	30,103	30,382	31,189	31,458	32,311	193,881
Project emissions in tCO2eq	-	5,135	9,083	11,208	11,450	11,724	11,980	12,274	72,853
Emissions reduction in tCO2eq	-	8,870	15,350	18,895	18,932	19,465	19,478	20,038	121,029

Source: Grütter, J. 2009[160]

Figure 6.8: **Comparative emissions: Baseline, project emissions and leakage**



Source: Grütter, J. 2009[161]

by making it easier for them to access the opportunities of the city, by enhancing the visibility of the socially stigmatized areas in which they live, and by improving air quality. The first cable car and the associated urban upgrading interventions around the station have given the area higher visibility to outsiders and a sense of social and political inclusion among local residents. Coupled with substantially increased commercial activities around the stations, as well as greater police presence and changes in the nature of the illegal drug business, this has helped to reduce levels of violence and crime in the neighbourhoods surrounding the aerial cable cars.[162]

6.3 Shifting urban development away from private vehicles in Bangkok, Thailand

Since the 1980s, Bangkok has been infamous for its ever-worsening traffic congestion. When Thailand embarked on modern economic planning in 1961, Bangkok rapidly became a modernized and motorized city. The Thai Government imported an American approach to urban planning, with an emphasis on car-orientated infrastructure as well as zoning-style land use controls. New urban development and transport projects were aimed at facilitating the efficient flow of people, goods and services in support of economic production. These projects led to a geographical separation of commercial, industrial and residential areas,

reinforcing the spatial "division of labour" and a physical separation between living and working locations. Since then, Bangkok's built-up area has extended along the main inter-urban roads beyond the traditional core areas. This has been driven by various factors, including the shortage of land for housing in the city, the construction of expressways linking suburban locations with the central business districts, and the lack of land-use controls, particularly restrictions on the locations of subdivision projects.

While road development was planned and generally financed by the government, housing development was led by the private sector. Housing projects followed the construction of roads, expanding the city's boundaries to the suburbs. These projects were implemented with little consideration for urban development implications, let alone environmental consequences. Even with the power to control land use planning, urban planning agencies did not have authority over infrastructure development by other agencies, thereby leading to the proliferation of subdivision projects on green field sites.

To combat increasing traffic congestion, the government started to build more arterial roads, ring roads and expressways. Since Bangkok's first expressway was built in 1981, more than 200 kilometres of elevated expressways have been built in the metropolitan area. More than 80 per cent of the city's daily trips during the early 1990s were by bus, cars, motorcycles and taxis. Instead of decreasing congestion, the problem became even worse: average vehicle speeds during peak hours dropped to as low as 8 km/h.[163]

It took planners and policymakers many years to realize that traffic congestion did not improve with more roads and expressways, much the same as in Cairo where congestion remain a headache despite roads and expressway development.[164] Alternative modes of transport were desperately needed and mass rail transit became an attractive option. To policymakers back then, the main objective of urban rail projects in Bangkok was to reduce traffic congestion, not necessarily to achieve urban sustainability. However, shifting commuters from private vehicles to rail transport significantly reduces the fossil fuel consumption and emissions associated with their mobility, making it a more environmentally friendly alternative.

Several master plans for urban transits were repeatedly drafted, endorsed, scrapped, revisited, and endorsed again over the years before actual projects were implemented. The first transit project was supposed to be in operation by the early 1990s, but political and bureaucratic issues delayed and derailed it. There were even civic demonstrations against the project due to concerns about pollution, crime, urban aesthetics and accidents. It was not until 1999 that the first urban railway, the Bangkok Transit System (BTS), began service.

The introduction of the system was a turning point for Bangkok. Gradually people started to realize the benefits of mass transits and ridership has steadily increased. During the first few years of its operation the ridership was fewer than 150,000 trips per day, but it picked up quickly afterwards and the ridership as of September 2011 was about 500,000 trips per day. The figure is expected to increase by at least 15 per cent in 2012.[165] The opening of the Bangkok Metro in 2004, the Airport Link in 2010 and two additional extensions of the BTS lines in 2009 and 2011 further strengthened the trend. Four other transit lines are currently under construction. According to the current Bangkok Mass Transit Master Plan, a total of about 290 kilometres of mass rail transits will be built in Bangkok. Another ambitious plan expects

the city to have almost 500 kilometres of urban rail by 2030. Even among transport planners, it is no longer fashionable to talk about expressways - mass rail transits are considered the way forward for Bangkok.

Despite the short timeframe since their introduction, urban rail systems have already had a noticeable impact on the spatial structure of the city, slowing both the pace and scale of suburbanization. While the core areas of Bangkok have always been vibrant, those areas with access to the transit stations have gained greater advantages than others. Commercial buildings now find ways to connect themselves with the train stations either via Skywalk (the second-level pedestrian way) or underground tunnels.

Many residential housing developers have substantially revamped their investment strategies from focusing on subdivision projects in the suburbs to condominium projects along the rail lines. According to the Government Housing Bank, only 26 per cent of the new housing units completed in 2010 were in subdivision projects for detached houses in the suburban areas, while 42 per cent were condominium projects in the inner areas of the city. Property developers used to promote their projects by stating how close they were to expressways; now they boast the proximity to transit stations.

The paradigms and underlying assumptions for urban planning and control in Bangkok have also changed. Before the Bangkok Transit System, all Bangkok Comprehensive Plans were based on the idea of a car-based city. The two recent Comprehensive Plans have focused more on transit-orientated development, providing additional incentives for development close to transit stations.

The obvious shift to rail-orientated development does not mean that Bangkok's streets are no longer congested. According to the Office of Transport and Traffic Policy and Planning, approximately 1,500 cars and 1,100 motorcycles are still added to the streets of Bangkok each day. Nonetheless, the transit systems provide people with modal options that they did not have before. They also create more options in terms of where to live, as a growing number of urban redevelopment projects have increased the residential space in central areas of the city where jobs are concentrated.

Bangkok Transit System
© Apiwat Ratanawaraha 2011

The shift from car-dominant infrastructure development to a rail-based system can be attributed to several factors. Ironically, one factor is the level of congestion, which became so bad that people were ready to embrace any reasonable alternatives to improve their commute. The benefits of a rail-based transportation system have also become apparent as fuel costs and energy concerns are on the rise; the rail system provides an attractive alternative to private cars. Changes in population structure may also contribute partly to the shift. As young professionals delay marriage and have fewer children, they are willing to live in smaller condominium units in the city instead of buying new houses in the suburbs and having

to buy cars. The success of the Bangkok Transit System has made it a showcase that has helped to generate support from the public and policymakers for building up the subsequent systems. Another reason for the increasing popularity of rail is that it has become extremely difficult and expensive for the state to expropriate land from private landowners to build expressways in the city. Several public demonstrations in the 1990s were successful in preventing construction of highway projects. Mass rail projects involve less land expropriation, making it an easier and attractive choice for policymakers. The shift in mindset of policy makers is critical, as it now seems that mass transits are more manageable, feasible and sustainable.

Although Bangkok's gradual shift to mass transits is a welcome phenomenon, there is still room to improve the sustainability of the city's public transport system. Mass rail transits remain "class transits" because the fares are expensive compared to buses and only the middle class can afford to use them. The benefits of mass transits in terms of addressing intra-generational equity are thus rather limited. With attention focused mainly on building mass transits, bus services have been neglected and service quality remains poor. Without improving the quality of other modes of public transport, the potential contribution of mass rail transits to urban sustainability might not be fully realized.

6.4 Planned urban extensions in the Cairo Metropolitan Area

In 2010, Egypt's total population reached 78.8 million. Currently, 43.4 per cent of its population lives in urban areas and most of the population inhabits 5 - 6 per cent of the available land in Egypt, including the Nile Valley and the Delta. The Cairo region, including Cairo, Giza, and Qaliobeya governorates, has a relatively stable share of Egypt's total population (approximately 25 per cent), although this increased slightly from 1996 to 2006. In contrast, the size of Cairo governorate's share decreased

Figure 6.2: **Greater Cairo boundaries and its extensions**

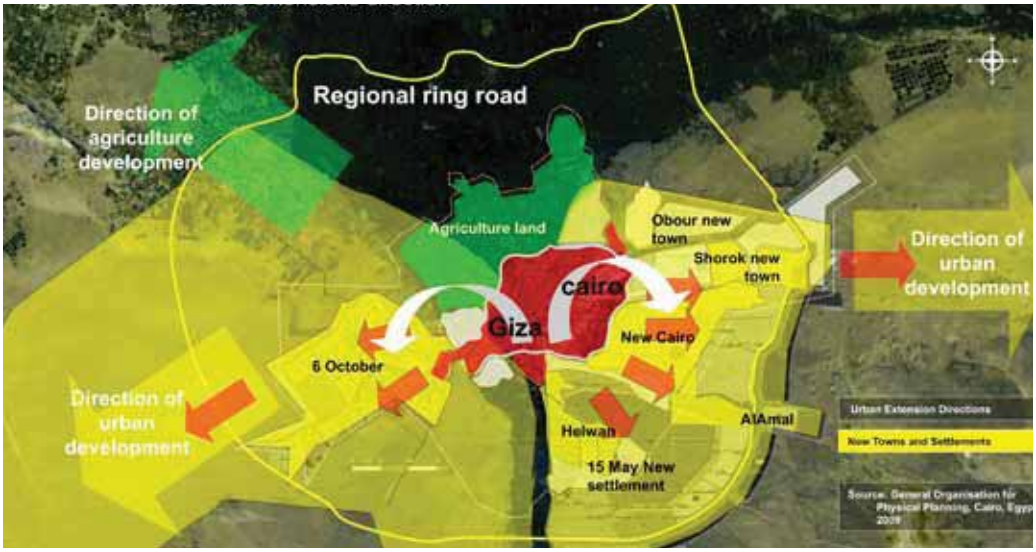
Source: General Organization for Physical Planning, Cairo; and UN-Habitat, 2009

from 13.8 per cent in 1976 to 10.7 per cent in 2006, and the balance shifted to neighbouring governorates within the Cairo region and New Urban Communities (term used to described planned urban extensions). This was a result of the Greater Cairo extension strategy. The strong attraction of the Cairo region and its new town extensions resulted in the largest incremental population growth (3.4 million people) among all Egypt's regions from 1996 to 2006.[166]

In Greater Cairo, large parts of the city - including both infill and the periphery of the urban area - have developed as informal settlements (Figure 6.4) in response to the housing needs of low-income households. While each settlement has its unique characteristics, what is common in most of the cases is that illegal construction has hampered implementation of land use plans and policies, and illegal occupation has jeopardized property rights leaving people exposed to unhealthy living conditions. These informal settlements have emerged without any mitigation measures for lack of sanitation, insecurity, lack of safety and vulnerability to natural and manmade disasters.[167]

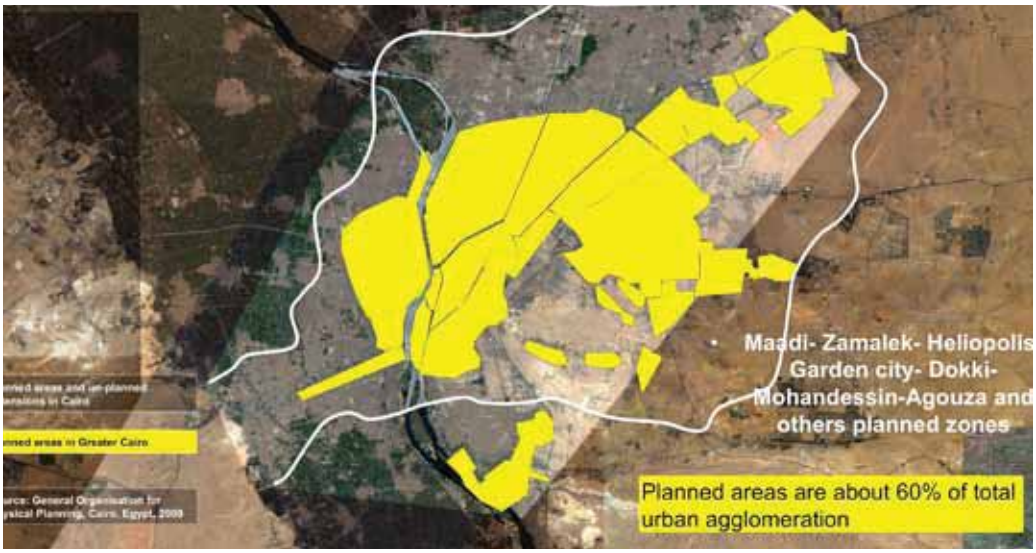
In 1977, the Government of Egypt, introduced a New Urban Communities and Settlements Programme as a planned counter-measure to rapid urban sprawl and the emergence of informal settlements within the metropolitan cities. The New Urban Communities Authority, under the Ministry of Housing Utilities and Urban Development, spearheaded the implementation of this project. The programme targets approximately 20 towns nationwide, including eight new town projects implemented in the desert area at the outskirts of Greater Cairo (Figure 6.3): Six of October, Tenth of Ramadan, New Cairo, Fifteenth of May, Al-'Ubur, Sheikh Zayed, Al-Shuruq and Al-Badr. Recently, the Government of Egypt cooperated with UN-Habitat in a consultative process to set the vision for Cairo 2050 and prepare strategic plans for other mid-size towns. The purpose

Figure 6:3: **Greater Cairo extensions direction**



Source: General Organization for Physical Planning, Cairo; and UN-HABITAT, 2009

Figure 6.4: **Greater Cairo planned areas and unplanned extensions**



Source: General Organization for Physical Planning, Cairo; and UN-HABITAT, 2009

was to confront the informal expansion of cities and boost development in targeted areas around Cairo.

Greater Cairo's New Urban Communities are planned and implemented on government-owned desert land in the outskirts of the city. Vast public investments were made to develop the urban infrastructure – roads, electricity, water, sewers, public spaces and street furniture. Several participatory consultations were carried out to seek the community's views on the future of Cairo and such extensions.

In Sixth of October (established in 1981) and others in the first generation of extensions, investment was made in social housing, schools and other public facilities. Due to the size of Sixth of October, it contains areas with mixed use, but also has designated areas for large scale commercial, business and industries. Both public and private sector development agencies developed the land.

People living in this new town have good access to their work locations. The government developed transport networks and a public transport connectivity for Sixth of October with Greater Cairo; a local airport was recently opened but is not fully functional. The transportation network to and from Cairo's city centre encouraged people to find job opportunities in this new town. However, this network recently became congested due to the increased traffic generated by activity in this new town. One of the key challenges in creating job opportunities was to attract and accommodate private enterprises. For this purpose, the government had offered reasonable land prices and a tax reduction scheme to private investors, all of which required enormous amounts of long-term public and private investment.

In 1981, it was projected that this new town would accommodate a population as large as 500,000. However, after 30 years, there are only 306,200 people living in Sixth of October, according to the statistical book

of 2011. In 2011, Sixth of October had a 50 per cent housing occupancy rate in all income categories. That represented an improvement over a 25 per cent occupancy rate in 2008, which stemmed from poor accessibility to the city centre, relatively segregated housing and limited housing finance options. The improvement resulted primarily from a) the construction of the 26th July Road connecting Sixth of October to the city centre and the Cairo ring road; b) the implementation of diversified, affordable mixed-use housing programmes with public private partnerships; and c) the development of a new housing finance model for low income affordable housing through the Mortgage Guarantee Fund.[168]

Another extension to greater Cairo, Fifteenth of May new town, also developed in early 1980s, demonstrates an interesting case. It was planned to have a population of 180,000. In 2011, the count was approximately 120,000 people (75 per cent of the projected number). The vacancy rate of developed housing units is 25 per cent, which is remarkably less than other New Urban Communities in Egypt. This New Town is unique in its location and style as it is located adjacent to an existing built-up area with established service industries, transportation network and work opportunities. This is the only New Town whose entire development was led by the public sector.

The most successful of Greater Cairo's urban expansion schemes have depended on a number of factors: a short distance from the city centre, adequacy of and access to infrastructure development, including public transport, and affordability of housing due to the diversified housing programmes undertaken between 2005 and 2010. These particular planned New Urban Communities have also tended to offer extensive economic and social activities.[169]

From the government's perspective, one of the benefits of developing New Urban Communities is preventing informal settlements by covering the cost of urban infrastructure in the price of the land that it services. The government does subsidize some land for lower income groups, yet the limited supply of affordable serviced land rarely matches the demand.

Despite protracted vacancies, the last census in 2006 showed that New Urban Communities around greater Cairo experienced an average growth rate of 10.7 per cent per year from 1996 to 2006. By comparison, the villages and small towns surrounding Cairo had a growth rate of 2 per cent, which was itself slightly higher than that of the main agglomeration (1.7 per cent). The growth in population therefore shifted primarily from the central part of the main agglomeration to its planned urban extensions (New Urban Communities).[170]

Nevertheless, the current populations of New Urban Communities are still behind their original targets. Part of this is due to the legacy of planning for non-diversified housing in single-use neighbourhoods in the 1990s, as well as a failure to adopt mixed-use policies. Once this policy began to shift – accompanied by improvements in land accessibility – vacancy rates began to decrease. In general, New Urban Communities adjacent to Greater Cairo offer better living environments than within the city centre. New Urban Communities are equipped with efficient and effective basic urban infrastructure, such as roads, electricity, water and sewers. Land and properties in these new towns are officially registered, which makes them easier to be traded in the housing market. This also helps with taxation and collection of public service charges. If successful, New Urban Communities as the planned extension can absorb urban growth and prevent

informal settlements sprawling to the urban periphery.

The relative success of Fifteenth of May new town highlights some of the crucial ingredients of planned extensions in Egypt. First, people select their settlement on the basis of accessibility to the work place. Securing accessibility is therefore critical to attracting people to New Urban Communities. Second, the concentration of housing demand on the urban periphery is driven by low to middle-income households, particularly those seeking affordable housing. Developing planned residential areas can yield more socioeconomic benefits – more extensive basic urban infrastructure, more secure tenure and property rights, and higher returns on public investments –than upgrading informal settlements. Urban regeneration and the redevelopment of informal areas and squatter settlements into areas representing mixed income have been presented as an option by the government for inner city redevelopment and modernization. In some instances these informal areas were relocated entirely, and in other cases only partially. Often these informal settlers were relocated to the new urban communities, which assisted in reducing the vacancy rates of these towns through a new model for partnership with private developers.[171] Meanwhile, to attract people to New Urban Communities they need not only the physical infrastructure but also a social mechanism that makes them lively and vibrant.

Settlement in Sixth of October increased when a major urban corridor (26th July) was constructed between the town and Giza city, and a new connection was established between Cairo ring road and Cairo governorate. This highlights the significance of establishing efficient transport systems within new towns that allows residents to access the central city. Demand for access to the central city (particularly by efficient public transport systems) remains, even if New Urban Communities develop their own business and commercial centres more and more within themselves – an excellent example of urban polycentrism – as past experiences show. Maintenance and sustainability of the urban infrastructure and public facilities are also important in Egypt because many New Urban Communities like Sixth of October are built in the desert land. The effect of climate and weather conditions on infrastructure such as roads, water and sewerage pipes, electricity and even building requires more attentive maintenance and renewal plans to keep the new extensions from deteriorating.

Provision of affordable housing for low- to middle-income households is also a key to the success of planned urban extensions. This was the challenging task for the Egyptian Government, who had to spend an enormous amount of public money to develop Sixth of October and other New Urban Communities. In many cases, when the actual costs of development are reflected in housing prices, such prices are unaffordable unless the government provides subsidies/incentives through dedicated affordable housing programmes. Planned urban extensions will not be a solution for urban sprawl without tackling this challenge and as long as urban sprawl in Egypt is primarily driven by the demands of low to middle-income households.

6.5 The Great Urban Land Restructuring in Ouagadougou (1983–1995)

This case study focuses in particular on urban density and urban extension strategies in

Ouagadougou, Burkina Faso, in the period from 1983 to 1995, known as the years of the Great Urban Land Restructuring.

The Democratic and Popular Revolution, sparked in 1983 with the trademark slogan "Power to the People!", initiated a radical change in national development policy, urban planning and housing development in Burkina Faso. A new law on land and property reform was adopted and promulgated on 4 August 1984 with the principal aim of establishing the sovereignty of the state and the people over the land. The law abolished all land titles previously granted; henceforth the state was the sole proprietor of the land and granted people land use rights.

From that point on, the state also steered the restructuring process away from conventional urban planning rules and procedures. The primary objective of the

Ouagadougou in 2008
© Flickr/Guillaume & Pauline

massive urban land restructuring programme was the removal of the unplanned settlements that then stretched over 71 per cent of Ouagadougou, housing 65 per cent of its population. The programme was implemented in two phases. The popular development programme lasted from October 1984 to December 1985 and was followed by the first five-year people's development plan from August 1986 to December 1990.

One of the first actions of the programme was the establishment of land subdivisions. Conducted under the supervision of the Revolutionary Defence Committee, this process took place in each neighbourhood with the active participation of the beneficiaries, which helped to reduce the cost of each plot to 300 CFAF/m^2. It was of paramount importance that the allocation of plots be conducted in a transparent and publicly acceptable manner, and the process was therefore carried out in public over four years (1984-1987 inclusive). It was necessary for the applicants to be seen and identified by the participants. Consequently, each head of household was sequentially invited to sit at a table in the middle of the crowd, from which they arose as the "undisputed" custodian of their plot.

Following the revolutionary period, in 1987 the less-radical Popular Front regime came into power and they extended the Great Urban Land Restructuring until 1995. The following year, Burkina Faso submitted a report on its urban land restructuring programme at the second United Nations Conference on Human Settlements in Istanbul. The report showed that 197,112 plots had been established and allocated across the country from 1984 to 1995, which represented an average of 16,426 plots per year (as compared to 426 plots per year during the preceding two decades). One third of these plots – 66,526 – were in Ouagadougou. In effect, the implementation

of the programme drastically reduced unplanned settlements from 71 per cent to only 7 per cent of the total land area of Ouagadougou. The programme thus achieved its objectives.

It is, however, important to note some points with regard to the authoritarian nature and rapid pace of the Great Urban Land Restructuring programme and the way this affected the designers, whose goal was the harmonious development of the city. These aspects did not allow the designers to familiarize themselves with and master the expansion of the urban fabric in Ouagadougou in the area specified and according to the time frame recommended by the city's Master Plan for Urban Planning and Development, because they were pressured to draw up the urban land restructuring plans on the basis of topographic surveys.

In reality, the number of plots established during the period led to rapid urban sprawl, necessitating transport and utility networks (railway lines, drainage channels, drinking water, electricity and telephone lines) that greatly exceeded the capacity of service providers. The areas also needed public services (education and health services, household waste centres and sport and leisure centres). Those needs could only be met gradually by the government. This massive urban land restructuring also significantly spurred land and property speculation that was encouraged by the reintroduction of customary land rights previously abolished by the land and property reform law.

With regard to the Great Urban Land Restructuring, it is important to remember that the clearing of unplanned neighbourhoods was achieved through strong will and political commitment. It cannot be denied that the implementation of the Great Urban Land Restructuring programme brought relief to underprivileged households that were rather suddenly allocated plots in a structured and considerably safer urban environment. This windfall encouraged them to build more durable houses that were less exposed to the elements.

These households were made to wait several years, however, for basic urban services, which became available only once the government had completed its planning and budgeting activities. A residence tax was imposed by the Ouagadougou municipal authority on the people living in the areas developed in 1998. This tax varied according to the level of urban facilities and services provided in each area and mainly funded services such as the reshaping of urban roads and the construction of municipal rainwater drainage channels.

6.6 The "Favela Bairro" upgrading programme in Rio de Janeiro, Brazil

Favelas are slum settlements in Brazil that stem from slave colonies of the eighteenth century. Mass migration to the cities in the 1970s caused large population increases in the favelas, resulting in sub-standard services and infrastructure, low levels of education, social stigmatization, violence and unemployment.[172]

To this end, the Municipal Government of Rio de Janeiro launched the "Favela Bairro" upgrading programme in 1994 to reunite the divided city. The programme aimed to socially and physically integrate all low-income neighbourhoods into the formal urban fabric of the city of Rio de Janeiro by 2020.[173]

A key pressure necessitating development was the threat of environmental hazards

caused by unregulated construction on unstable hillsides prone to landslides and flooding. Overcrowded neighbourhoods, which lacked adequate infrastructure to service them, had inevitably resulted in health problems and crime, the direct result of high birth-rates and soaring urbanization. The need for safe, serviced housing gave rise to an urban renewal initiative that aimed to make physical improvements to the built fabric to form a safer, more cohesive urban framework.

The proposed services component of the programme included sanitation infrastructure comprising of water reticulation and drainage, and hard landscaping strategies, such as the widening of roads and the introduction of new transport access nodes. A strong emphasis was put on creating public space to encourage community interaction. A wider-reaching government-led objective of the plan was the reduction of poverty through investment strategies, social services provision, more effective laws and job creation.

The project aligns with Local Agenda 21 aims, which focus on the use of community participation to resolve issues of social integration and environmental sustainability in secondary cities. In keeping with the agenda aims, a municipal and community partnership was established to aid environmental and cultural heritage management, promote tourism and encourage access to urban services.

Favela Bairro is the largest social housing initiative in Rio de Janeiro. Funded by the Inter-American Development Bank (IDB) and implemented by the municipal government. It specifically targets medium-sized favelas of between 500 and 2,500 households each, which represent the majority of the city's favela population.

The project's successful implementation was largely due to revised government policy through relaxation of planning policy processes that favoured extensive public engagement and grassroots-led project management. In practical terms, favelas were declared to be zones of special interest and were therefore exempt from planning regulations. Also, long-term rights of use were granted to residents for property regularization, thus avoiding the complex process of freehold titles grants.[174]

The funding timeline for the project was three-phased, with phase one initiated in 1996 followed by phase two in 2007 and funding for phase three approved by the Inter-American Development Bank in 2010. The city's urban development strategy for phase one aimed to legalize land ownership (with partial success), issue land titles and encourage the use of empty land for low-income housing. The establishment of the Municipal Employment Department in 1997 meant that increased funding within the government body was allocated to social upliftment projects intended to tackle economic empowerment. By 2000, over 90

A favela in Rio de Janeiro
© UN-Habitat/Julius Mweu

favelas had been upgraded. The expected results of the phase three project include the regularization of 18,000 homes, the issuance of 3,000 property titles and the creation of 45 new social services facilities.[175]

Certain ex-municipal agency officials who were familiar with residents' needs through their work in favelas during the 1980s were key to policy developments. This collective shaped the underlying principles of the "Favela-Bairro" project structure, taking cognizance of the tightly knit social interrelationships of the favela communities that were a consequence of cramped living conditions and volatile livelihoods.

While control over housing policy remained centralized, the execution of policy was decentralized. However, some problems arose with the process of community involvement in decision making. Although legislative reforms had occurred, internal power conflicts within a government that still favoured single-sector planning and intervention prevailed, resulting in insufficient consultation within the participatory process.

Several other obstacles exacerbated policy implementation, including the practical challenges of favela access. Difficulties caused by the steep terrain that is typical of favelas were compounded by physical walls used to block thoroughfares - a tactic used by drug cartels in their quest for control of certain areas in the favelas. A pilot project on citizen security was launched in an effort to shift control from the favela's drug lords back to its residents and to improve security.[176]

The Growth Acceleration Programme (PAC) is a government-led social programme employed in the favelas to reduce poverty and increase social housing. In this programme, the government supplies materials and services while the residents supply labour. It uses a holistic construction model based on the United Kingdom's Code for Sustainable Homes, involving mandatory roof-mounted water tanks and innovations in building methods. These methods include off-site construction of lightweight material components and ease of assembly, which allow unskilled workers to construct homes quickly.[177]

Other improvements in urban sustainability include recycling programmes set up through Rocinha's (Rio de Janeiro's largest favela) sustainable tourism project (Sustainable Tourism Workshop 2011), and housing projects that combine affordability with renewable energy advances, including geothermal and solar energy and urban agriculture.

A refrigerator exchange programme has been set up by the Swiss foundation SENS International that swaps old refrigerators for a new, energy-efficient models. Households then become eligible for a government programme that subsidizes the energy consumption of poor families up to 100 kWh, which also reduces electricity theft.

Although no baseline data had been captured, a quantitative evaluation of redeveloped favelas was undertaken by the IDB, whose findings revealed that, compared with un-redeveloped neighbourhoods, favelas experienced a significant increase in the availability of all services, with the exception of garbage collection.

While the programme did not increase formal ownership, it did increase the numbers of informal means of documenting ownership and also had a large impact on perceptions of favela property values. Also noted was a small, positive impact on school attendance, a substantial increase in child daycare

attendance, and a 15 per cent increase in household incomes. No impact was noted on time spent reaching public transport, or on employment or type of work.[178]

A successful characteristic of the "Favela-Bairro" that differed from conventional urban poverty reduction policies, and provided a replicable model for local governments, was the unique use of legislative reforms. These reforms encouraged community governance through the support of existing community programmes, which allowed the absence of full land tenure legalization and its use of the concession of right to use but not own land. This put greater emphasis on infrastructural and living condition improvement rather than on the public sector initiatives being implemented. However, loss of confidence within the community, caused by corrupt representation to some extent, eroded the participative process and alternatives need to be reviewed for future projects.

Economic improvements in favela neighbourhoods were questionable; job creation was not successful because, in some instances, people needed literacy training before employment training. A lack of microcredit schemes meant costs were beyond residents' capabilities.

Although the use of design as a core project strategy for social and physical integration was a success on the whole, the project displayed the limitations of physical interventions, proving that structural upgrades cannot reduce crime on their own. In order for similar policies to be replicated elsewhere, a method of improving facilities without the threat of gentrification needs to be found - in this case, the impersonal construction of infrastructure without any preservation of character or the unique sense of place.

Linked to this idea is that the introduction of tourism in tightly-knit neighbourhoods such as in the favelas alters the social fabric of the society through gentrification, and in this case, perceptions of its community will take a long time to change as stigmatization of the favelas through mass media is deeply entrenched. The ethics of tourism in favelas is thus debatable.

It is apparent that the potential for success and long term sustainability in such projects, the improving of local environmental conditions, upliftment of society, the reduction of poverty through employment opportunity, is complex and challenging and depends largely on the extent and nature of the democratic participation of the relevant community as well as effective appropriate integration into the city as a whole.

6.7 The Najvan & Sofeh Parks Project in Isfahan, Iran

The Najvan & Sofeh Parks Management Project in the city of Isfahan is a state initiative geared towards the conservation of agricultural land that was being rapidly consumed by residential development. The project successfully addresses the land use conflict on the city's fringe by curbing the often illegally built urban sprawl through the establishment of a green corridor that links the city with its periphery.

Isfahan is a UNESCO World Heritage site in central Iran, an Islamic state positioned between the Persian Gulf and the Caspian Sea.[179] The city is the capital of Isfahan province and displays a well-designed urban framework with public squares edged with ancient buildings of Persian grandeur and Islamic significance.

A key pressure for change in the city's urban policy was the need to protect land peripheral

to the city, in particular the Najvan region. This region was under increasing pressure from a lack of agricultural profitability in the area as a result of water scarcity. This had led to the destruction of land through extensive conversion to housing developments.[180] A rural-urban exodus and consequent population growth and associated housing shortages in the Najvan region put further environmental pressures on the land's natural resources.

To resolve these issues, the Isfahan Municipality Local Authority initiated the Najvan & Sofeh Parks Project, a 1,200-hectare development to protect the existing public and private gardens in the area which would encourage the renewal of public urban spaces and improve the natural environment. The public gardens in the city have a particular significance since the ordered garden tradition stems from as far back as the Abbasid Dynasty and the gardens of Mesopotamia, now Iraq.[181]

A large land management framework designed by a government-funded social programme led the greening process, which was enabled through purchase agreements with existing landowners. These agreements were introduced to prevent the conversion of agricultural lands to residential units. This was enforced through state purchase of land at fair market value. Landowners were then assisted with sourcing alternative land zoned for construction. This system enabled the government to take possession of plots in order to implement the ambitious greening project. The clout of the scheme also enabled the government to restrict houses of inferior quality being built as a temporary housing solution within the identified green corridor.

To get collective agreement, a focused public awareness campaign encouraged landowners to contribute to land rehabilitation. Further incentives were given, such as free access to saplings and seedlings to stimulate agricultural land conversions to orchards, and the issuance of permits for walling to demarcate boundaries and so limit the encroachment of agricultural planting. The use of drought-resistant plant species along with the rehabilitation of waterways for irrigation purposes was also encouraged.[182]

Key to policy developments was the relationship between landowners and local councils, which was improved through stakeholder participation in community education drives through knowledge and information transfer. Specialist ecologists were employed to assist with tree selection, the introduction of drought-resistant plant species and water preservation measures in the project and these ecologists formed an integral part of the consultant team along with architects, urban designers and lawyers. As well as being given planting requirements, landowners were assisted where necessary with agricultural and arboricultural expertise through training schemes, which ensured the longevity and success of the scheme.

Although some land was already agricultural, the proposed services component of the project included environmental protection measures including extensive soil conditioning. Design guidelines were used as a key urban design device and included a restriction on heights of new developments. Multiple hard and soft landscape design strategies were used and particular emphasis was given to the placement of trees to redirect airflow and provide shade. Trees were also planted on the edges of waterways to decrease water evaporation and on hillsides in concentrated volumes as an engineered reinforcement to avoid landslides. Each tree planted also served as a valuable carbon sink.[183]

The project was initiated in 1997 and the timeline spanned ten years. It formally began in 1998, with project implementation in 2001 when land subdivisions, change of use and destructive land practices were halted and land rehabilitation got underway. The Najvan management organization occurred was formed in 2004 and the final project ratification was in 2007.[184]

A revised government policy was instrumental in the practical implementation of the project. Applications for change of use were made for about 300 hectares of lands to put a cap on new developments. Legislative measures such as limiting the fragmentation of plots, prohibiting the chopping down of trees - even on private property - or tampering with existing gardens, preventing unlicensed construction, outlawing construction on agricultural land and preventing change of use applications were all enforced.

A newly greened city garden network resulting in increased tourism as an indirect result of the project's success but was, of course, also assisted by the city's rich collection of art and architecture dating back to the Parthian Empire, the Safavid Dynasty and Paleolithic and Aspandanic periods.[185] The influx of tourism has enabled the project funders to recoup some of their costs and allowed further investment in land acquisition for development with loans granted to landowners.

Unsurprisingly, several problems arose in response to the request for sale of land, particularly in the cases where landowners had inherited their land. A shortage of space to house their extended families increased the pressure for land subdivisions. This was made worse by the fact that these landowners lacked the economic means to work their lands and were largely illiterate, merely trying to meet their immediate needs and unable to adapt their livelihoods to any longer-term aspirations of environmental upliftment.[186]

The question of land ownership and consequently the need to avoid conflicting agendas could be seen as an unresolved aspect of the scheme's prospects for replicability and success. Another obstacle that exacerbated policy implementation was the practical challenge of greening a harsh, arid landscape with scarce water supplies.

Further to these problems was the issue of the Islamic environment that public spaces occupied. Cultural regulations within Shia Islam, the country's official religion, inhibited the movement of women and within this project a segregated women's-only garden was established to create a secure and private recreation space. This notion must be questioned, however, when implementing this project's model elsewhere; the creation of a private space can be seen as reinforcing the regulatory environment and doing little to address the issue of women's rights.

The question of implementing a contemporary urban renewal doctrine on an ancient city with a layered culture is fraught with complexity and is discussed at length by Sarraf. He muses that the potential for revitalizing the socio-spatial network of a city is informed by the relationship between physical transformation and social communication.[187] This project thus serves as an example of the need to recognize the potentially rigid nature of contemporary urban renewal strategies in general, and so has specifically and appropriately adapted a contemporary intervention in the city's socio-spatial complexities.

A qualitative evaluation of the parks' design methodology reveals enhanced social services, and a positive environmental and resource management outcome through

community participation. Furthermore, the project has revealed an increase in per capita urban landscape.

The physical transformation of the Najvan and Sofeh region can ultimately be seen as having helped to disincentivize urban sprawl and resolve land use conflicts through the effective introduction of green nodes and the rehabilitation of the area's natural resources. Finally, through the creation of local parks and public gardens designed as public places of engagement, the project arguably encourages spaces of democracy in a culturally hierarchical society.[188]

6.8 The Honeysuckle Urban Renewal Project, Newcastle, Australia – A Snapshot of leading urban revitalization and brownfield redevelopment

The Honeysuckle Development Project in Newcastle, Australia, is a leading example of how targeted redevelopment of inner city areas can assist efforts to respond to urban decline and stimulate investment and economic growth, encourage improved environmental conditions, and support sustainable behaviour. The master plan for the project was finalised in 1991. It was supported by the Australian Federal Government's Building Better Cities programme (some USD 102 million). Newcastle is the largest regional city and the sixth largest urban area in Australia. Its proximity to Sydney makes it vital for absorbing a proportion of the predicted population growth of Sydney, however, despite the spectacular location of the city, sandwiched between the ocean, estuary and hills, the city was tainted by its industrial past. Because of this, the Honeysuckle project was the only regional city in Australia to secure the Building Better Cities funding, intended to catalyse a revitalization of the city.

Cycling and pedestrian access in the Honeysuckle development
© Hunter Development Corporation, 2008

The Honeysuckle development is located on waterfront land in the inner city of Newcastle, directly adjacent to the central business district (CBD). At the time of the project's development, Newcastle had suffered from some 20 years of inner city decay, and faced a range of problems related to urban sprawl and car dependency that resulted in people, retail, and jobs moving to the suburbs. The regional economy was based around industry, mining and energy generation, and was slowing down significantly. There were many barriers, constraints and challenges to the redevelopment of the formerly industrial area and the land was far from "market ready" or in an acceptable state to be subdivided for sale. Some areas of the site required land reclamation; there was a lack of the services and infrastructure necessary for a mixed-use development, such as roads, drainage, sewer, water and power supply; much of the site being contaminated from industrial use; the fact that the site was subject to mines subsidence; and the four kilometre foreshore required replacement or refurbishment of the seawall and land revetments.[189]

The Honeysuckle development has been highly successful in utilizing derelict, inner city land to provide high density, affordable inner city housing, thus minimizing urban sprawl. This mixed-use development has generated further, significant investment in Newcastle, and assisted in transforming the identity and employment base of the city away from the city's industrial roots. The initial injection of public funding provides an ideal model for how the revitalization of a city can be catalyzed when the fundamentals are not yet in place for private investment. At the time, it was also a model for a holistic approach to urban development, in which innovative, synergistic solutions could be found for environmental, social and economic problems concurrently.

There have been some criticisms about the development, including that it remains isolated with only weak connections to the CBD, from which it has absorbed a significant amount of business and vitality.[190] In particular, a railway line runs between the Honeysuckle precinct and the CBD, which provides valuable public transport access but may effectively reduce access between the two areas. The criticisms need to be seen in the context of the pre-existing decline of the Newcastle CBD and the main retail strip, Hunter Street. Although there has been a migration of commercial business to Honeysuckle, the New South Wales state planning authority notes that this is more due to a lack of A-grade office space within the CBD, with Honeysuckle having filled this void. There is limited retail space in the Honeysuckle development (although large shopping malls located in the suburbs of Newcastle have attracted a large proportion of retail business), and the decline of Hunter Street is more a reflection of the need for the CBD to be redeveloped than a lack of systematic planning in the Honeysuckle development.[191] Indeed, the New South Wales state government has earmarked Newcastle as a priority area for urban renewal, with multiple initiatives aimed at increasing the potential of the city as a major metropolitan centre in the state.[192] The City Centre Plan for Newcastle builds on the success of the Honeysuckle development in reinvigorating inner city areas, and includes plans for the revitalization of multiple, integrated precincts throughout the city centre.[193]

Boardwalk and Maritime Centre at the Honeysuckle development
© Hunter Development Corporation, 2008

There were six objectives for the Honeysuckle development, including:[194]

- Economic: To catalyse the economic revitalization of Newcastle;
- Social: To revitalize the city and improve the quality of life in Newcastle;
- Political: To maximize commitment by all three levels of government, and develop strong local community support;
- Environmental: To contribute to the environmental sustainability by reducing the demands for urban sprawl and ensuring environmentally sensitive planning and design;
- Transport: To facilitate more effective and efficient public transport system;
- Financial: To optimize returns on surplus government land and maximize the economic and social benefits.

Parallel with these objectives, the development aspired to demonstrate efficient, ecologically sustainable and socially just approaches to urban growth and renewal - essential to maintain growth, investment and competitiveness of the nation. The project was ideal for showing how greater economic, environmental and community benefits could be achieved by taking a strategic and integrated approach to the development of the site.[195]

Development of the site began in the mid-1990s with significant preparatory work on remediation, seawall repair, provision of services and roads and repairs to the heritage railway workshop buildings.[196] The final stages of the Honeysuckle development are due for completion over the next three to five years[197].

The Honeysuckle Development Corporation was established in 1992 as the New South Wales State Government organization responsible for the development. The corporation operated at the juncture between federal, state and local government, who jointly funded the project, with funding also provided through the Building Better Cities programme. The funding was important because the fundamentals were not in place for the private sector to invest in the redevelopment of inner city Newcastle. Despite strong community support for the Honeysuckle development, extensive work was needed to determine the feasibility of the project and specific land uses.[198]

The Honeysuckle development set a benchmark in design innovation, delivery processes and planning frameworks. It focused on managing urban spaces holistically rather than as single solutions, by integrating places within the development, recognizing the multi-dimensional, complex and interrelated nature of urban problems, and creating a place-specific rather than function specific urban development. In this way, the development was able to integrate policies across sectors to provide

Green space and restored waterways in the Honeysuckle development © Hunter Development Corporation, 2008

strategic solutions to economic, social and environmental problems. This was a deliberate approach by the programme, which recognized the tendency for specialized agencies, such as roads, housing or community services, to pursue objectives and outcomes relevant to their portfolio, but in isolation of broader urban objectives, leading to sub-optimal outcomes.[199]

Reporting on the project was complicated by conceptual and practical difficulties largely stemming from the difficulty in determining how a specific development has contributed to broader social, economic and environmental trends and outcomes, as well as obtaining the type of data needed to make such assessments. Based on a range of assessments, and commentary from other researchers and organizations, Honeysuckle largely met the key objectives, including:

Economic: Overall, the project generated an economic impact of USD 1.33 billion, and once the project is completed, it is estimated it will have generated an economic impact of over USD 2.16 billion.[200]

Social: The development has created over 4,800 direct and indirect jobs,[201] in a variety of sectors. There are 1,200 residents living in the Honeysuckle development and there are 170 community housing units. Over USD 92 million has been spent on community projects.[202] The mixed-use form enables access to services, retail, housing and recreation, which encourages cycling, walking and public transport. The development creates a sense of place through artwork and features, communal areas and shop fronts open to the pedestrian path. This creates a sense of security, as do the residential apartments which overlook these areas.[203]

Political: The development is considered successful in demonstrating an alternative to prevailing urban planning approaches, and that a focus on holistic management of urban space can deliver strategic solutions across sectors to economic, social and environmental problems.[204]

Environmental: The Honeysuckle development provides housing in the inner city, reducing urban sprawl. As a mixed-use development, it reduces the need for travel and provides options for walking, cycling and public transport. It has, however, been criticized for being poorly integrated into the CBD, and efforts are ongoing to increase access and reduce barriers. The development has provided other environmental benefits such as the decontamination and remediation of the site, the improved health of the existing creek waterway, the repaired and stabilized seawalls, and the incorporated open space landscaping.[205]

Transport: The development includes a significant length of shared walking and cycling path, and can be accessed on foot or bicycle from the CBD. It is designed to encourage pedestrians and cyclists and is also close to public transport.[206] There have been calls for the access to Honeysuckle to be improved through the removal of the rail line between Newcastle and a nearby town. It is suggested that connectivity would be improved by terminating the rail line at Wickham, constructing a new terminal there, introducing bus links into the CBD and creating a pedestrian and cyclist shared zone that would follow the path of the former rail line. This would further enhance the active transport connections to Honeysuckle.[207]

Financial: The development and investment of public funds has catalysed the rejuvenation of the city and assisted in re-establishing Newcastle as a regional capital.

A fruit market outside of the seven doors to Tetouan's historical Medina in Morocco, a walled maze of small alleys which enjoys a UNESCO World Patrimony distinction and draws tourists and foreigners © UN-Habitat/Alessandro Scotti

Conclusion 7

This guide recognizes the complex nature of cities and urban systems and the challenges they face in accommodating urbanization whilst combating climate change. In support of the "green economy", the concept of the compact city and planned (versus unplanned) urban extension are presented here as key parts in achieving sustainable settlements and green growth.[208] Properly managed and appropriately applied, compaction efforts and directed urban growth can positively enhance the life of the city dweller and can support sustainable urban patterns that benefit the functioning of developed as well as developing world cities.

A compact city can support greater efficiency in the use of land (impacting on its ecological footprint), reduce the reliance on private vehicles, lower non-renewable resource consumption per household, support increased access to public transport and services, reduce the fragmentation of natural systems, foster viable public transport systems and harness agglomeration advantages. Urban compaction is thus all about density, diversity, design, destination and distance to transit – the so-called "5 Ds".[209,210]

A city's spatial building blocks and how these elements interweave to form the urban fabric, presents opportunities for spatial intervention at various scales. With this as the base, a set of principles in pursuit of compaction and structured urban growth has been developed, which include:

- Promote, preserve and open up natural spaces,
- Integrate and retrofit infrastructure,
- Develop a sustainable urban transport strategy,
- Identify and intensify urban nodes,
- Increase built area and residential densities,
- Enhance the role of the street,
- Promote mixed-use development and intensification of activities, and
- Practise good governance, knowledge sharing and cooperative approaches.

In implementing a sustainable compact urban pattern, actions and interventions are required and this guide outlines action steps at the disposal of the urban planner and local decision maker to this end. Given the complexity and diversity of cities, different levels of intervention will be possible. This guide is not intended to provide a one-size-fits-all solution. An ambitious spatial restructuring plan linked to infrastructure development might be a viable option for one city, while a realistic option for others might merely involve the upgrading of public places – however, both cases have merit within the broader goal of achieving a sustainable urban form.

Upfront, the governance and regulatory systems needs to be reviewed and adapted to the local context. Securing leadership, political will and creating an enabling policy environment while engaging with the receiving communities are required. Urban planners and decision makers need to be equipped with knowledge along the way. Most importantly, a strategic spatial planning approach needs to be adopted, focused at the metropolitan scale, and with strategically timed and sequenced physical interventions. These could include:

- Investing in sustainable transport options and in appropriate infrastructure,
- Developing an urban densification strategy and delineating containment edges to prevent uncontrolled urban sprawl,
- Activating the street,
- Planning for informality,
- Pursuing brownfield development – practice the notion of re-use and retrofitting,
- Responding to climate change risk areas,
- Creating great public places – place making.

The case studies and examples provided throughout the guide emphasize the fact that there is no one solution to all problems, but rather they are innovative, unique responses to their urban complexities and challenges.

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