The SymbioCity Approach

A CONCEPTUAL FRAMEWORK FOR SUSTAINABLE URBAN DEVELOPMENT

SymbioCity
SUSTAINABILITY BY SWEDEN

The SymbioCity Approach

A CONCEPTUAL FRAMEWORK FOR SUSTAINABLE URBAN DEVELOPMENT

CITIES ARE FOR PEOPLE

Current urbanisation trends will result in 70% of the global population living in cities by 2050, and given the increasing social and environmental challenges, it is imperative that we learn how best to develop, govern and manage integrated and sustainable cities. Properly planned and managed cities and towns offer enhanced opportunities for people to meet, work, access public services, enjoy social and cultural benefits, and fulfil their life dreams. Cities are the drivers of political, economic and cultural development, and making them attractive, safe, healthy and livable is crucial for a more sustainable future.
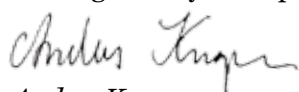
Elected local representatives have a key role in promoting policies and programmes that improve economic, socio-cultural and environmental conditions for the citizens of successful towns and cities. Climate change is a global concern, but its effects are local, and local mitigation and adaptation measures are essential.

Urbanisation and urban development are complex and dynamic processes, and the challenge is to develop more equitable, environmentally sustainable and economically viable cities, in order to alleviate poverty. The *SymbioCity Approach* has been developed to contribute to a better quality of life for all urban citizens.

This publication does not provide solutions to all problems and challenges – the solutions lie in the hands of local elected representatives and officials who govern, plan and manage particular cities and towns. Rather, the *SymbioCity Approach* offers support to those developing holistic and integrated strategies to improve urban environments and living conditions.

The *SymbioCity Approach* is part of the Swedish Government's effort to promote sustainable urban development internationally. The Swedish Association of Local Authorities and Regions draws its inspiration for the *SymbioCity Approach* from the innovative spirit and proactive drive of its members who are striving to achieve a more sustainable society.

I hope that you will find this publication inspiring and useful in your local urban development processes, and we look forward to hearing about your experiences and achievements!

Anders Knape
President, Swedish Association of Local Authorities and Regions (SALAR)

CONTENTS

A sustainable city or eco-city is designed to minimise negative environmental impacts by reducing non-renewable resource inputs and harmful waste and pollution outputs. Reducing the use of fossil fuels is a key challenge, as they are non-renewable and produce CO_2, which is a major cause of global warming and climate change. The transition to renewable energy sources and efficient energy use is thus an essential strategy for sustainable urban development. Environmental efforts of this kind should always be related to a socio-cultural and economic perspective, including poverty alleviation, economic integration and a fair distribution of environmental mitigation measures.

Human beings are social beings, and urban environments provide a wide range and choice of social, educational, cultural and economic opportunities. Dense and coherent urban structures also enable economies of scale, with shorter supply and access distances for services, which can save energy and other resources. Well-designed, sustainable cities can achieve minimal environmental impact, renewable energy and resource use, and have a thriving 'green' economy. They can also provide a pleasant, safe and green built environment, and a diverse and stimulating social, cultural and intellectual life.

1.

INTRODUCING THE
SymbioCity Approach

THE SymbioCity Approach URBAN SUSTAINABILITY

Hammarby Sjöstad – one of several redevelopment areas in Stockholm.

1.1 Background

The increasing rapidity and scale of urbanisation, especially in areas of Asia and Africa, presents a vast and urgent need for more holistic governance and planning of urban development. Though urbanisation generates significant environmental and socio-economic challenges, it is essentially a positive phenomenon. With proper governance and planning, urbanisation can contribute to improved livelihoods and social values, ethnic and cultural integration, extension of democratic rights and poverty alleviation[1]. Urbanisation can enhance political, cultural and economic development and living conditions.

However, rapid and unplanned urban growth often results in negative environmental and social impacts, for cities and individuals. In 2010, 1 billion out of about 3,5 billion urban dwellers lived in slums or informal settlements, mostly with insecure tenure rights, insufficient clean water and inadequate shelter [2]. Over the past 10 years, the proportion of the urban population living in slums in the developing world has declined from 39% in 2000 to an estimated 32% in 2010. However, the urban divide endures, because in absolute terms the numbers of slum dwellers have actually grown considerably, and will continue to rise in the near future[3].

Related challenges are constraints in public finance, the lack of political will, inadequate governance structures and capacity, and economic marginalisation of the poor. Poverty needs to be understood from a wider perspective as not only a lack of income, but deprivation in terms of basic human needs and rights. Unless poverty is addressed from this perspective, sustainable development cannot be achieved. Conversely, if environmental challenges are not addressed, this directly and indirectly leads to poverty and the violation of human rights.

Integrated system solutions, together with improved management of municipal infrastructure and environments, are essential to address these challenges. This need led to Swedish Government and Swedish Trade Council representatives launching the *Sustainable City* concept at the *World Summit on Sustainable Development* in Johannesburg in 2002. Based on this initiative, Sida developed a manual, *Support to Environmentally Sustainable Urban Development*, in 2006–2007. Ongoing sustainable urban development interventions and projects in Sweden underpinned this initiative.

Projects such as Hammarby Sjöstad in Stockholm and the Western Harbour in Malmö won international recognition, in both developing and developed countries, for their approaches to sustainable urban development.

Sweden has since positioned itself to contribute to sustainable urban development, both nationally and internationally. A Government bill outlines a coherent development policy to meet global challenges (2009/10:129)[4]. It identifies sustainable urban development as a focus area in the *Swedish Policy for Global Development 2010–12*, under the heading *Climate Change and Environmental Challenge*. Sweden also formulated a *Policy for Environment and Climate Change*[5] for Swedish development cooperation during 2010–2014.

A key target area is to promote sustainable urban development, given that environmental and climate change have severe impacts on poor urban dwellers, especially women and children. Sida's urban development support policy, *Fighting Poverty in an Urban World (2006–11)*[6], also has the objective to *»promote the development of sustainable cities where all citizens have opportunities to improve their living conditions and thus can further contribute to the development of their city and country«*.

In 2008, the Swedish Government launched *SymbioCity – Sustainability by Sweden*, based on the knowledge and experience gained from implementing the Sustainable City concept, and from Sida's development cooperation work. The objective was to create a unique market platform for sustainable urban development, based on Swedish environmental knowledge and technology.

In 2010, the Sustainable City concept was integrated into the *SymbioCity Initiative*, as an overarching concept and communication platform for Swedish institutions and actors involved in sustainable urban development. This revised version of The *SymbioCity Approach* is an integral part of this initiative, and the change from manual to conceptual framework reflects a shift in the purpose and use of the approach.

The *SymbioCity Approach* promotes an integrated, holistic and multidisciplinary approach to sustainable urban development, to achieve better quality urban environments via efficient resource use and synergies between different urban systems. An inclusive and multidisciplinary approach to sustainable urban development can also contribute to poverty reduction by making better cities and towns for all their inhabitants, and address climate change issues.

Various terms are used in urban development, in part to bridge the gap between different sectors and stakeholders. The *SymbioCity Approach* uses the term multidisciplinary to empha-

»The City is not a problem – it is a solution«

Jamie Lerner
former Mayor of Curitiba, Brazil

[1] In State of the World's Cities 2010/2011 – Bridging the Urban Divide (UN-Habitat) the implications of urbanisation are further discussed.
[2] UN-Habitat definition of urban slum dwellers, individuals residing in housing with one or more of the following conditions: inadequate drinking water; inadequate sanitation; poor structural quality/durability of housing; overcrowding; and insecurity of tenure.
[3] State of the Word's Cities 2010/2011 – Bridging the Urban Divide (UN-Habitat).
[4] Amendment to Government Directive to Swedish International Development Cooperation Agency for financial year 2006, Ministry for Foreign Affairs, March 2006.
[5] Policy för miljö- och klimatfrågor inom svenskt utvecklingssamarbete 2010–2014. Regeringskansliet, 2010.
[6] Sida (2006) Fighting Poverty in an Urban World – Support to Urban Development (Policy).

Tangshan Bay Eco-City

sise the need to involve various actors in the process. Interdisciplinary and transdisciplinary are also used, the latter indicating a strategic approach to knowledge generation, that combines scientific knowledge with experience in policy making and practice in business and community life.

The *SymbioCity Approach* has been applied in various contexts, using the first version of the Sida manual. The concept was piloted in the cities of Skopje, Macedonia and Visakhapatnam, India, during 2007–2009, in conducting sustainability reviews to identify short and long-term development strategies. These experiences have been integrated into this publication.

Parts of the concept were also applied in China to develop principles for ecocities and green city districts. A number of aspects were scrutinised and developed, including ecocycle models demonstrating integrated solutions for energy, waste and water, integrated land use and transportation, ecosystems planning, sustainable building design, and strategies to reduce air pollution.

The *Approach* was also the basis for dialogue between Swedish actors and Chinese local and central authorities on common efforts to promote sustainable urban development. The planning of Tangshan Bay Eco-City is a leading example of the large-scale application of integrated systems solutions, which involved close collaboration between Swedish and Chinese experts. In 2010, a Chinese version of the concept was developed and published in connection with the *Shanghai World Exhibition*.
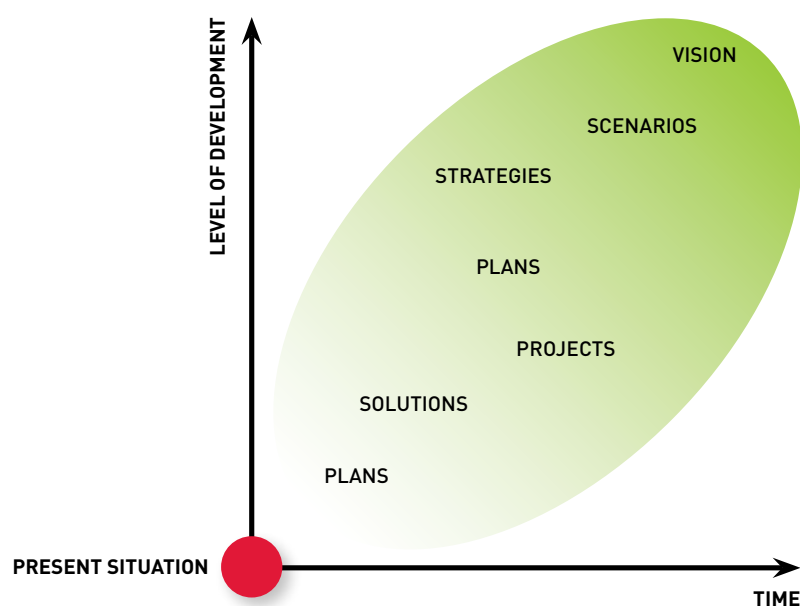
Figure 1.1
The *SymbioCity Approach* can be used for various purposes.

The *SymbioCity Approach* offers opportunities to communicate various possibilities for sustainable urban development from both an urban planning and development perspective, and regarding viable and integrated environmental, socio-cultural and economic solutions. The Approach can serve as a starting point and inspiration for developing *visions, scenarios, strategies* and *solutions* for sustainable urban development in developing and transition countries, in that it pays special attention to the conditions and needs of poor, vulnerable and marginalised groups such as women and children, indigenous people and migrants.

Methods and tools included in the *SymbioCity Approach* can support progressive transformation of urban areas towards sustainability and improved livelihoods. The Approach promotes inclusive development processes and cooperation among stakeholders, including communities, municipalities, regional and national governments, institutes and universities, civil society organisations and private companies. However, the most important stakeholders are urban communities, and particularly slum dwellers, who need to participate in matters that affect their lives.

In 2010, Sida contracted the *Swedish Association of Local Authorities and Regions* (salar) and its subsidiary *skl International* to develop the *SymbioCity Approach*, with a focus on developing and transition countries. This choice was motivated by salar's extensive network of 290 Swedish local authorities, which engage on a daily basis with environmental and climate change issues in relation to urban development and sustainability.

SymbioCity is a Swedish Government initiative that promotes sustainable urban development worldwide, based on Swedish knowledge and experience in working toward urban sustainability. It includes the Ministries of Environment, Foreign Affairs, Enterprise, Energy and Communications, the Swedish Trade Council (representing the business sector), salar and Swedish universities.

The initiative is closely related to the *Swedish Delegation for Sustainable Cities* – a unifying national forum that promotes sustainable urban development, including financial support, and *Mistra Urban Futures* – an international centre for sustainable urban development, which includes stakeholders involved in both research and practice in countries including Sweden, England, South Africa, Kenya and China.

The Western Harbour in Malmö – an area for sustainable living, working and knowledge generation.

1.2 The *SymbioCity Approach* – its purpose and scope

The *SymbioCity Approach* promotes a holistic, integrated and multidisciplinary approach to sustainable urban development, which includes *environmental, social, economic* and *spatial* dimensions. The Approach provides opportunities to improve living standards and well-being, safety, comfort and quality of life for all. It provides a *conceptual framework* for sustainable urban development, with primary entry points in the spatial and environmental dimensions.

> The ultimate aim of the *SymbioCity Approach* is to promote and encourage sustainable urban development, primarily in low and middle income countries. By improving the life conditions from environmental, socio-cultural and economic perspectives, the *SymbioCity Approach* can contribute to the alleviation of poverty. The conceptual framework is generic and should be applied in a flexible way according to the conditions and needs of the local context. The Approach is thus also relevant for cities and towns also in transitional and developed countries.

The *SymbioCity Approach* also provides guidance and tools to support sustainable urban development processes. It is a dynamic and generic concept, which should be adjusted to particular regions, cities, towns and urban areas. The main objectives of the *SymbioCity Approach* are

> To encourage and support *multi- and transdisciplinary* cooperation among stakeholders, and a holistic and integrated approach

> To contribute to *capacity building* by mutual sharing of knowledge and experience between different stakeholders, primarily at local government level

> To serve as a *basis for dialogue and cooperation* between stakeholders, particularly at local level, but including regional and national institutions

> To serve as a guideline for *urban sustainability reviews*, based on a combined multidisciplinary and sector approach, which can be applied on different urban levels or scales

> To *contribute to the development of city-wide strategies* for short, medium, and long-term improvement of urban areas, including all dimensions of sustainability

> To support cities and towns in *identifying practical and integrated systems solutions* for sustainable urban development.

Sustainable urban development is a very complex field which includes many systems, services and relationships, and the *SymbioCity Approach* provides an overview of the many issues and

linkages which need to be considered in any urban development initiative. The conceptual framework emphasises development processes and systematic working procedures, as well as interfaces and synergies between various systems, fields and aspects. It can also include a poverty analysis, and proposals that contribute to poverty alleviation.

However, the framework does not claim to fully cover or go into depth on every aspect, e.g. the social or economic dimensions of development. Its primary entry point is the environmental dimension of urban sustainability, but with linkages to the other dimensions.

The conceptual framework aims to encourage and contribute to an integrated and holistic approach to sustainable urban development. It should complement rather than replace existing regulatory frameworks, policies and guidelines. The *SymbioCity Approach* aims to provide methodological and process-oriented support to sustainable urban development initiatives, to integrate and articulate different needs, perspectives, and intentions. How, and to what extent the approach is applied should depend on the local context and available economic, technical and human resources.

The *SymbioCity Approach* provides an overview of the different aspects to consider in urban development. It acknowledges the many other approaches to and resources on urbanisation trends, challenges and solutions, and institutional, economic and socio-cultural aspects. The *Approach* intends to cooperate and complement rather than compete with those who share common interests and objectives.

Any urban development analysis or programme needs to consider the situation of disadvantaged women, men, girls and boys, and ensure that their needs and rights are taken into account. This is particularly important, because poor and disadvantaged groups often lack adequate representation, and are not involved in plans and decisions that affect them. It is outside the scope of this publication to address this need in detail, but the *Institutional factors* chapter gives an overview of governance and participation issues in urban development.
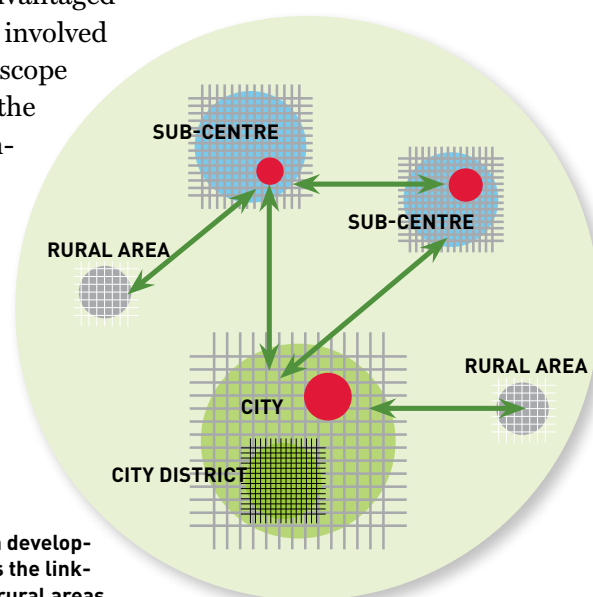
Figure 1.2
The *SymbioCity Approach* emphasises urban development according to the local context, and thus the linkages between city centres, sub-centres and rural areas.

The *SymbioCity Approach* primarily addresses stakeholders involved in sustainable urban development at *local authority level*, e.g. elected representatives on political committees and officials in departments of local councils or municipalities. Relevant regional and national departments should be involved where their functions are related to particular issues and needs. The *Approach* can also serve as an overarching and integrating theme in the context of bilateral and multilateral development cooperation programmes and partne¨rships, training and educational programmes, research and development cooperation, exchange programmes and study visits, and export promotion and economic cooperation.

Figure 1.3
The *SymbioCity Approach* involves different stakeholders acting as decision-makers, participants, contributors and partners, etc.

The SymbioCity Approach intends to cooperate rather than compete with others with common interests and objectives.

1.3 The *SymbioCity Approach* as a method

The *SymbioCity Approach* is a *conceptual framework* and *flexible guide* which should be adapted to *local conditions* and *specific needs*. It can be used at different urban levels and scales when

> *initiating and undertaking development planning processes*
> *elaborating development strategies for existing or new towns, cities and areas*
> *conducting sustainability reviews of a particular town, city or city district*
> *analysing institutional or organisational frameworks in urban contexts.*

The approach includes relationships and linkages with the urban hinterland, i.e. the interface between urban and rural development, as well as with the national and international context.

The *SymbioCity Approach* builds upon three interconnected core areas – the *Conceptual Model, Institutional Factors* and *Urban Systems*. Each core area may be approached independently, depending on the context, objective and focus of the activity. However, in many situations, it is useful to combine the three core areas, which can be done in different ways.

For example, when planning a project for a specific urban system such as water, waste or energy, institutional factors such as urban governance and planning are often vital to the success of the project. The *Conceptual Model* can help to *define sustainability* in the local context, and to identify *synergies* with other urban systems and links to economic and socio-cultural dimensions.
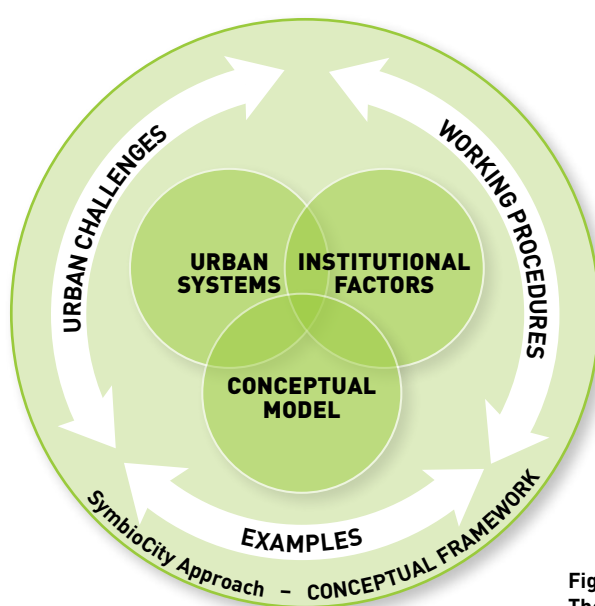
Figure 1.4
The *SymbioCity Approach* can be used as a conceptual framework and guide for sustainable urban development processes.

The framework includes a generic *working procedure* that can be used to develop local analysis, assessments, proposals and strategies. Combining the three core areas and the working procedures is encouraged when engaging in initiatives to improve sustainable urban development. The core areas are briefly described below.

THE CONCEPTUAL MODEL can guide the definition of urban sustainability in any local context, by showing the relationships between the environmental, socio-cultural and economic dimensions of development, as well as linkages to the spatial dimension, institutional aspects and urban systems. The conceptual model is elaborated *in Chapter 3*.

THE INSTITUTIONAL FRAMEWORK and **SETTING** are fundamental in every society from an overall development perspective, and in the governance and management of urban areas. Institutional competence is crucial to achieving structural changes and enduring improvement. When conducting a sustainability review or developing strategies, an analysis of the institutional setting identifies essential preconditions and aspects that need to be considered. Institutional factors are often central for promoting integrated concepts, ideas, strategies and solutions (*see Chapter 4*).

URBAN SYSTEMS are integral to existing and desired spatial and functional features of a region, city, town, or area. Urban areas include various functions, systems and services that are spatially distributed and interconnected, either systematically or randomly. In order to promote sustainability and address environmental, socio-cultural and economic challenges, the *SymbioCity Approach* focuses on urban systems and the interfaces and synergies between them. *Urban systems* refers not only to *technical systems*, but also to *ecosystems* and *socio-cultural* and *economic structures*. (*see Chapter 5*).

When conducting a review or developing strategies for urban development, working procedures should be target-oriented, multi-disciplinary, transparent and inclusive. Various methods and tools can be used to support such working procedures when establishing baseline data and information, analysing sustainability and planning strategies to enhance sustainability in an area. Working procedures should include strategies for implementation and follow-up activities.

The framework includes references to the current state and trends of urbanisation globally, and typical *challenges* and *opportunities* that need to be managed. *Examples* of urban development projects *in Chapter 7* illustrate different approaches to enhancing sustainability of urban areas at different levels of scale.

The *SymbioCity Approach* can be applied on different planning levels and in various contexts such as formulating visions and strategies, drafting spatial plans, and conducting sustainability assessments and reviews. It can also supplement existing regulatory frameworks and planning procedures, to enhance and integrate sustainability aspects.

An *urban sustainability review* is a proactive way of initiating dialogue on sustainable urban development among different stakeholders, and can focus on a geographic area with or without existing development plans (e.g. a *Master Plan* or *Integrated Development Plan*). A common review objective it to identify issues that need to be addressed to enhance the performance and sustainability of the area.

The *SymbioCity Approach* can also be applied in various change and development processes in a city, town or urban area, for example

> in planning new sustainable urban areas
> in renewing existing areas to enhance sustainability
> in improving new comprehensive or city-wide strategic plans in terms of environmental solutions which enhance sustainability
> in revising existing plans to support more sustainable development.

Figure 1.4
A MULTIDISCIPLINARY APPROACH – **involving various sectors in an open and transparent process.**

Although the *SymbioCity Approach* emphasises a multidisciplinary approach, two entry points are possible.

1. A MULTIDISCIPLINARY APPROACH that analyses an area from a number of perspectives to identify synergies between different aspects in the integrated planning framework. This approach requires an open and transparent process from the start, to manage possible institutional barriers or conflicting interests.

2. A SECTORIAL APPROACH that analyses a specific urban system, e.g. water, waste or transportation, in detail. In this case, a progressive broadening of the scope of the review can identify potential synergies with related aspects and systems. This approach is common when an existing plan is in place, or a draft proposal needs to be reviewed. A sectorial approach should preferably develop over time into a multidisciplinary approach.

Figure 1.5
A SECTORIAL APPROACH – starting with a detailed analysis of a specific urban system.

1.4 Structure of the publication

This publication is structured according to the different pillars of the *SymbioCity* conceptual framework. This makes it possible to use chapters independently, depending on the need and context. However, for a full understanding of the framework, all pillars should be considered.

1. THE SymbioCity Approach

2. URBAN CHALLENGES AS OPPORTUNITIES

3. A CONCEPTUAL MODEL FOR URBAN SUSTAINABILITY

4. INSTITUTIONAL FACTORS

5. SUSTAINABLE URBAN SYSTEMS AND POTENTIAL SYNERGIES

6. WORKING PROCEDURES
APPLYING INCLUSIVE AND TRANSPARENT PROCESSES

7. GOOD PRACTICE EXAMPLES

> **CHAPTER 1** introduces the framework, the aim and objectives, and guidelines on how to use the framework in different contexts.

> **CHAPTER 2** introduces urbanisation trends and challenges addressed in subsequent chapters.

> **CHAPTER 3** introduces the conceptual model as the basis for an integrated and holistic approach to sustainable urban development, and how it can be used to develop complex urban contexts.

> **CHAPTER 4** provides an overview of institutional factors that are central to a successful approach to urban sustainability, including implementation to realise identified goals.

> **CHAPTER 5** provides an overview of the urban systems that need to be considered in urban sustainability reviews and development planning processes. It also indicates how potential synergies can be identified and addressed.

> **CHAPTER 6** suggests a generic working procedure with six process steps, supported by a number of working methods and tools, which can be used when setting up, organising and implementing an urban sustainability review or development planning process.

> **CHAPTER 7** provides short introductions to a number of sustainable urban development case studies which illustrate the concept and integrated methodology of the *SymbioCity Approach* and show how synergies can be identified as part of systems solutions.

1.5 Global policy framework for sustainable urban development

Sustainable urbanisation is a crucial issue for the future of mankind. The well-known definition of sustainable development comes from the 1987 Brundtland Report[7].

> »Humanity has the ability to make development sustainable – to ensure that it meets the needs of the present without compromising the ability of future generations to meet their needs.«

The rapid speed of urbanisation and its environmental and social implications were identified as early as the first *Conference on the Environment in Stockholm* in 1972. This initiated an international UN process to address environmental challenges globally. The next *Conference on the Environment in Rio* in 1992 resulted in the *Rio Declaration and Agenda 21* – a holistic approach to and international programme for sustainable ecological, economic and social development.

Local Agenda 21 (LA 21) developed as the local government component of the programme, which focused on urban development. The next global conference was the *World Summit on Sustainable Development* (WSSD) *in Johannesburg*, South Africa in 2002, which resulted in the Johannesburg *Declaration and Plan of Implementation*, which includes necessary actions for sustainable urban development.

The *United Nations Commission on Sustainable Development* (UNCSD) manages the above process, monitors progress and provides advice on further action, including in areas of the *Symbio City* framework such as water and sanitation, energy and transportation. Important WSSD outcomes included non-negotiated partnerships and initiatives to implement Agenda 21 and LA 21.

In September 2000, heads of state at the UN General Assembly adopted *The Millennium Declaration* on development, poverty eradication, the environment, HIV/AIDS, financing, trade and development cooperation. This was later condensed into eight *Millennium Development Goals* (MDGs), each with specified targets and indicators. Goal 7 is *to ensure environmental sustainability*. Target 11 of Goal 7 requires a significant improvement of the lives of at least 100 million slum dwellers by 2020. This goal is also stated in the Millennium Declaration. Target 10 of Goal 7 is to reduce by half the proportion of people without sustainable access to safe drinking water and basic sanitation by 2015.

The Kyoto Protocol was adopted in 1997, under *The United Nations Framework Convention on Climate Change* (UNFCCC), and came into force in 2005, but covers the five-year period 2008–2012. In all, 37 industrialised countries and the European Community committed to reduce the emission of greenhouse gases (GHG) by an average of 5% against 1990 levels. Since the introduction of the Convention and Protocol, participating countries have met annually to monitor progress – most recently in Durban, in 2011.

Today, various global organisations and institutions actively work to fulfil these global agreements, e.g. *The World Bank, UNDP, UN-Habitat, UNCSD, Cities Alliance* and others. Global sustainable development policies now guide the efforts of many national and local governments towards achieving sustainable development, and these will hopefully be reinforced by upcoming events such as *Rio+20* and *World Urban Forum VI*, in Naples in 2012.

2.

URBAN CHALLENGES AS OPPORTUNITIES

URBAN GROWTH CLIMATE CHANGE RESILIENCE CHALLENGES

2.1 Urban growth trends in transitional and developing countries

Since the beginning of this century, the majority of the world's population has lived in cities. It is projected that the world population will increase from 7 to 9 billion between 2010 and 2050. Scenarios predict that 60% of people will live in cities by 2030, and almost 70% by 2050. This urbanisation trend is apparent especially in developing countries and countries in rapid transition. The future growth of the world's population will thus take place almost entirely in cities and towns in less developed countries. Each year, about 50 million people (or 140 000 per day) move to urban areas, and mostly into shanty towns.

According to UN projections, the urban population in developing countries will surpass the rural population by 2020[1]. The continuous increase of the share of the population living in towns and cities has been especially evident since the 1950's. In 1950, more than 25% of the population in developed countries was urbanised, but only some 18% in less developed regions. In 2001,

[1] UN-Habitat, Planning Sustainable Cites, 2009.

1950	1980	2010	2030	2050
29%	39%	52%	60%	67%
TOTAL POPULATION 2 532	TOTAL POPULATION 4 453	TOTAL POPULATION 6 896	TOTAL POPULATION 8 321	TOTAL POPULATION 9 306
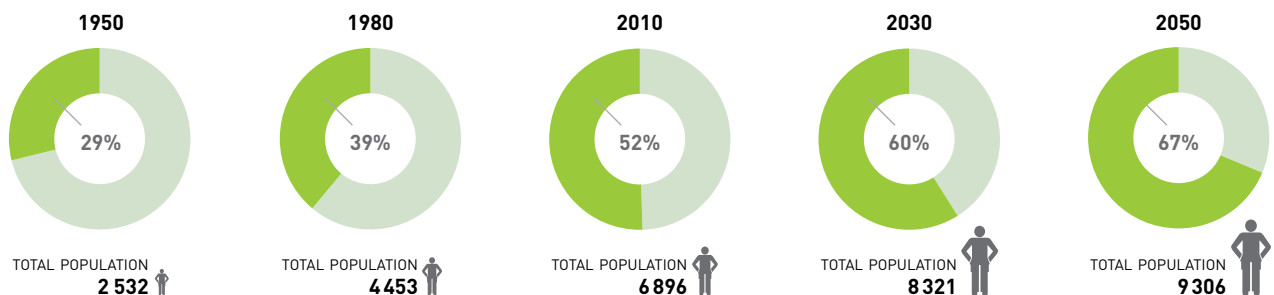
Figure 2.1
The projected world population distributed between urban and rural. By 2030 some 60% is estimated to be urban, and some 67% by 2050. = total population in millions. *UN statistics, 2011 revision*

1950	1980	2010	2030	2050
18%	29%	46%	56%	64%
TOTAL POPULATION 1 721	TOTAL POPULATION 3 372	TOTAL POPULATION 5 660	TOTAL POPULATION 7 025	TOTAL POPULATION 7 994

Figure 2.2
The projected distribution of the urban and rural population in less developed regions. By 2020 some 50% of the population will be living in cities and towns. By 2050 the urban population will be almost similar to the urban population in the world (65%). = total population in the less developed regions in millions. *UN statistics, 2011 revision*

the average annual urban growth rate in the least developed countries was some 4%, though some had rates of over 6%. By 2050, an average of 68% of the global population will be urbanised.

Some large cities experienced an annual growth rate of 7–10% in the second half of the 1900s. Between 1975 and 2007, the urban population in less developed regions increased from 817 million to 2 382 million, and is expected to reach 3 590 million by 2025 (*UN-Habitat, 2009*). However, there are significant differences between different cities, regions and countries.

Developing countries in Latin America are the most urbanised in the world. In 2010, about 80% of their populations lived in urban areas (*South America 84% and Central America 72%*). Urban growth is slightly lower than in other developing countries, at less than 2%. Annual population growth in Rio de Janeiro (12 million inhabitants) has slowed, and is expected to average only 0,9% per annum between 2000 and 2015.

In Africa, the least urbanised continent, 40% of people live in urban areas. This is predicted to increase to 50% by 2030 – an urban growth rate of about 5% per annum. In South Africa, 61% of people live in urban areas, whereas only 24% are urbanised in East Africa. In Uganda, Ethiopia, Eritrea, Malawi, Rwanda and Burundi, 80% still live in rural areas.

In Asia, about 42% of people live in urban areas – only slightly higher than in Africa. Urban growth averages 2,5%, and is highest in Cambodia, at 5,5% per annum. China has recently undergone the largest internal migration in world history. Within the next decade, China will be transformed from a predominantly rural society into an urban one, with at least 60% of people living in cities and towns by 2030 [2,3]. One explanation is that a large proportion of China's workforce, the so-called 'floating population', does not work in the place where they have their registration (hukou [4]). In 1990, only 27% of the population lived in cities, but from 2000 to 2010, the urban population increased from 36% to 47%. As a result, by 2010, China had about 90 cities with over 1 million inhabitants [5].

South America

83%

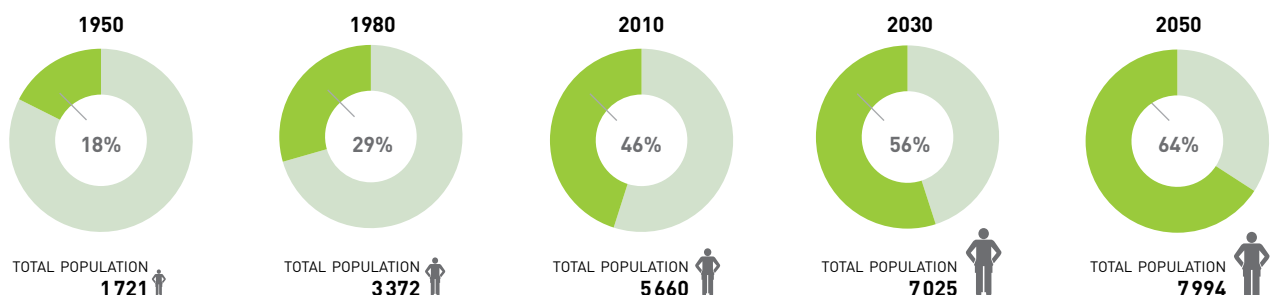**Africa**

39%

Asia

44%

Europe

73%

North America

82%

World

52%

Each year, about 50 million people, or 140 000 per day, move to urban areas, and mostly into shanty towns.
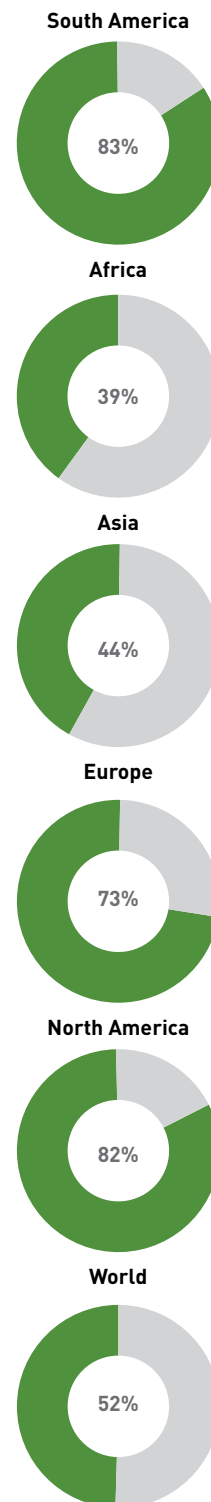
Figure 2.3
Urban populations in 2010
UN statistics, 2011 revision

PHOTO Nelson Mandela Bay Municipality, South Africa

[2] United Nations, World Urbanization Prospects, 2009 revision.
[3] Benewick, R & Donald, SH (2009), The State of China Atlas, Mapping the fastest-growing economy, University of California Press, Berkley Los Angeles.
[4] Ljunggren, B (2008), Kina – vår tids drama (China – the drama of our time), Hjalmarsson & Högberg.
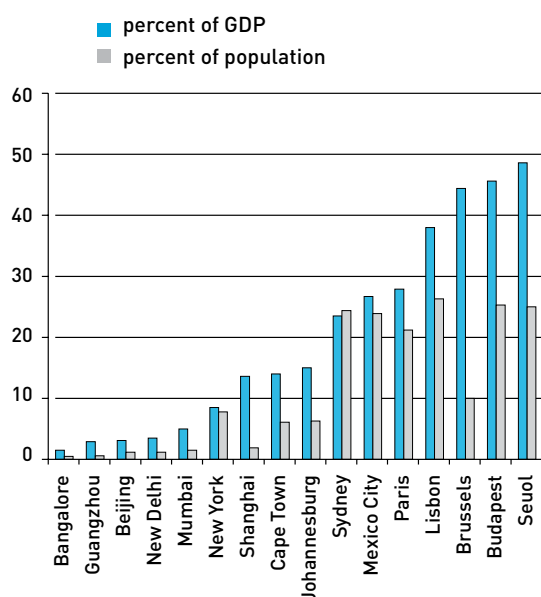[5] United Nations, World Urbanization Prospects, 2009 revision.

- ■ percent of GDP
- ■ percent of population

(Chart y-axis: 0, 10, 20, 30, 40, 50, 60. X-axis cities: Bangalore, Guangzhou, Beijing, New Delhi, Mumbai, New York, Shanghai, Cape Town, Johannesburg, Sydney, Mexico City, Paris, Lisbon, Brussels, Budapest, Seuol)

Figure 2.4
Share of urban population versus percent of GDP in selected cities.
State of the World's Cities, 2011 – Bridging the Urban Divide, UN-Habitat 2008

Solar water heating systems at Galeshewe Eco Village, Kimberley, South Africa. Urbanisation has the potential to lead to a more equal distribution of income and greater environmental sustainability.

PHOTO Viera Larsson

---

[6] This discussion is based on texts in Worldwatch Institute, State of the world 2007: Our urban future, p 6 and onwards.
[7] The World Bank, Eco 2 Cities – Economic Cities as Ecological Cities, 2009, p 14.

2.2 Urbanisation presents new opportunities for humankind

The flow of people into cities is unlikely to stop, because economic and other opportunities are better in cities, even for the disadvantaged [6]. In spite of environmental and climate change challenges, urbanisation offers improved living conditions, sustained consumption, social cohesion and income and job opportunities. The many challenges that are concentrated in urban areas present the need for integrated technical, financial and social solutions, to create better quality urban environments.

Rapid growth in cities and towns creates a dynamic environment and provides more livelihood options. From a developmental perspective, urbanisation provides a crucial challenge and opportunity to create living patterns that harmonise with the environment. Cities with high population density can develop *economies of scale* in public transport, recycling of water, waste and materials, and efficient energy use. The concentration of people and activities in cities offers a *diverse and intense* mix of functions and possibilities.

Cities attract migrants and retain residents because they offer *educational, employment and livelihood opportunities* that are not available in rural areas. Cities have diverse and dynamic business and economic conditions, and offer a wide range of more accessible and better quality *services* and *socio-cultural activities*. They also present greater opportunities for social networking among people and groups, and these are increasingly enhanced by new social and communications media. In general, cities drive *political, democratic, cultural and economic development*.

In many countries, cities employ a relatively small percentage of the country's population, but generate a large proportion of the *Gross Domestic Product* (GDP). According to the World Bank [7], about 75% of global economic production takes place in urban areas. This share is increasing rapidly in developing countries, where urban shares of GDP are above 60%.

Globally, people in larger cities contribute approximately three times more than others to GDP. Urbanisation thus has the potential to lead to a more equal distribution of income, and greater environmental sustainability. However, this will require the development of rights-based institutions and policies that promote inclusion, justice and redistribution of power and resources. In the longer term, economic sustainability will depend on social and environmental sustainability.

Some of these opportunities are elaborated in *Sections 2.6 to 2.9* and in the *Institutional Factors and Urban Systems* chapters.

2.3 Climate change and energy

Climate change is now one of the most critical challenges at both global and local levels, and its impacts increase the magnitude of existing urban challenges. However, this urgent challenge can drive behavioural change, and thus be turned into an opportunity, which must be exploited by any urban development intervention. The *SymbioCity Approach* provides a brief introduction and background to this wide and complex area. For a deeper understanding of climate change, see relevant publications and websites listed as References.

Developing countries contribute less to global warming than developed countries, as they only generate about 25% of the per capita emissions of developed countries. However, the urban poor in developing countries are most vulnerable to the impacts of climate change, such as coastal storms, flooding, inundation, erosion, and saltwater intrusion that pollutes freshwater supplies.

At present, energy is largely derived from burning fossil fuels (oil, gas and coal), which results in the emission of greenhouse gases (*GHG*), and particularly carbon dioxide (CO_2). Electricity generation, transport, heating, industry, waste, agriculture and changes in land use all generate GHG. Increasing emissions of GHG increase global warming and the risk of drastic climate change. Scientists researching Antarctic ice cores have discovered that CO_2 levels are now extremely high compared to those over the past 400 000 years [8]. This increase has contributed to a rise in global temperature by an average of 0,74 degrees Celsius between 1906 and 2005 [9].

The International Panel on Climate Change (IPCC) forecasts a further increase in average global temperatures of between 1° and 6° Celsius by 2100, which may result in a considerable rise in sea levels. The upper range of potential sea level rise is uncertain. Conservative projections show an upper level of just over 0,5 m by 2100. However, sea levels are rising faster than in these scenarios, and with potential large-scale releases from Antarctica and Greenland, they may be much higher by 2100. A far greater rise in sea levels is possible if the Greenland ice cap melts completely [10].

The effects of climate change increase the risks and vulnerabilities of urban areas in many ways. The increase in global temperature will cause extreme weather episodes such as heatwaves, flooding and extreme storms. Monsoon patterns in Asia may be disrupted if precipitation takes place out to sea instead of over the continent. Cities on floodplains or coastlines are exposed to a higher risk of flooding, and rising sea levels will have enormous impact.

The uneven distribution of emissions is one of the core issues and challenges for the international community in attempting to find effective and just solutions. Emissions from the least developed countries were less than 1% of the global total in 2005.
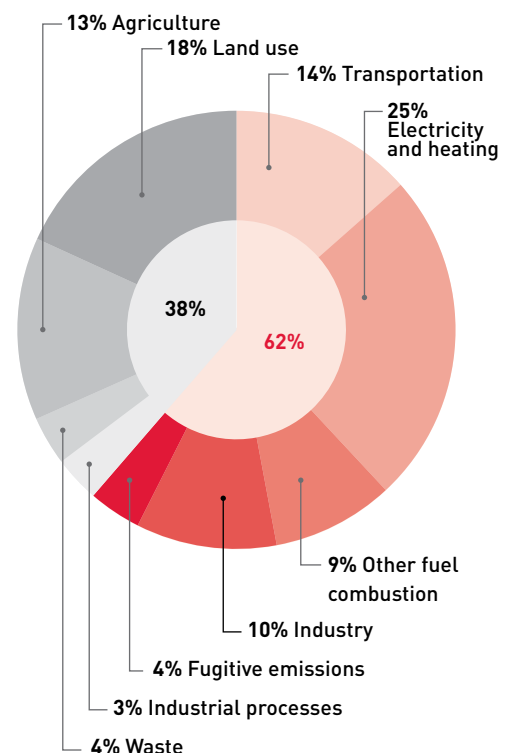
Figur 2.4
Global emissions of greenhouse gases by sector (%). Some 62% is related to the use of energy.
Cities and Climate Change, UN-Habitat, 2011

13% Agriculture
18% Land use
14% Transportation
25% Electricity and heating
38%
62%
9% Other fuel combustion
10% Industry
4% Fugitive emissions
3% Industrial processes
4% Waste

[8] Dow and Downing, Earthscan, p 38.
[9] UN-Habitat, 2011, Global report on Human Settlements 2011, Cities and climate change.
[10] Dow and Downing, Earthscan, p 41 and p 68.

However, due to rapid industrialisation and growth, developing countries have a much higher increase in emissions than G8 countries: 237% versus 8% in industrial processes, 118% versus 17% in transportation and 176% versus 9% in electricity and heating[11].

Even if it takes some years before the total emissions of developing countries match those of developed countries, the situation is so critical that all possible measures should be considered to assist developing countries to adopt new 'leap-frog' technologies and sustainable planning alternatives, to limit their increase in emissions.

PHOTO WordpressBlogg

PHOTO Anjo Bagaoisan

SOME FACTS

SETTLEMENTS IN LOW ELEVATION COASTAL ZONES

- The share of the urban population living in low elevation coastal zones is expected to increase, especially in Africa (from 60% in 2000 to 71% in 2025) and Asia (from 56% in 2000 to 68% in 2025).

- About 140 million people, of which a majority live in developing countries, live less than one meter above sea level.

- 20 000 cities with a population over 100 000 people are located in coastal zones, many of them in developing countries.

- 40% of all people in the world live less tha 60 miles (appr. 96 km) from the coast.

- 2% of the world's total land area and 13% of world population live in the world's largest cities located in low-elevation coastal zones.

– Dow, K & Downing,T E, Earthscan, 2011, The Atlas of climate change. Mapping the world's greatest challenge.
– UN Habitat, 2011, Global report on Human Settlements, Cities and climate change.

As cities and towns are linked to rural areas, the impact of climate change on the latter will also have serious consequences for urban areas. The impact of extreme weather events in rural areas will accelerate urban migration by 'environmental refugees'. In dry regions, water shortages will become more critical, while wet regions can expect higher rainfall. Flooding and landslides can be devastating in urban environments, especially where rapid urban growth has resulted in inadequate planning, infrastructure, and land management. Informal settlements are often extremely vulnerable in this regard.

One of the most vulnerable countries is Bangladesh, where 17 million people live less than 1 m above sea level. In China and Vietnam, very severe flooding has killed thousands of people. Poor urban communities living on marginal land are most at risk. Hurricane Mitch in Central America demonstrated the effects of such events, and similar storms in India, Vietnam, the Philippines and Indonesia have killed many thousands of people, and resulted in immense loss of property.

[11] Dow,K & Downing, T E, 2011, The Atlas of climate change, Mapping the world's greatest challenge, Earthscan, p 19.

ENERGY AND EMISSIONS

According to a Chinese climate report, coal accounted for 69% of total energy consumption in China 2005, oil for 21%, and natural gas, hydropower, nuclear power, wind power and solar energy for 10%. This means that the economy is 'coal-driven', with 80% of electricity generated by coal-fired power plants. This fossil fuel dominated energy mix makes China the world's largest emitter of carbon dioxide. Its per capita emission is 4 tons, which, however, is only one fifth of US emissions, at 20 ton per capita [12].

PHOTO Getty Image, Haffingtonpost

There are two main ways to address the impacts of climate change

> **Mitigation**, or proactive measures to reduce GHG emissions, to reduce the rate of global temperature increase, and thus reduce climate change risks.

> **Adaptation**, or adjusting natural and human systems to cope with changing environmental conditions. Adaptive measures can reduce both impacts and vulnerability.

These two strategies are essential when considering urban systems (*see Chapter 5*). *Chapter 7* shows the efficiency of integrated solutions that create synergies among urban systems in order to reduce both impacts and costs. *Chapter 5* argues that sound institutional arrangements and factors are also crucial for efficient solutions.

[12] Benewick, R & Donald, SH (2009), The State of China Atlas, Mapping the fastest-growing economy, University of California Press, Berkley Los Angeles and
Ljunggren, B (2008), Kina – vår tids drama (China – the drama of our time), Hjalmarsson & Högberg.

2.4 Urban resilience

Urban resilience refers to the long-term capacity of cities and towns to respond to threats and challenges, while continuing to change and develop. In a time of increased stress on ecological and social systems, understanding how to strengthen such systems is essential.

Urban agriculture was a key component of the Hull Street Sustainable Housing Project in Kimberley, South Africa.

RESILIENCE

»The ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organisation, and the capacity to adapt to stress and change.«

Definition according to the International Panel on Climate Change

Urban resilience to the impacts of climate change includes health and safety aspects, food security and energy provision. Many cities are at risk due to their location and spatial organisation, and city planning and development must reduce vulnerability and increasing resilience in the face of impending threats.

Urban resilience must take into account the larger context of the surrounding hinterland, and regional, national and international interdependencies, including the provision of water, food, energy, resources, labour, capital and markets. For example, increasing local food production in an urban area and its immediate vicinity can reduce dependence on provision from more distant regions. Change can often be foreseen, and development should be consciously planned in relation to expected changes and risks. However, in recent years, certain changes have occurred more suddenly and without prior notice, causing severe impacts on both ecosystems and societies. Resilience includes the long-term capability to manage sudden changes and events.

Urban development planning needs to start with a comprehensive risk analysis to identify threats, as the basis for planning strategies and measures to minimise risks and manage consequences. Resilience is a crucial planning consideration for regional, city, town and local area planning.
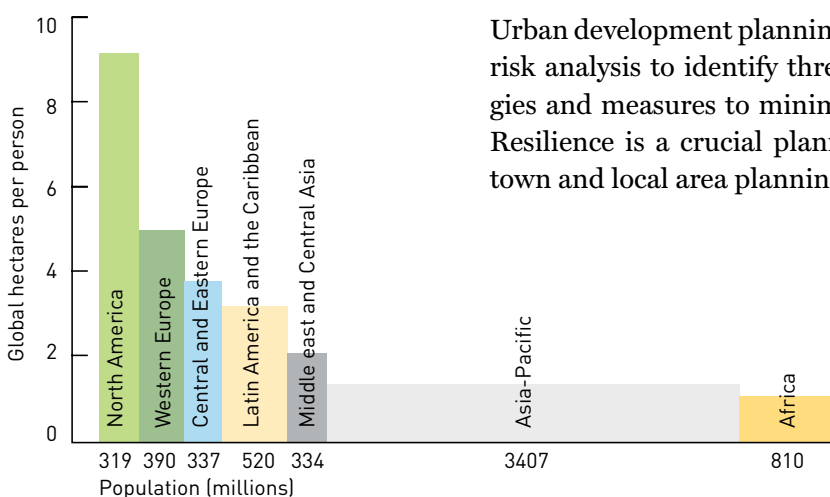

**Figure 2.6
The ecological footprint per region compared with the bio-capacity of the earth (1,8 ha/capita).**
*Source: WWF, 2004.
See also additional statistics from
»Living Planet«, Report, 2010, p 40*

ECOLOGICAL FOOTPRINT

Ecological footprint is defined as the area of productive land required to supply energy, food and other resources. The ecological footprint of rich countries increased by 400% during the 20th Century. During the same period, the land available globally for food production fell by 25% relative to that available in 1900, from 6 to 1.8 ha per capita, due to the population increase (WWF, 2010).

Developed countries require 3 to 5 times the land area per capita than is available for the total global population per capita. In Africa and Asia-Pacific, the average footprint is less than the productive area of the biosphere per capita. However, this footprint is rapidly increasing in India and China.

The ecological footprint is relevant for the description of urban environmental problems in an overall perspective. It can serve as an 'alarm clock' that urges us to urgently reduce consumption and improve our environment. It helps us see issues in a larger perspective. A city's footprint can be seen as the total area that would have to be enclosed under a glass dome in order to sustain its total consumption.

The footprint concept reveals an important reality: due to high population densities, the rapid rise in per capita energy and resource consumption, and growing dependence on trade, the ecological locations of human settlements no longer coincide with their geographical locations. Cities and industrial regions are dependent for survival and growth on a vast and increasingly global hinterland of ecologically productive landscapes[13].

One limitation is that there is no agreed way to measure the ecological footprint of cities. As resources are imported from many places around the globe, it is difficult to use the footprint concept practically in sustainable urban development analysis and planning. However, it reveals that modern cities are strongly separated from local primary production areas. The consumption of local produce and energy is only 1–2% in northern OECD cities[14]. For cities in less developed regions, this share should be much higher, and closer linkages between cities and their surrounding rural areas should be promoted, to reduce the ecological footprint.

[13] Wackernagel & Rees (1996) Our Ecological Footprint. Reducing Human Impact on the Earth. New Society Publishers.
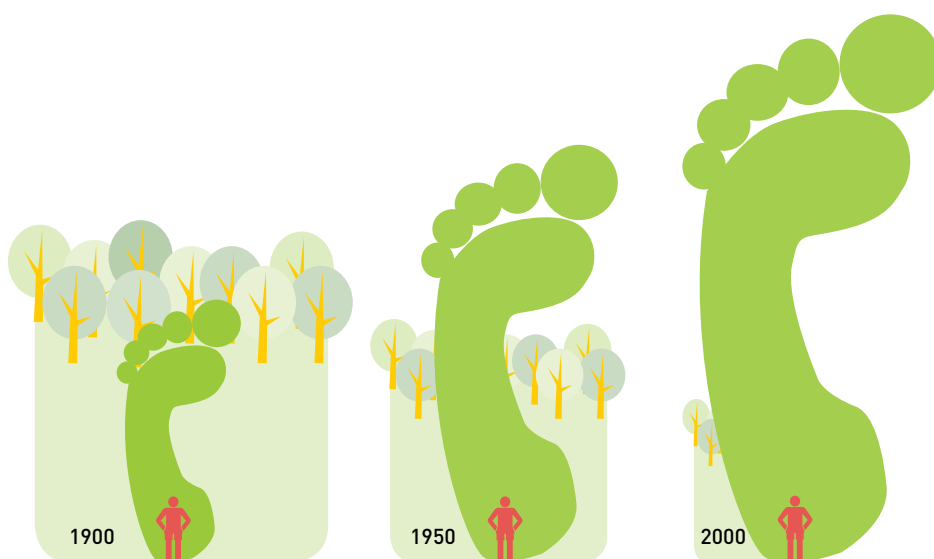[14] According to Berg, P., (2011), Sustainable Cities as Resilient Citylands SUCAR (PM).

Figure 2.7
The ecological footprint – the discrepancy of the footprint in the rich world (North America and Europe) compared to the land available for the global population per capita.
Source: Wackernagel & Rees (1996); Ranhagen et al (2000)

2.5 Environmental challenges related to urbanisation and urban growth

In spite of all the actual and potential opportunities that urbanisation offers, the problems of urbanisation generally dominate the debate. The opportunities of urbanisation are seldom realised, especially in cities in the developing world. As economic generators and the major contributors to national GDP, cities should have the economic resources to address urbanisation challenges, particularly for disadvantaged groups.

The environmental impact of cities is enormous, due to both their increasing demographic 'weight' and the volume of natural resources they consume. Every aspect of urban living has significant implications for the planet – the energy required for billions of people to drive cars on metropolitan highways, to heat or cool buildings, and to provide food and other resources, often from the opposite end of the earth[15]. Fossil fuel based energy and low energy efficiency in vehicles and buildings increase the CO_2 emissions that contribute to climate change.

Poor communities and other vulnerable groups are often most affected when the environment is degraded, or inaccessible due to weak environmental management, as they usually depend more directly on local natural resources for their livelihoods. Exposure to water and air pollution, toxic chemicals and environmental hazards such as floods, tsunamis, droughts and landslides are severe problems, which poor people usually cannot counteract.

Furthermore, the urban poor, living in informal settlements, often without land title or registration as inhabitants of the city, usually lack representation and are not involved in urban development planning and decisions. Human rights cannot be secured in a degraded or polluted environment, as environmental conditions determine the extent to which people enjoy basic rights to life, health, adequate water, food, housing and public services.

Many environmental challenges derive from existing economic, social and cultural systems in cities and towns – but also from collective and individual behavioural patterns and attitudes. The lifestyle in developed countries is aspired to globally, but would require an impossible level of resource exploitation. This high-consumption lifestyle is unobtainable for all and unsustainable, even in rich countries. This means that a paradigm shift in our vision for future society is essential, both in the short and long term.

Some of the more common environmental problems and their causes are summarised below, based on current books and reports[16].

PHOTO Klas Groth

Informal trading activities besides a railway line in Kibera, Kenya. The opportunities of urbanisation are seldom realised, especially in cities in the developing world.

[15] From an article by Burdett, R & Kanai, M (2006), City-building in an age of global transformation from the book Cities – Architecture and Society published for the 10th International Architecture Exhibition in Venice.
[16] Including Davis, Mike (2006) Planet of Slums, London: Verso and Tannerfeldt & Ljung (2006).

2.5.1 Natural and artificial hazards

Poor settlements are generally on the periphery of cities, often on marginal land such as steep hillsides and volcanic slopes, floodplains and swamps, railroad reserves, waste dumps and desert fringes, etc. Squatters are the pioneer settlers of such areas, where well-off citizens would never imagine living.

As these sites are often poorly located, unattractive and hazardous, they are excluded from the formal land market and the trend of rising land values in cities. Such sites constitute the normal living conditions of the poor, who are exposed to a variety of disaster risks, including devastating fires. Informal settlements have greatly multiplied natural hazards in urban environments in developing countries. Informal settlement (slum) populations are growing by 25 million inhabitants per year (or 70 000 per day), largely due to migration into cities. When people move to cities they lose the rural networks and neighbours that they previously could rely on during and after disasters.

Earthquakes have destroyed more than 100 million homes in the 20th century, mostly in slums, tenement districts and poor rural villages. Seismic risk is so unevenly spread in cities that the term 'class quake' has been coined to characterise the biased pattern of destruction. However, the chief anxiety of the poor is fire[17].

The impact of hazards and disasters is magnified by urban poverty. Artificial hazards are generated by toxic industries, anarchic traffic and collapsing or non-existent infrastructure. Many residents living in areas exposed to regular flooding keep returning to their vulnerable sites out of economic necessity.

Basic urban planning principles such as preservation of open spaces and separation of noxious land uses from residential areas are often reversed in poor cities, where a kind of 'infernal zoning ordinance' seems to surround dangerous industrial activities and transport infrastructure with dense thickets of shanty housing.

[17] Davies, Mike (2006), Planet of Slums.

PHOTO Nutridylan

EXAMPLES

SETTLEMENTS IN HAZARDOUS LOCATIONS

One quarter of the favelas in Sao Paulo, Brazil are located on hazardously steep hillsides and riverbanks facing the likely risk of rapid erosion. In Caracas, Venezuela, two thirds of the slum population live on unstable hillsides, threatened by seismic activity. At least 25% live in absolute poverty. In August 1988, rainstorms and flooding of the Nile River displaced 800 000 poor residents of Khartoum, Sudan. The flooding surpassed the 1946 watermark peak, and the impact was tenfold that in 1946, due to the increased sprawl of slums located in the floodplain, and without drainage.

2.5.2 Traffic congestion, deaths and injuries

Sprawling urban growth without equivalent public investment in public transport or grade-separated highways has made traffic a public health disaster in many developing country cities. In spite of extreme congestion, motor vehicle use in developing cities is soaring. In 1980, developing countries accounted for only 18% of global vehicle ownership. It is estimated that by 2020, about 50% of the world's projected 1,3 billion cars, trucks, and buses – along with several hundred million motorbikes and scooters – will clog the streets and alleys of cities and towns in poorer countries.

The *World Health Organization (*who*)* has estimated the overall cost of road deaths and injuries to be almost twice that of total development assistance received worldwide by developing countries. who considers traffic to be one of the worst health hazards facing the urban poor, and predicts that by 2020, road accidents will be the third major cause of death.

Rapid urbanisation in developing countries, combined with expanding industries and traffic, has created a situation where people face similar health risks to those in parts of Eastern Europe 30 years ago, due to coal combustion.

The lack of functioning urban transport systems in many cities in South East Asia and the rapidly growing number of cars are generating severe health problems. Air pollution caused by traffic is a serious problem due to obsolete buses and trucks, and two-wheelers (two-stroke engines emit 10 times as much fine particulate matter as modern cars and 3 to 5 times the level recommended by who). In New Delhi, India, it is estimated that 10 000 people die annually as a result of traffic-generated air pollution.

Photo Ulf Ranhagen

[18] Campanella, Thomas J (2008), The concret dragon. China's urban revolution and what it means for the world. Princeton Architectural Press New York.
[19] Benewick, R & Donald, SH (2009), The State of China Atlas, Mapping the fastest-growing economy, University of California Press, Berkley Los Angeles.

EXAMPLE

CHINA – THE FORMER HOME OF THE BICYCLE

An irrational priority is currently given to automobiles. In 2009, car sales exploded, partly due to state stimulation, making China the world's largest car market (with 13,6 million vehicles sold in 2009 – 50% more than in 2008). From 2006 to 2008, the ownership of private cars increased from 18 to 27 cars/1000 inhabitants.

China was traditionally 'a nation of bicycles', but their use declined by 26% between 2001 and 2006, and they are now banned on many city streets [18]. In addition, cyclists now face new license fees and the termination of bicycle subsidies. However, a positive sign is an increased number of electric mopeds in cities.

The average number of deaths on the road was 68 per million people in 2006. However, despite the significant increase in private passenger vehicles, the number of people killed in traffic accidents is decreasing [19].

Bangkok gains 500 new cars every day, and Beijing 1000. Cars are a major contributor to global climate change, producing 25% of all emissions. Exhaust gases from vehicles cause health problems and premature death. Particles of sulphur dioxide, nitrogen oxides and photochemical oxidants (especially those smaller than 10 microns) that are deposited in the lungs cause respiratory problems such as asthma and bronchitis, and may lead to respiratory mortality. Children in particular are sensitive to these emissions, and poor people living close to traffic in cities are at extremely high risk.

<div style="background:#eef3db; padding:1em;">

EXAMPLE

AIR POLLUTION AND HEALTH

Foul air is most deadly in the sprawling mega cities of Mexico (300 bad ozone days per year), Sao Paulo, New Delhi and Beijing. In China, a government study showed that outdoor air pollution causes 400 000 premature deaths each year. In 2006, only two of China's major cities met the WHO interim target of 70 micrograms per m³ for countries with heavy pollution.

The extensive use of cars in cities also affects the use of streets and space, as road networks and cars 'consume' space, besides generating noise and air pollution. Although vehicles can be improved technically to reduce noise and emissions, this does not solve the problems of space consumption and congestion. However, integrated public transport systems can reduce all these problems, and increase mobility, and thereby economic activities in cities.

</div>

PHOTO Wikinut, Internet

2.5.3 A lack of green areas and biodiversity

Sustainable urban living is enhanced by the creation and preservation of green open spaces, including wetlands, forests and agricultural areas. Environmental efficiency and public well-being also depend on ecosystem services. According to UN-Habitat[20], natural environmental processes provide benefits that are vital to city functioning and human health. These processes, or ecosystem services, are provided by the biodiverse ecosystems that produce oxygen, store carbon, and filter toxins and pollutants, and their resilience and biocapacity are crucial to our survival.

Ecosystem services include the natural protection of coastal and other zones from flooding, wind exposure, erosion, etc. Human activities such as land development, pollution, and destruction of wetlands and green environments can harm such ecosystem services. Increasing urbanisation places greater demands on natural resources and imposes significant stresses on environmental processes that deliver ecosystem services and their essential benefits for societies.

Cities need an alliance with nature in order to recycle their waste products, e.g. through composting, which can produce inputs for farming, gardening and energy production. However,

[20] UN-Habitat – Cities and Climate Change, p 77.

urban open space is often subject to uncontrolled waste dumping, and peripheral greenbelts are converted into ecological waste-lands. However, even small green areas in cities can maintain high biodiversity, especially wetlands [21].
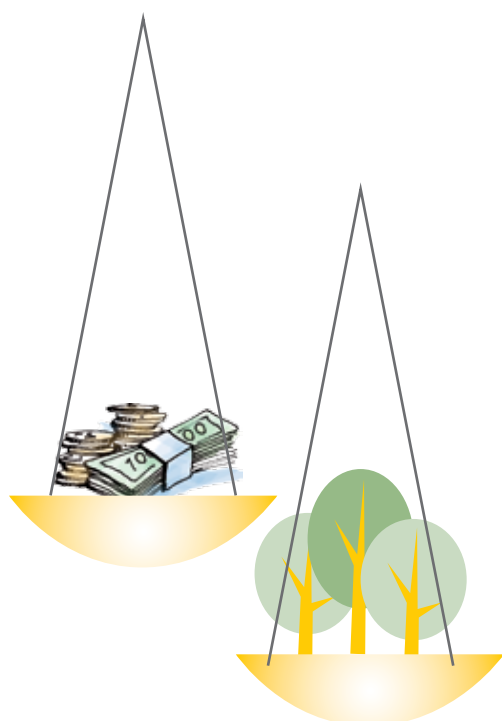
Globally, 850 million people are undernourished, and 75% of these living in urban areas suffer from food shortages. Urban agriculture on marginal and public land can contribute to addressing this problem, and improve child nutrition. Arguments for increased urban agriculture include
> shortage of supply and access to food in developing countries
> dependency on long-distance transport, which increases emissions and reduces product quality
> the need to decrease GHG emissions in the agricultural sector, which accounts for 14%, of the total emissions (65% in Sweden) [22]
> shortage of other resources, e.g. energy, water and nutrients.

A positive example is Bangkok (10 million inhabitants), which obtains one third of its aquaculture products (fish and water plants) from peri-urban areas.

The *Millennium Ecosystem Assessment* [23] identifies climate change as a key factor behind the accelerated loss and degradation of ecosystem services. The assessment found that about 60% of the ecosystem services evaluated were being degraded or used unsustainably. Wetlands will be particularly threatened in coming decades by landscape modification and rising sea levels that will cause the Earth's deltas to sink below sea level.

The loss of ecosystem services, besides potentially affecting food provision and human health, can significantly reduce the revenue of cities. The poorest and most vulnerable communities are most directly reliant on these services in order to meet their basic needs, and they will be most severely affected by damage to ecosystems services.

EXAMPLE

THE ECONOMIC VALUE OF MAINTAINING ECOSYSTEMS SERVICES

In Durban (South Africa) the replacement value of the ecosystem services (e.g. water provision, flood prevention) within the city's network of open space was estimated at US$ 418 million per year in a 2003 study. This was approximately 38% of the city's total capital and operating budget at that time, illustrating the financial consequences of losing access to these services.

UN-Habitat, Cities and Climate Change, 2009

---

[21] This was first recognised in an urban context by theorist Patrick Geddes in Geddes, P (1915) Cities in Evolution. London: Williams and Norgate.
[23] A global effort to assess the consequences of ecosystem change, initiated in 2001, released in 2005.

2.5.4 Waste problems and waste management

In large cities in developing countries, less than 50% of waste is collected daily by municipalities. In most slum areas there is no organised collection at all. The chronic discrepancy between the rate of waste generation and properly organised disposal is often staggering. The situation is particularly severe regarding hazardous and contagious waste from industries, hospitals and households, and volumes of all types of waste are constantly increasing.

EXAMPLE

The average waste collection rate is low in many cities (Dar-es-Salaam, Tanzania 25%, Karachi, Pakistan 40%, Jakarta, Indonesia 60%). Kabul, Afghanistan, with 3,2 million people (2007) only has 40 garbage trucks, which transport only 25 to 40% of the city's total waste.

In Colombo, Sri Lanka, where slums sprawl into surrounding fields, a unique form of cultivation called 'keera kotu' has emerged, where urban waste, including what is hygienically unsuitable, is used to grow vegetables quickly, wherever possible [24].

Sanitary landfills are rare in the developing world, and uncontrolled dumping presents a major, long-term threat to soils, groundwater and surface water. Even a limited rehabilitation of all uncontrolled waste sites in the world would cost billions of dollars. Uncontrolled use and dumping of hazardous waste leads to bio-accumulation of persistent organic toxins in the entire food chain, affecting everyone, rich and poor.

Waste management in developing countries also presents a direct major health hazard in that many poor people trade in waste and work as scavengers on uncontrolled waste dumps. Poor management of waste disposal also results in diseases spread by vectors such as rats, dogs, monkeys and birds.

2.5.5 Water scarcity

From a global perspective, there is no such thing as water scarcity. However, water scarcity in some African, Middle Eastern, South American and Asian countries is a critical concern, even if not always directly connected to urbanisation. Groundwater levels drop drastically every year, as agriculture, cities and industries compete for water. Globally, more than 70% of the world's fresh water is used in agriculture [25]. As major water resources are shared between countries, there is a pressing need to improve water resource management of international, as well as national, regional and local levels.

The need to conserve and manage water worldwide is now widely recognised, but improvements in water management are slow. Water stress in China, India and Sub-Saharan Africa in-

PHOTO Viera Larsson

Poor people scavenging on a waste dump in Kimberley, South Africa.

24 Davies, M, (2006) Planet of Slums, London, Verso.
25 2007 World Water Day, Coping with Water Scarcity.

creases every year and is expected to affect more than 3 billion people by 2025.

PHOTO Ulf Ranhagen

PHOTO Ulf Ranhagen

EXAMPLES

Around 1,2 billion people, or one-fifth of the population on the earth, live in water-scarce areas. Food production requires on average 2–3 m³ of water per person per day, while households use 30 to 150 litres per person per day.

Groundwater levels in Inner Mongolia, China, drop every year. In the region's capital, Hohhot, the decline is reported to be one metre annually. China has a low per capita access to water, at one fourth of the global average (and in northern and western China, only one tenth)[26].

To the individual it does not matter whether water scarcity has quantitative and qualitative dimensions, and water scarcity in this sense is even more pronounced. From 1990 to 2004, the number of people without access to safe drinking water increased by 25%, and the portion of people without sanitation increased by 30%. These alarming figures increase in climate change scenarios. In order to meet the *Millennium Development Goals (*MDG*)* by 2015, more than 1,6 billion people – half of them in urban areas – need to gain access to adequate sanitation and drinking water.

Despite efforts to increase access to safe drinking water, forecasts estimate that close to 1 billion people will still not have access by 2015. It is likely that MDG targets will be met better in urban areas, where access is on average three times better than in the countryside.

2.5.6 Water and sanitation problems

Service coverage of water supply and sanitation is generally poor in developing countries, and even where coverage is higher, service quality and environmental protection are often poor. Water supply services are often too expensive for the poorest communities, and the lack of clean water and basic sanitation are a major cause of water-borne diseases that kill at least 1,8 million children every year.

Rapid urbanisation forces poor people to settle in areas where the water supply and sanitary situation is worse than in other parts of a city, e.g. along rivers that serve as sewers, or close to uncontrolled waste dumps. The scarcity of clean water in urban slums is a growing concern due to microbial contamination and high levels of hazardous chemicals. Unhygienic conditions in most slums pose the risk of epidemic diseases, and governments need to take vigorous action.

Water supply and sanitation is typically a local responsibility, but local authorities often lack financial resources for major in-

[26] OECD (2006), DAC Guidelines and References Series, »Applying Strategic Environmental Assessment. Good Practice Guideance for Development Cooperation«.

frastructure investments. Privatisation of water services is sometimes implemented as a solution, as infrastructure deteriorates and public investment fails to keep pace with urbanisation. However, privatisation typically leads to reduced access, higher prices and water cut-offs in poor communities, and is often resisted.

EXAMPLES [27]

The mega city of Kinshasa in the Democratic Republic of Congo with a population fast approaching 10 million, has no waterborne sewage system at all.

Less than 10% of homes in Manila in the Philippines are connected to the sewer system.

In India only 17 of 3 700 cities and large towns have any kind of primary sewage treatment system before final disposal, and cities providing a 24-hour water supply are rare.

In Chinese cities, the sanitation coverage increased from 61% in 1990 to 74% in 2006. There was also an increase in rural areas, from 43% in 1990 to 59% in 2006 [28].

PHOTO Viera Larsson

The direct health implications of poor sanitation and water supply are the primary concern, but the mismanagement of water also has a negative environmental impact on rivers, lakes, shores and groundwater. Rivers and lakes are over-fertilised by sewage, resulting in changed fauna and flora and even extinction of species; groundwater is contaminated by nitrates and bacteria, and other water supply sources are contaminated, etc.

The constraining effect of poor water and sanitation services and practices on the economy is increasingly recognised, and in growing economies such as India and China, the demand for improved services and coverage is increasingly from the private sector. In many cities where water services have improved, this has been due not only to technical improvements, but also to financial and management innovations.

2.5.7 The urban health crisis

Rapid urbanisation of the poor has led to urban health epidemics (e.g. tapeworm, roundworm, etc. that were previously mostly confined to rural areas), and the escalation of new epidemics such as HIV/AIDS. The growth of urban populations in many cities is strongly interrelated with deteriorating environments and a wide spectrum of health hazards. It is estimated that 2 million people die annually from diarrhoeal diseases in urban areas. People in slum areas are particularly vulnerable due to lack of access to clean water and adequate sanitation, which causes severe health problems such as diarrhoea and cholera.

These problems are worsened by the fact that drinking water

[27] Davies, M, (2006) Planet of Slums, London, Verso.
[28] UN Habitat (2009), Planning for Sustainable Cities, Global Report on Human Settlements, Earthscan London Sterling, VA.

sources are polluted by effluents from industries, pesticides etc. Many cities and towns 'export' their waste and environmental impacts to others, using downstream regions as sinks for their pollution. Groundwater contamination by porous landfills is also a common problem, especially when household waste is mixed with industrial waste.

2.5.8 Causes of environmental and health problems

Urban environmental and health problems of the kind described above have many sources and causes: *over-rapid and uncoordinated urban growth, population increase and spatial demands, insufficient investment* in services; *inadequate technology* in industry; increasing and environmentally *unsound transport; inadequate sewage systems* emitting untreated wastewater from industry and households into the environment, *unsatisfactory waste management*, etc.

Sub-optimum use of natural resources and limited environmental protection is also due to the *lack of integrated approaches* which consider the linkages between different urban systems. Inefficient supply and use of non-renewable energy also cause environmental and health problems. In the past 150 years, cities have become increasingly reliant on polluting and remote energy sources, causing air pollution and emitting of huge quantities of GHGS. Millions of people in the world's poorest cities do not have access to modern energy services and their energy needs are often met in unsustainable ways. Urban residents in the developed world use less energy per capita than rural residents, while in developing countries the converse it often true. For example, one third of India's population living in cities consumes 87% of the nation's electricity[29].

Underlying the above causes and sources of environmental problems, there is often a *lack of financial resources* and *institutional capacity*, both essential elements in the fight against poverty. Authorities dealing with environmental management are often weak, and use outdated, top-down management and decision-making practices. *Legislation is often inconsistent* or unenforceable and *resources for implementation and monitoring* are scarce. Environmental policies are seldom effective in stimulating improvement. Municipal budgets are often limited and mostly spent on recurrent costs, while major capital investment often requires national government financing.

Corruption is also an obstacle to effective environmental management, e.g. the uncontrolled issue of permits to extract natural resources and poor enforcement of pollution control regulations.

Environmental management cannot be treated separately from other development concerns, and it is essential to integrate

PHOTO Klas Groth

Urban environmental and health problems have many sources and causes, including waterways polluted by wastewater and refuse.

[29] This discussion is based on texts in Worldwatch Institute, 2007, State of the World: Our Urban Future.

environmental considerations into other policy areas and urban systems such as energy, transport and industry. Improving environmental management in ways that benefit the poor requires policy and institutional changes that cut across sectors, and improvements in national economic and social policies and governance.

In many cities in developing countries there is little *coordination* between actors involved in waste management, planning, energy, transport, traffic and environmental management. Consequently, the value that could be added by cooperation and synergies is not realised. For example, incinerating waste as a resource can generate biogas, electricity, and energy for heating or cooling. This adds value and saves costs in various ways – waste or energy generated from it can be sold at a profit, waste dumping and its costs are decreased, and public transport could access comparatively cheap fuel for buses, which reduces purchasing of more expensive non-renewable energy, and the harmfulness of emissions.

This is just one example of how increased integration of different systems in the urban environment can generate both financial and environmental gains. However, such integration requires an analysis of specific functions or problems that considers related areas and systems, and the interfaces between them. *Incentives* are also needed to get different departments and agencies to cooperate and exploit synergies.

PHOTO Mats Ögren-Wanger

Residents collecting firewood near Old Naledi, an urban settlement in Gaborone, capital of Botswana.

Environmental management cannot be treated separately from other development concerns, and it is essential to integrate environmental considerations into policy and planning for subsystems such as energy, transport and industry.

2.6 Socio-cultural challenges of sustainable urban development

Socio-cultural and socio-economic aspects of urban life are essential for human well-being and sustainable urban development. However, these aspects are complex and difficult to address in the urban context. They include economic conditions and livelihood and employment opportunities, culture and group identity, religion and values, gender and distribution of powers, education, migration and rural-urban linkages, social structures and networks, etc.

From an urban planning and development perspective, socio-cultural aspects related to equitable access to basic physical and social services are of central concern. One measure to enhance access is planning of mixed-use areas, with a variety of public and private services. This promotes a vibrant built environment with better opportunities for employment and income generation, greater safety and better use of public services and spaces. Good urban governance, development planning and design need to identify and prioritise measures to improve living standards and conditions for the poor and for vulnerable groups such as the elderly, disabled, young children and minority groups. Improved access to education, health services and income generating opportunities are essential for more equitable social and economic development.

Safety and security are also critical, and appropriate urban structures and well-designed, well-lit public spaces enhance surveillance, safety and social interaction. Access to green areas and sport and recreational facilities is vital, as are schools, churches, libraries and other public services and meeting places. A well-designed built environment encourages community ownership of public areas and promotes community building.

Socio-cultural dimensions also concerns the origin, history and development of a particular area. Cultural and historical features and activities strengthen a sense of community identity, which good urban planning and design should enhance. Many cities and towns are characterised by significant class differences between communities in terms of their built environments, economic opportunities, and access to services and cultural and recreational activities. Such inequalities need to be addressed as a public priority in urban development processes that promote overall sustainability.

In the broader and longer term, socio-cultural aspects and living conditions have a direct link to the economic and environmental dimensions of urban development. The goal of sustainable urban development should be to create a quality urban environment in all respects and for all communities, which is also resilient and sustainable. In developing countries, this requires a focus on poverty reduction and improving livelihoods, quality of life, well-being and safety, particularly in poor communities.

PHOTOS Sixten Larsson

A mixed-use development combining flats with ground-floor business premises – Johannesburg, South Africa.

2.7 Economic challenges of sustainable urban development

Poor governance combined with a lack of financial resources is often the key factor limiting poverty reduction. Sachs (2008) states that »The poor know what to do but are too poor to do it. Since they can't meet their immediate needs (food, safe water, health care) they also can't afford to save and invest for the future. That is where foreign assistance comes in. A temporary boost of aid over the course of several years, if properly invested, can lead to a permanent rise in productivity.«

According to Sachs, the logical chain is: temporary aid → increased productivity → increased saving and investment → sustained growth. The escape from extreme poverty requires investments in

> productivity in core livelihood activities, e.g. in agriculture, to lift small farmers above the subsistence level
> health, including control of the main killers – infection, nutritional deficiencies and unsafe childbirth – through preventative and curative health services
> education, to develop skills that are relevant for economic activity and employment
> infrastructure, to support productivity, including power, roads, safe drinking water and sanitation, phone and internet connectivity, and port services.

Urban areas are the 'engines' of *cultural, social, political and economic development*. While urban planning should encourage economic initiatives and provide for economic activities, economic sustainability requires interventions on various levels, from macro to local, and from improving governance to enhancing entrepreneurship. However, sustainability requires economic development that is in balance with other areas and considerations, and with available resources.

Rapid economic growth and change presents a particular challenge in terms of how cities and towns are planned, governed and managed. Urban planning measures to promote economic development include integrating different land uses (mixed-use development), and minimising unnecessary regulations and 'red-tape' that hinder business development. However, this may not be appropriate in all situations, depending on the context.

To promote economic sustainability, cities and towns must support and provide opportunities for private sector investment and business development and facilitate interaction and cooperation between the private business sector, academia and the public sector (sometimes referred to as the *Triple Helix Model*). Such cooperation can also promote skills development and capacity building for all parties.

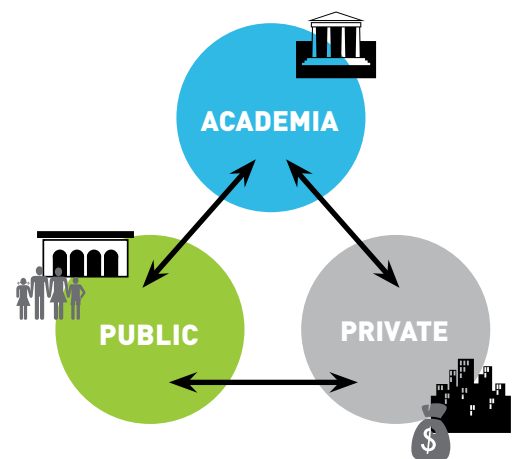Cooperation between different stakeholders can identify op-

Figure 2.8
The 'Triple Helix Model' promotes cooperation between the public, private and academic sectors, in order to achieve sustainable urban development.

portunities and enhance investment in green technologies in areas such as infrastructure, services, transport, housing and energy provision. 'Greening' the economy is a key aspect in developing urban sustainability, but this often requires a paradigm shift in both governance and management of urban areas, and in the private sector. Creating a green urban economy and investing in environmentally sustainable projects can contribute to climate change mitigation and adaptation, and generate job opportunities and local economic development (LED). The challenge is to identify and introduce realistic incentives for this paradigm shift in practice, especially in situations where resources are scarce.

Urban planning and design can contribute by providing the physical and geographical preconditions for sustainable economic development, but local authorities, other levels of government and the private sector need to be actively engaged. A compact and mixed-use urban environment increases synergies between different economic activities and reduces the time people spend commuting and not working or adding value.

Local authorities need a long-term approach to economic development, which includes a clear vision and policies, and realistic cost-recovery on investments, particularly in major service infrastructure. An integrated approach is necessary to link economic and other aspects of urban development in a common vision and development framework. For example, in South Africa, all municipalities are required to produce *Integrated Development Plans* (IDPS), based on a process that includes public participation.

The Spatial Development Framework (SDF) for Nelson Mandela Bay Municipality provides the basis for sustainable community area planning.
Source: Sustainable Communities Planning Guide, 2007, Nelson Mandela Bay Municipality

Africa

44%

Asia

18%

Latin America and the Caribbean

44%

Figure 2.9
The proportion of slum dwellers in relation to total urban populations.
UN-Habitat, Planning for Sustainable Cities, 2009.
NOTE: Statistics include all countries in a region, though data not is available for some countries.

INTEGRATED DEVELOPMENT PLANNING, SOUTH AFRICA

The Integrated Development Plan (IDP) is one of the key instruments and tools designed to facilitate integrated municipal development. The IDP process aims to be consultative, systematic and strategic, and to harmonise short, medium and long-term development. IDPs form the basis for municipal budgeting, land planning and management, local economic development and institutional arrangements. The IDP process includes needs identification and prioritisation, formulation of strategies, identification of projects, integration, approval by elected representatives, and monitoring, evaluation and annual review. IDPs are five-year plans, which are updated annually.

From an environmental perspective, it is also important to support existing economic and industrial activities to reduce pollution and become more environmentally responsible. At present, industrial activities in rapidly developing countries generate a large proportion of greenhouse gas emissions [30].

2.8 Spatial dimensions of urban sustainability

Along with urbanisation, cities experience population growth, which creates new demands for housing, employment, services and infrastructure. According to un-Habitat, cities and towns tend to expand spatially either through 'metropolitanisation' or peri-urbanisation (urban sprawl [31]), with various implications for sustainability. In the developed world, some 63% of people live in medium-sized and small cities, and only 9,8% in megacities. 14 the world's 19 megacities are located in developing countries, but only 8,4% of the urban population live in these cities [32].

No matter the size of a city or town, urban planning and design should shape the urban structure and spatial organisation in ways that support sustainable environmental, economic and social development. The growth and development of small and medium-sized cities needs more attention, as the focus, particularly in developing countries, is often on large cities.

The high concentration of people and economic activities in urban areas can lead to economies of scale, and synergies based on proximity and collaboration. Urbanisation can be a positive phenomenon if it enhances efficient energy use, which helps to reduce GHG emissions. Managed urban growth should enhance the proximity and accessibility of various urban functions and facilities (homes, businesses, services, etc.), and encourage the use of public transport, walking and cycling. The spatial organisation, density and typologies of urban areas are important factors that either enhance or diminish urban sustainability.
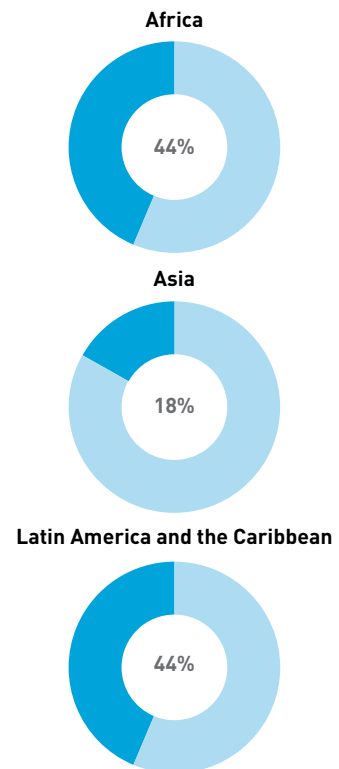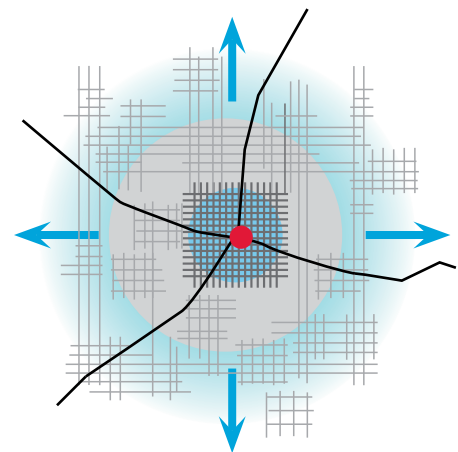
Figure 2.10
In many cities and towns, uncontrolled urban sprawl takes place beyond the traditional city limits, often because of the lack of suitable land to develop.

---

[30] UN-Habitat, (2011) Cities and climate change, p 57.
[31] UN-Habitat, (2009) Planning for Sustainable Cities, p 27–29.
[32] UN-Habitat, Planning for Sustainable Cities, p 27–29.

Rapid and uncoordinated urban growth often causes urban sprawl and poorly planned new areas, so that existing resources and services are not are used in an efficient manner. This type of urban growth is driven by the growth of informal settlements and the need to provide housing, as a response to housing backlogs and the constant influx of new migrants.

New land for housing is needed because informal settlements are often located on unsuitable land, lack service infrastructure and provide inadequate and unhealthy living conditions. Urban sprawl results in inefficient land use and service inefficiency due to low densities and peripheral locations, requiring new and more extensive and expensive, longer-distance service infrastructure and public transport systems, and/or use of private cars and mini-bus taxis.

Proper planning and management of land use and infrastructure provision are vital to address urban environmental problems and increase sustainability and resilience. Key challenges in developing countries are to reduce urban sprawl and the growth of informal settlements[33]. Measures to address these challenges include sustainable land use planning, comprehensive or master planning, urban densification, mixed-use development and urban design standards.

One of the challenges for many urban areas – conglomerations as well as individual, smaller towns – is to manage the rapidly increasing proportion of slum dwellers. un-Habitat defines urban slum dwellers as »*individuals residing in housing with one or more of the following conditions: inadequate drinking water; inadequate sanitation; poor structural quality/durability of housing; overcrowding; and insecurity of tenure.*«

Addressing these issues has direct implications for the physical/spatial environment in cities, especially with regard to land management and provision of housing, infrastructure and services. The complexity and magnitude of these challenges cannot be underestimated.

The spatial organisation and design of a city and its built environment can also play a crucial role in mitigating climate change. Compact, efficient cities consume less energy per capita due to less long-distance commuting and increased use of public transport. Buildings can also use about one-third of the energy normally required, for construction and operation. When planning, designing and constructing new areas or building, or regenerating existing ones, it is essential to consider the energy efficiency and environmental footprint of the design, materials, systems and equipment used from a life-cycle perspective.

Urban development in Kigali, Rwanda.

PHOTO Viera Larsson

---

[33] Un-Habitat, Cities and Climate Change, p 94

3.

A CONCEPTUAL MODEL FOR URBAN SUSTAINABILITY

ENVIRONMENTAL
SOCIO-CULTURAL
ECONOMIC
SPATIAL

URBAN SUSTAINABILITY requires a multidisciplinary approach to development which encompasses economic, social and environmental dimensions. This chapter introduces the *SymbioCity* conceptual model as an ordering framework for these dimensions.

3.1. Dimensions of urban sustainability

Cities and towns are often described as nodes for *economic, social, cultural and political* development. In some cases, they are also administrative centres. Urban development and growth is generally seen in terms of increased population, economic growth and geographic size. However, a wider perspective is needed to address the sustainability of urban areas, which include *economic, social and environmental dimensions*. In line with the publication *Developing Sustainable Cities in Sweden* (2011)[1], these three dimensions can be characterised as follows.

3.1.1 Environmental dimensions

Environmental sustainability refers to the *protection and preservation of long-term biological and ecological systems* and processes, e.g. to guarantee sustained and enhanced biological diversity and ecosystem services. It is important to recognise the *carrying capacity of the environment* with regard to human settlements and their activities and needs. Environmental sustainability also refers to *climate change resilience*, and adaptation and mitigation actions that contribute to decreasing climate change impacts.

From an urban development perspective, there is a need to *use energy more efficiently, reduce emissions of greenhouse gases,* and increase the resilience of urban environments to withstand expected and sudden climate change impacts. In addition, green areas, corridors and public spaces, forests, urban agricultural areas and other natural resources should be developed and protected. Environmental issues and measures are especially important for cities and towns that are more exposed and vulnerable to climate change impacts.

3.1.2 Social dimensions

Social sustainability includes the capacity to provide basic social, commercial and physical services. It also refers to an inclusive and just community, where everyone can participate in democratic and civic processes, including urban planning. Special considera-

tion should be given to women, children, the elderly and disabled, ethnic minorities and other vulnerable groups. Access to health services and education, schools and parks, day-care centres, recreational opportunities, etc., is part of promoting social sustainability. Safety and security is another key dimension, as is access and mobility, which are enhanced by efficient public transport. Social sustainability can be promoted by integrated and diverse urban areas with mixed land use functions, cultural diversity, and a variety in housing options. UN-Habitat also promotes remedial interventions in slums to redress injustices.

3.1.3 Economic dimensions

Urban areas are often referred to as the engines of economic growth. Economic sustainability requires development that is in balance with available resources. Well-planned development of the built environment supports local economic development activities and investments. A diverse and mixed urban environment promotes creativity, initiative and entrepreneurship.

Economic sustainability is also promoted by investment in environmentally friendly infrastructure, services and systems, which mitigate climate change and create jobs and new business opportunities. Cooperation between private and public sector actors and academia also contributes to economic sustainability. The image of a city or town is important for attracting investment and new economic initiatives, and positive perceptions are based not only on the physical environment, but also on the social and economic environment.

A wider perspective is needed to address the sustainability of urban areas, which include economic, social and environmental dimensions.

PHOTO Peter Engström

PHOTO Viera Larsson

PHOTO Sixten Larsson

ENVIRONMENTAL

SOCIO-CULTURAL

ECONOMIC

HEALTH
COMFORT
SAFETY
LIFE QUALITY

Figure 3.1
The four dimensions of urban sustainability: environmental, economic, socio-cultural, and spatial (the built environment). Human health, comfort, safety and overall quality of life are in the centre.

2 UN-Habitat, 2011, Cities and Climate Change, p 55.

3.2 Spatial dimensions

Sustainable urban development requires a cross-sector and multidimensional approach, as towns and cities involve complex functions, systems and relationships. This integrated approach addresses the interrelated *social, economic and environmental dimensions* (including cultural and technical aspects). Considering the complexity of urban areas with all the interrelations and interdependencies between different sectors and systems, there are several ways of describing the three main dimensions of urban sustainability. However, in order to approach the definition of sustainability it is necessary to include the *spatial dimension* of the built environment in relation to environmental, social and economic aspects of sustainable urban development.

Urban sustainability has spatial and geographic implications (*see section 2.8*). The spatial distribution and location of urban functions, systems and services are of fundamental importance for sustainability. Poorly planned or unplanned urban development often results in urban sprawl and inefficiency. Some urban areas develop structurally via the agglomeration of various settlements, while others develop around infrastructure such as public transport systems. In all cases, the urban morphology has direct impact on the pre-conditions and potential for sustainable urban development.

According to UN-Habitat, there are at least seven aspects that influence the sustainability of urban areas – *compactness, sustainable transport, density, mixed land use, diversity, passive solar design and greening*[2]. All these factors should be integrated in the development of urban areas. The distribution and organisation of public space, as well as the quality of the built environment must be considered (including the planning and design of public spaces and cultural and historical precincts). All the above issues have direct spatial implications that need to be considered.

As cities develop and grow, more land is needed for housing, work places, services and infrastructure. Depending on the needs and the available resources, different strategies can be developed to meet this need. When analysing, reviewing or formulating strategies for sustainable urban development, urban areas should not be regarded as separate spatial entities, but as nodes or centres with a surrounding hinterland (which may be rural, or include other urban areas). The density of urban areas may be a crucial aspect to consider, in terms of both population and the built environment.

Both formal and informal systems that support life and functions in a town or city have links to a hinterland, and beyond this, regional, national and international links. Links related to water and energy provision, waste management and transport systems usually have direct spatial implications. From an economic perspective, job opportunities in cities are often linked to families living in the rural hinterland. In a globalised world, cities and town

increasingly depend on regional, national and international trade (import and export) and services.

3.3 A conceptual model for sustainable urban development

The *SymbioCity Approach* promotes a holistic, integrated and multidisciplinary approach to urban development, which is relevant for towns and cities in *developing or transitional* but also in *developed* countries. The model is generic, and encompasses the complexity and multitude of urban development issues and relationships that need to be governed and managed. However, as every city or town has a particular character, context and development challenges, the model should be adjusted to local conditions, and used in different ways and for different purposes.

The model can be used to support urban sustainability reviews and urban development planning at different levels, and various methods and tools are provided for analysis and development of solutions (*see the Working Procedures Chapter 6*).

The *conceptual model* emphasises the relationships between the *environmental, economic, socio-cultural and spatial dimensions* of urban sustainability. It also provides a framework for describing the relations between different functions and systems in urban areas, in order to identify potential synergies between them. It is also useful for identifying potential conflicts between different issues or interests at an early stage. The model can also

PHOTO Viera Larsson

The conceptual model emphasises the relationships between the environmental, economic, socio-cultural and spatial dimensions of urban sustainability.

Figure 3.2
Additional dimensions of urban sustainability in the *SymbioCity* conceptual model are institutional factors and urban systems.

be used when analysing the relationship of a town or a city to its surrounding hinterland and wider context.

A key objective of sustainable urban development is to reduce the ecological footprint while improving the natural environment and the quality of life, health, comfort and safety for present and future inhabitants. Sida's Urban Policy is: *to promote sustainable cities where all citizens enjoy opportunities to improve their living conditions and thus can further contribute to the development of their city and country* [3].

Although the conceptual model presents a holistic and multi-disciplinary approach to urban development, it can also be used as a tool for sector analysis and development planning. As described in the chapter on working procedures, it can then be expanded to include additional sectors. Regardless of the entry point or focus, incentives should be developed to promote and facilitate integrated approaches.

It may also be relevant to consider the *time dimension* in a development process. Prior to a sustainability review or development planning process, the conceptual model suggests an analysis of *past causes* of the present situation and challenges. The way forward is usually determined by *present* technical and financial resources, governance structures, regulatory frameworks and policies. A vision supplemented by development scenarios and implementation strategies all form part of how we can achieve change in *the future*.

Quality of life, including health, comfort and safety for all human beings, as the ultimate development goal, is placed at the centre of the model.

The *first circle* represents the *environmental, economic and socio-cultural dimensions* of urban sustainability. The three dimensions are in most instances related to both institutional factors and urban systems. For example, when planning a new public transport system, the design of the system will depend on the financial resources needed to construct and operate the system (*economic dimension*); the system most likely targets various user groups (*socio-cultural*) and has a positive environmental impact by decreasing private car use, emissions and noise pollution (*environmental*). In this circle are examples of common environmental, socio-cultural and economic aspects.

The *second circle* represents *urban systems* for water, energy, waste, transport & traffic, buildings & architecture, ICT and landscape & social space. Urban functions & structures that we normally make use of in our everyday life are defined as an urban system (e.g. housing, workplaces, and social service and commercial buildings, etc.). These urban systems and how they can be related to each other is further described in the chapter *Urban Systems and their Potential Synergies*.

»If we can build a successful city for children, we will have a successful city for all people.«

Enrique Peñalosa

PHOTO Peter Engström

[3] Sida (2006) Fighting Poverty in an Urban World – Support to Urban Development (Policy).

The *third circle* represents *institutional systems* and factors that support urban functions and development. These factors usually have direct or indirect influence on how sustainable urban development can be promoted. They are broadly defined, and include urban governance and management, the administrative system for urban planning and land management, legal frameworks for decision-making and planning, financing options, cooperation between various actors and stakeholders, and participatory processes, including training and capacity building.

The *fourth dimension* of the model represents the *spatial and physical environment*, which is the spatial context for any intervention to promote urban sustainability. The physical layout or design and spatial organisation of a city or town include the layout of infrastructure and integration of the natural environment with the built environment.

The *fifth dimension* of the model is time, with the 'time arrow' being perpendicular to the other dimensions. The model can thus be used to describe past, present and future situations, and to analyse and propose future steps and stages. The planning process involves organising activities in time, e.g. how proposals and reviews may be developed in planning cycles (*see Chapter 6 – Working Procedures*). Giving the time dimension a central role in the model makes it possible to consider change in general and important concepts such as resilience, robustness, etc. in a short, medium and long-term perspective.
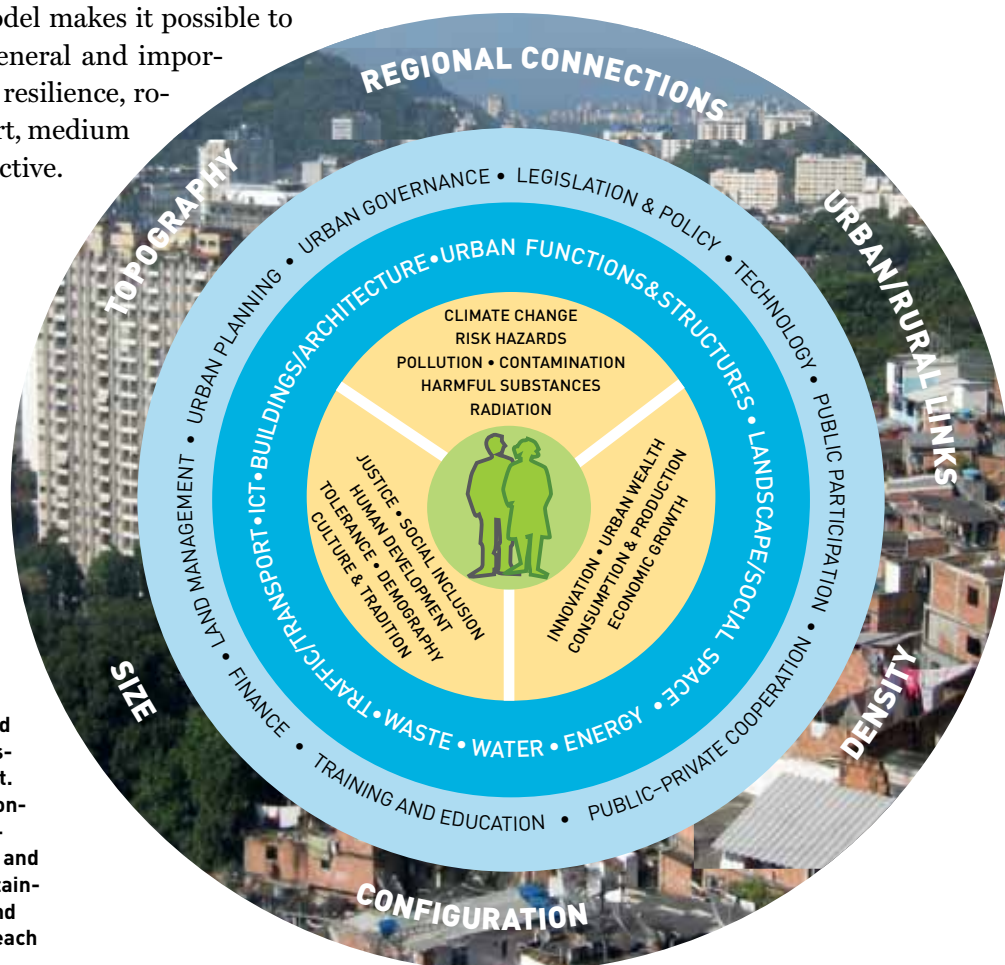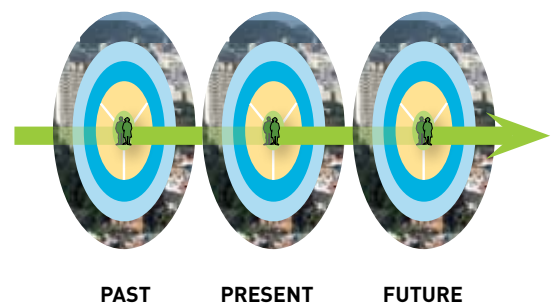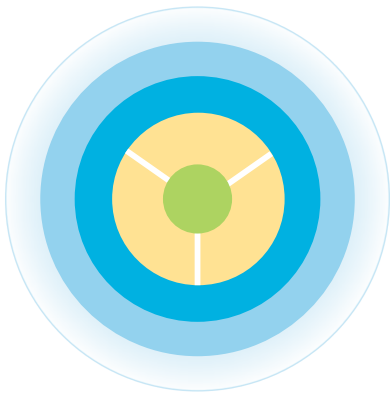

PAST   PRESENT   FUTURE

Figure 3.3
The *SymbioCity* conceptual framework for an integrated and holistic approach to sustainable urban development. The model shows the environmental, socio-cultural, economic, spatial, institutional and systems dimensions of sustainable urban development, and examples of key factors in each of the main dimensions.

Quality of life, including health, comfort and safety for all human beings, as the ultimate development goal, is placed at the centre of the model.

SymbioCity conceptual model – the key factors

HEALTH
COMFORT
SAFETY
LIFE QUALITY

ENVIRONMENTAL DIMENSIONS
CLIMATE CHANGE
RISK HAZARDS
NOISE POLLUTION
CONTAMINATION
HARMFUL SUBSTANCES
AIR POLLUTION
RADIATION

ECONOMIC DIMENSIONS
INNOVATION
URBAN WEALTH
CONSUMPTION & PRODUCTION
ECONOMIC GROWTH

SOCIO-CULTURAL DIMENSIONS
JUSTICE
SOCIAL INCLUSION
HUMAN DEVELOPMENT
TOLERANCE
DEMOGRAPHY
CULTURE & TRADITION

URBAN SYSTEMS
URBAN FUNCTIONS & STRUCTURES
BUILDING & ARCHITECTURE
ENERGY
WASTE
WATER
LANDSCAPE & SOCIAL SPACE
TRAFFIC/TRANSPORT
ICT

INSTITUTIONAL FACTORS
URBAN PLANNING
URBAN GOVERNANCE
LEGISLATION & POLICY
FINANCE
TRAINING & EDUCATION
PUBLIC – PRIVATE COOPERATION
TECHNOLOGY
PUBLIC PARTICIPATION

SPATIAL DIMENSIONS
REGIONAL CONNECTIONS
URBAN – RURAL LINKAGES
DENSITY
CONFIGURATION
SIZE
TOPOGRAPHY

4.

INSTITUTIONAL FACTORS

URBAN GOVERNANCE LEGISLATION SPATIAL PLANNING PUBLIC PARTICIPATION FINANCING

Urban governance involves the management and administration of cities and towns, and the financial, technical, organisational, and human resources necessary for sustainable urban development.

AN EFFECTIVE INSTITUTIONAL FRAMEWORK is essential to promote sustainable urban development and improve the urban environment. In the *SymbioCity* framework, this includes the following key aspects

> urban governance and capacity building, including adequate organisational and decision-making structures and strengthening of political and technical capacities
> legislation and policies, and their implementation
> spatial planning and land management
> participatory processes that include a wide range of stakeholders, and effective public information and communication
> financial resources and incentives
> private sector participation
> transparency and accountability.

In order to achieve sustainable solutions, it is important to combine different institutional factors in urban development processes, as institutional arrangements directly affect the achievement of synergies. For example, it is difficult to persuade industry to decrease emissions without legislation, or if fines are minimal, or emission permit can easily be 'acquired'.

This chapter provides an overview of important institutional factors in urban development. There are many studies and sources of information in this area, e.g. UN-Habitat[1], and Chapter 8 provides a list of references and other literature.

4.1 Urban governance and capacity building

Good urban governance is critical, as it involves the management and administration of cities and towns, and the financial, technical, organisational, and human resources necessary for sustainable urban development. Current rapid urbanisation and environmental problems require improved governance capacity on national and local levels to meet the challenges.

UN-Habitat defines governance as: »*The sum of the many ways individuals and institutions, public and private, plan and manage the common affairs of the city. It is a continuing process through which the conflicting or diverse interests may be accommodated and cooperative action be taken. It includes formal institutions as well as informal arrangements and the social capital of citizens*[2].«

[1] The State of the World's Cities – Bridging the Urban Divide (2010/2011) and – Harmonious Cities (2008/2009), UN-Habitat.
[2] Planning Sustainable Cities, Global Report (2009) UN-Habitat, p 73.

The World Bank[3] defines good governance as: »*Predictable, open and enlightened policy making, a bureaucracy imbued with a professional ethos acting for the public good, the rule of law, transparent processes, and a strong civil society participating in public affairs.*«

The *SymbioCity Approach* views urban governance primarily from an urban development and planning perspective, and emphasises improvement of urban environments, including systems and socio-cultural, economic and spatial aspects.

Capacity building should be a continuous process, to enhance good governance and develop effective public institutions. Institutional structuring should encourage multi- and transdisciplinary collaboration across the traditional barriers between functions ('silo organisation'). Incentives should be introduced to encourage integrated working on both small and large-scale urban development projects. This requires *political will and leadership* from the top management, and *adequate professional capacity* to make and implement appropriate decisions on sustainable urban development.

Democratic governance also requires participation and consensus building among stakeholders within and between municipalities, and between the public and private sectors. Responsibility for decision making and management of resources should be decentralised to local authorities in order to be responsive to local development needs and environmental conditions.

Increased local self-governance requires the strengthening of institutional capacity and technical support, improved public communication and participation, professional auditing and a national system for monitoring municipal performance[4]. Adequate financial resources, controlled by municipalities, are also essential.

Democratic institutions and their development and enhancement is a prerequisite for involving communities and interest groups in urban planning and environmental improvement. Effective representation by elected local representatives is the essential starting point for democratic local governance.

UN-Habitat (2008a) observed that: *Around the world, urban populations are spreading beyond their old city limits, rendering traditional municipal boundaries, and, by extension, traditional governing structures and institutions, outdated.* Governing larger, more complex and rapidly expanding cities presents significant new challenges. According to UN-Habitat (2008a), jurisdictional coordination is one of the most pressing challenges common to cities worldwide. It has two aspects

> *Vertical, multi-level jurisdictional coordination* of services across multiple levels of government

> *Horizontal, inter-jurisdictional coordination* of services across metropolitan areas.

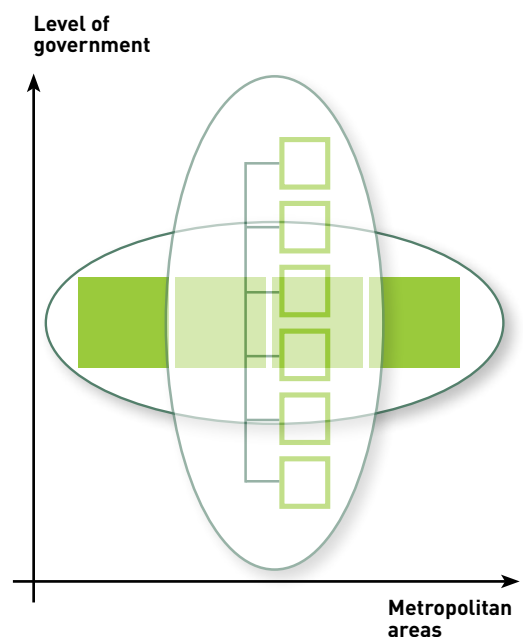**Level of government**

Metropolitan areas

Figure 4.1
Coordination of services across levels of government and metropolitan areas.

[3] World Bank definition of Good Governance - The World Bank's Experience (1994) – World Bank.
[4] Tannerfeldt, G & Ljung, P (2006), More Urban Less Poor – an introduction to Urban Development and Management.

National and regional governments and other state agencies are usually involved in urban governance, besides local authorities, and they need to collaborate to protect, plan and manage a multidimensional environment that often spans multiple jurisdictions. This applies in both developed and developing countries. According to UN-Habitat (2008a), two major criteria can be used to characterise governance of metropolitan areas and cities

> the *degree and level of centralization* or control of urban functions
> the *degree of formality* in the relationships among the various units and agencies.

According to the US National Research Council (2003)[5], there are four major types of governance system, based on permutations of the first criterion

> **THE FRAGMENTED MODEL**, with a number of autonomous local government units, each with jurisdiction over particular functions or a specific local territory.
> **THE MIXED MODEL**, where many semi-autonomous local municipalities and governmental organisations work together in a metropolitan area (e.g. Casablanca and Rabat in Morocco and the County of Stockholm, Sweden).
> **THE CENTRALISED MODEL**, where central government and its specialised state agencies control large metropolitan areas (e.g. Ho Chi Minh City, Vietnam).
> **THE COMPREHENSIVE MODEL**, where local authorities have considerable functional power and autonomy over the whole metropolitan area (e.g. The Metropolitan district of Quito, Ecuador; Abidjan, Cote d´Ivoire; Cape Town Metropolitan Municipality, South Africa).

Cooperation between metropolitan units is characterised by degrees of formality.

Cooperation between metropolitan units is characterised by *degrees of formality*. For several reasons, most cooperation is informal and based on cooperative arrangements. Higher levels of government may be wary of creating alternative power structures by institutionalising municipal governance for large conglomerations of people. There may also be differences and conflicts of interest among the local governments and with other government agencies.

There are both 'strong' and 'weak' examples of the *formal model*. In the strong version, central local authorities have an established leadership and clear lines of authority. Such examples are found in South African unicities and the new district of Abidjan in Cote d´Ivoire. In weaker situations, the central authority has limited power and there are often unclear lines of authority connecting various local councils. Examples are the metropolitan governments of Bangkok and Manila.

[5] UN- Habitat (2008a).

How locally elected representatives and citizens participate in metropolitan governance is critical to determining their success and longevity, according to UN-Habitat (2008a). If institutions lack legitimacy, they are often short-lived. Three interrelated factors are of crucial importance

> **EFFECTIVE LEADERSHIP** to overcome fragmentation and build consensus across metropolitan areas
> **EFFICIENT FINANCING** for metropolitan government, as a core requirement (*see section 4.5*)
> **EFFECTIVE PUBLIC PARTICIPATION** in decision-making regarding the allocation of resources across a multiplicity of metropolitan agencies (*see section 4.4*).

PHOTO Viera Larsson

Public participation in decision making is a key institutional factor.

ASPECTS TO CONSIDER

- How is the local authority organised with respect to urban development, planning and environmental issues?

- What alternative management and organisational structures would promote a multi-disciplinary approach?

- What is the division of responsibilities between different governmental agencies, from national to local level?

- How decentralised/centralised is urban planning and environmental decision making?

- What capacity does the local administration possess in terms of developing policies, standards and programmes for urban development and environmental improvement?

- What institutions are there for self-governance for the poor in urban settlements? Do these also embrace environmental activities?

- Where can we find information and data on the opinions of the public? Are there established communication channels with the community?

- To what degree can tradition and culture influence planning?

- What systems are there for monitoring municipal performance regarding the environment – including urban settlements?

- Is the municipality capable of managing private concessions or community-based initiatives for the construction or operation of infrastructure and other services?

- Are there obvious conflicts of interest between different stakeholders (on a vertical or horizontal level) that work against an integrated approach?

- Are there inbuilt obstacles that constrain action or cooperation? Do actors have their hands tied by other commitments? Is the scope for their decision making limited because the authority to decide lies at another level?

4.2 Legislation and policies

Legislation and policy are powerful instruments for promoting development and enforcing improvements in the urban environment. Urban planning and environmental legislation (e.g. Urban Planning and Environmental Acts) provide a national framework for urban development by establishing objectives, planning and building codes, environmental standards, etc., which regulate and guide urban development at local level.

However, urban planning and environmental legislation should be flexible and allow adaptation to local conditions and needs, and the development of local policies and standards, within the national framework. The harmonisation of national, regional and local legislation and policies is of great importance for development of appropriate local strategies. The challenge is to develop locally appropriate legislation and policies, which promote both horizontal and vertical coordination of services (*see section 4.1*).

In some instances, different legislation and policies might be valid, yet contradictory. For example, *densification* to enhance sustainability and service efficiency conflicts with *environmental policies* that promote health and well-being by providing or protecting large green areas, or policies to decrease traffic, noise and air pollution. While all these policies aim to enhance the quality of life and urban sustainability, their proposed solutions can be contradictory. It is thus critical that planning authorities manage and balance the integrated formulation of urban development plans, or conflicting policies can contribute to division rather than cooperation between different functions.

An integrated approach to urban development will identify contrary policies and consider alternative development scenarios at an early stage in planning processes, and involve stakeholders in balancing different objectives to achieve solutions that best combine *ecological, socio-cultural, economic and spatial* considerations.

Legislation and policies should also contribute to inclusive cities that provide opportunities and support for disadvantaged residents to develop their full potential and gain their fair share of the 'urban advantage'. All residents should have »*access to all aspects of basic, decent living conditions such as housing, transportation, education, recreation, communication, culture, religion, employment and the judiciary, among others.* [6]«

All residents should have access to all aspects of basic, decent living conditions such as housing, transportation, education, recreation, communication, culture, religion, employment and the judiciary, among others.

PHOTO Viera Larsson

---

[6] UN–Habitat, 2008b.

PROMOTING INCLUSIVE CITIES
UN-Habitat has identified the following five areas to address in promoting an inclusive city.

1. Assessing the past and measuring progress
This means a thorough understanding of the underlying factors of a particular situation, as the basis for determining strategies to increase inclusiveness.

2. Establishing new, more efficient institutions, or strengthening existing ones
Experiences from various cities has shown that the manner in which an issue is addressed has a critical influence on the outcome. Inclusive cities conduct in-depth reviews of their systems, structures and institutional mechanisms to pave the way for change. A paradigm shift may be necessary, which places institutional structures at the centre of sustainable urban development, and recognises the moral leverage and power of social transformation.

3. Building new linkages and alliances across tiers of government
Experience indicates successful collaboration between different tiers of government often depends on institutional capacity to share resources (e.g. staff, skills, funding, information and knowledge) for mutual benefit or gain. Strategic alliances and co-operation can enable the development of innovative programmes and more efficient use of resources. Links between public authorities and civil society may also enhance the sustainability of local programmes.

4. Developing a sustained, comprehensive vision to promote inclusiveness
Cities in transition and development need a clear vision of the future that combines creativity, realism and inspiration, to inform long-term comprehensive planning. Any vision – for the entire city or a particular area or sector – must be context-driven and developed with the participation of all segments of the population. The »buy-in« to the vision, will ensure a higher degree of inclusiveness and ownership – provided that the process is transparent, inclusive and genuine. The vision should be translated into a workable plan, with clearly defined funding sources and accounting mechanisms.

5. Ensuring an equitable redistribution of opportunities
Strong empirical evidence confirms that concentrations of people and productive activities generate economies of scale and proximity. This stimulates growth and reduces the costs of production, including the delivery of basic services. Five policy areas have been identified to bridge the urban divide and integrate excluded and marginalised groups: (1) improve the quality of life, especially for the urban poor, (2) invest in human capital development, (3) foster sustained economic opportunities, (4) enhance political inclusion, and (5) promote cultural inclusion.

Source:
UN-Habitat (2008), State of the World's cities
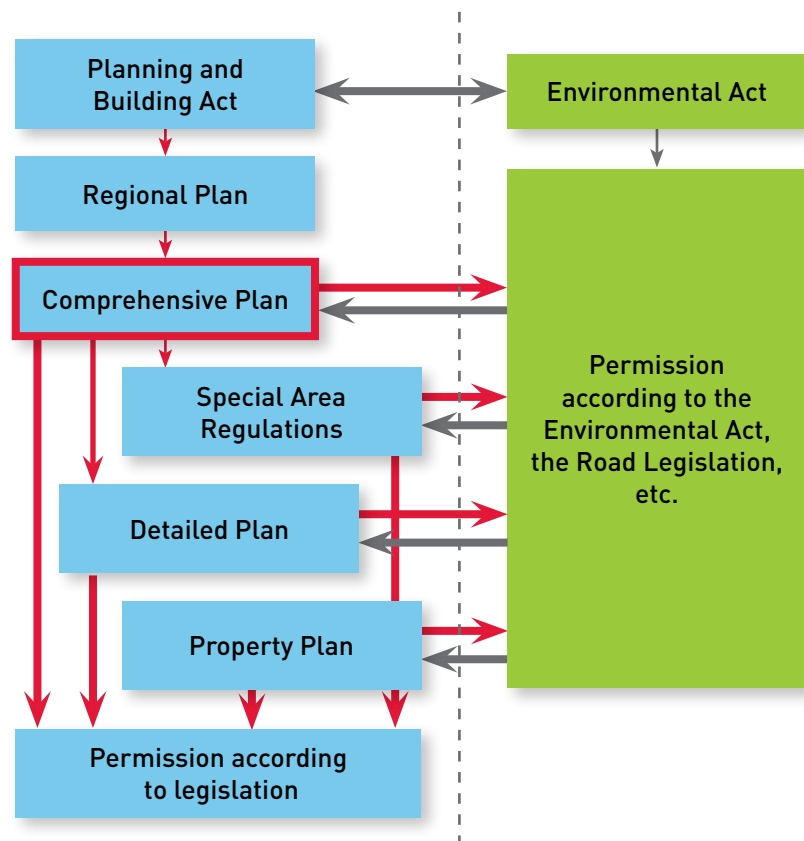*2010/2011, Bridging the Urban Divide.*

UN-HABITAT FOR A BETTER URBAN FUTURE

Figure 4.2
Overview of the Swedish Planning System, illustrating the links between the Planning and Building Act and the Environmental Code.

4.3 Spatial planning and land management

Spatial planning is closely connected to governance systems, and involves coordination of all types of land use and the built environment over time. It is also called urban planning when applied to urban areas. However, as the interplay between urban and rural areas is so important for sustainable urban development, the *SymbioCity Approach* preferred the terms *spatial planning* or *comprehensive urban planning.*

Ideally, spatial planning is a local authority function, as this strengthens the coordination and integration of urban systems such as land-use, service infrastructure and green areas. Planning of both urban and rural areas should identify interrelationships and promote synergies. For example, organic waste from a city or town can become fertiliser for agricultural production, or be used to extract biogas. Spatial planning can play an important role in promoting *urban-rural synergies* in a municipality, and contribute to reducing the ecological footprint.

There is an increasing need to connect urban and regional development to create a well-articulated, integrated and balanced urban hierarchy with sub-centres in the rural peripheries[7]. Small and intermediate centres play an important role in decreasing pressure on larger urban centres, by attracting rural migrants. They also serve as centres for marketing agricultural products, producing and distributing goods and services to rural areas, and for non-farming activities and employment. Intermediate urban centres can become growth nodes that enable clustering of services, facilities and infrastructure, which are not economic in small villages.

Spatial planning provides a *framework for developing synergies* between different urban systems and an integrated systems approach, focusing on both physical and social environments. Planning processes that involve different sectors, organisations and administrative levels incorporate varied professional and sector perspectives[8]. This promotes synergies between urban systems, which is an important part of the *SymbioCity Approach.*

A common understanding of the role of planning and its processes is important, if it is to be effective in a multi-stakeholder environment. This enables real integration based on the collaboration of actors with different and sometimes conflicting contributions.

In a campaign to encourage local politicians, planners, environmental experts and traffic engineers to cooperate in integrated urban planning, a Swedish agency[9] stated: »*Traffic planning and housing development should no longer apply to our towns, but should be replaced with town-making in which traffic is one of the fundamental prerequisites contributing to a living and well-functioning town*«. This way of thinking can be extended to other urban systems in town- or city-making processes.
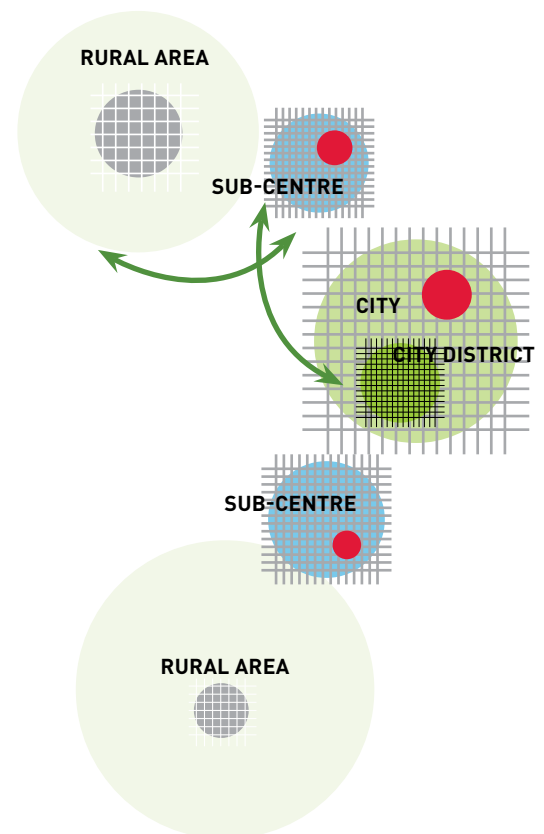
Figure 4.3
There is an increasing need to connect urban and regional development to create a well-articulated, integrated and balanced urban hierarchy with sub-centres in the rural peripheries.

[7] Li, Yuheng (2011), Urban-rural relations in China, Doctoral thesis in Infrastructure with specialisation in Planning and Implementation, KTH, Stockholm.
[8] Tornberg, P (2011), Making Sense of Integrated planning, Doctoral Thesis in Planning and Decision Analysis, with specialisation in urban and Regional Studies, Stockholm.
[9] The National Board of Housing, Building and Planning (2004).

Integrated development planning requires the integration of *different stakeholders* in the planning process. Another prerequisite for success is the involvement of different stakeholders, including communities and the private sector, in all phases of planning as a participatory process.

Municipal environmental strategies take Local Agenda 21 as their point of departure, which also emphasises public participation, transparent decision making and good governance. Good examples are the IDP (Integrated Development Plan) process in South Africa and the comprehensive planning process in Swedish municipalities.

A *spatial* or *comprehensive urban plan* guides short and long-term development and *supports decision-making and governance* regarding land use and development of the built environment. An urban spatial plan should include a *long-term vision* for urban development, and show how the city can respond to environmental, housing, infrastructure, investment and other challenges. It

Figure 4.4
Comprehensive Urban Plan for Gothenburg 1) the regional perspective, 2) the use of land and water, and 3) illustration of area objectives.
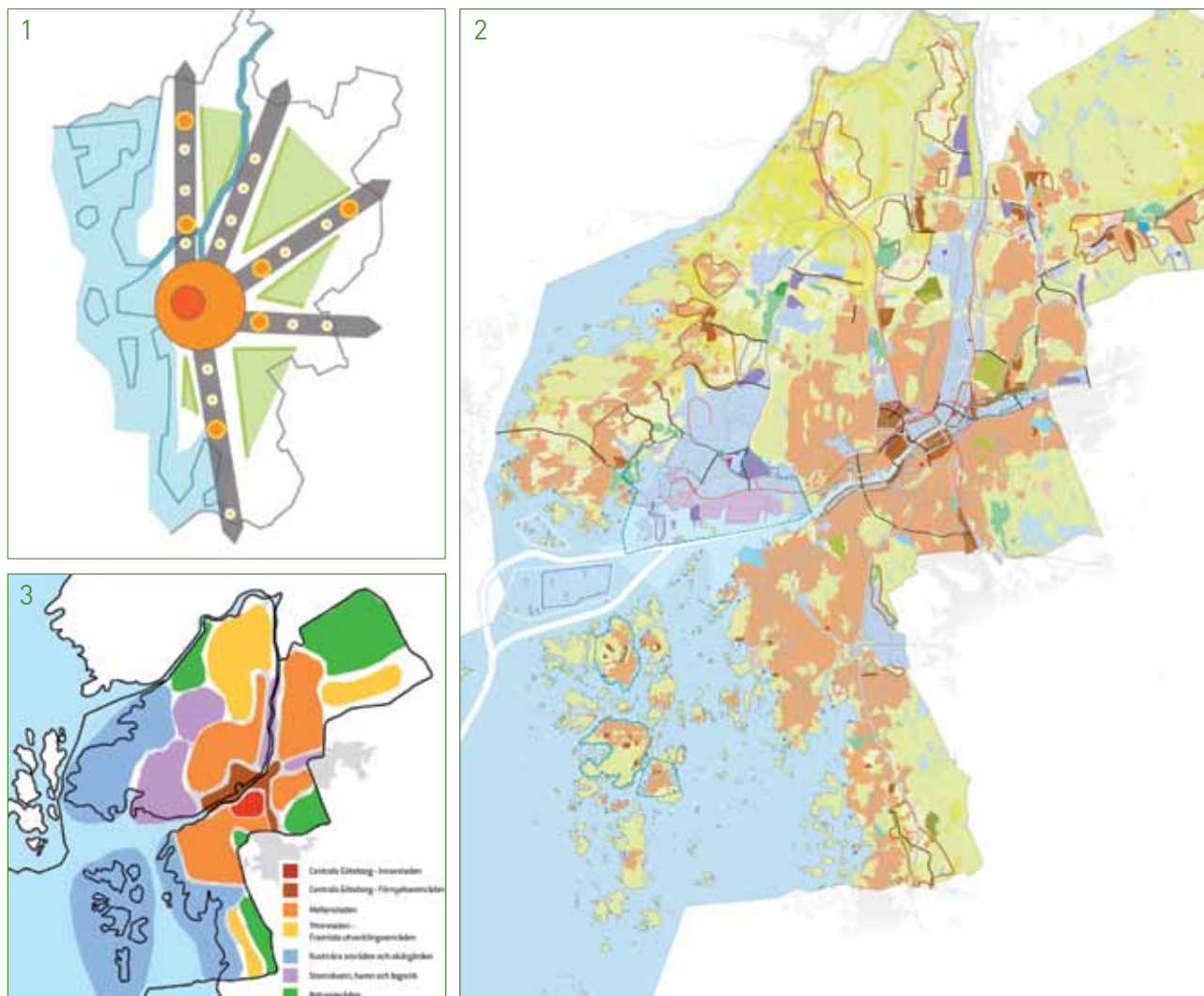
provides a framework that guides detailed development planning for particular districts or areas, e.g. by regulating land use and building rights. Detailed development plans in turn guide building permissions and control. A good comprehensive plan involving all stakeholders is the basis for *efficient, integrated and inclusive* urban development.

Spatial plans should also be linked to municipal budgets, as they show the different priorities and strategies to manage development challenges, and their financial implications.

Reviewing spatial plans on a regular basis is necessary to ensure that they are updated in relation to contextual changes, in and beyond the city. A plan review process should include dialogue with stakeholders, e.g. citizens, land owners, public and private companies, civic organisations, etc. The plan process then serves as a *communications platform* to strengthen participatory development and collaboration. It should *include new issues* that emerge on the urban agenda, and *address conflicting issues* and interests, if necessary.

FUTURE ROLES OF COMPREHENSIVE URBAN PLANNING

UN-Habitat has identified the following future roles of urban planning. The specific aspects can serve as guidelines when developing or applying planning systems in developing countries.

- **The guiding values of planning** – planning is a value-driven activity, not only a technical one

- **Shifts in the form of plans** – a more proactive, flexible approach to intervening in urban development than that promoted by so-called 'master planners'

- **Shifts in planning processes** – a central role of planning is the mediation of inevitable conflicts over land and resources. Planning requires input and support from communities, stakeholders and wide range of professionals, not only planners.

- **Shifts in urban forms** – to achieve sustainable spatial features such as higher densities (but low-rise structures), public transport, spatial integration, a defined and protected open space system and an urban edge to prevent sprawl

- **Urban modernism is a problematic built-form model** - find alternatives to mega-projects without informal activities, which exclude the poor and encourage unsustainable consumption.

- **Planning with and for informality** – develop creative ideas for promoting sustainable forms of informality; develop new forms of tenure and land delivery that articulate with customary law; the provision and pre-servicing of land for informal settlements; ways to retrofit services within informally settled areas; providing public spaces and infrastructure for informal trade

- **Revisiting both directive and regulatory aspects of the planning system** – allow for a greater mix of land uses and urban forms; more flexible land-use categorizations that include informal settlements; performance-based criteria rather than use-based criteria for approving land-use change; new ways of linking the regulatory planning system with indigenous forms of land rights and use

- **Planning and institutional integration** – emphasise the role of planning in sectoral integration, as all sectoral programmes have spatial implications

- **Planning scales** – the concept of the city-region, which has important economic potential and attractiveness, requires coordinated and integrated spatial planning and management across all urban scales.

Source: UN-Habitat,
Planning Sustainable Cities, 2009
(summarised)

The *interplay* between the vision and strategies in a *spatial plan* on the one hand, and active *management of land* on the other, creates new opportunities, which require better coordination between the two. The development of land management systems should thus be closely connected with urban planning.

According to Tannerfeldt and Ljung (2006): »*One critical issue for the poor in growing urban centres is lack of affordable land for housing. More effective land and housing markets would improve the situation and remove one of the obstacles to economic development as well. Legislative reforms and revised regulations allowing small plots, mixed land use, incremental housing and affordable infrastructure are required. If public land is not available for current and future needs the local authority should acquire reserves of land for urban expansion. This would allow the municipality to sell some plots at market prices to other developers.*«[10] The increase in land values due to urban expansion could contribute to subsidies to the poor, including for integrated environmental measures.

ASPECTS TO CONSIDER

- What systems exist for planning on different levels or geographical areas of the community – e.g. municipal level (comprehensive plans), town or district level (comprehensive plans) and area/block level (detailed development plans)?

- How are environmental issues considered in strategic or detailed planning, e.g. in studies, formulation of objectives, planning proposals and in environmental assessments of plans?

- To what extent are synergies or conflicts between different environmental issues discussed in planning activities and documents?

- Which methods and tools are applied? Are plans and documentation presented in a graphic, easy-to-understand manner? Are there computerised systems for presentation, documentation and revision of plans?

- How are the environmental needs of poor people included in strategic and detailed plans?

- What systems are there at local level for land management related to urban plans?

- To what extent is affordable land for housing, industry and services available to the poor?

- What opportunities do the poor, including women, have to influence decisions on the localisation of urban functions relevant to their needs?

- Has the local authority any strategies concerning the purchase and preparation of land areas with affordable infrastructure and acceptable environmental conditions with regard to air pollution, noise, landslide risk, etc?

- What is the situation concerning property and usage rights of land, and public land surveys?

[10] Tannerfeldt & Ljung page 97–98.

4.4 Public awareness and participation

An inclusive development and planning process involving all stakeholders is required to achieve appropriate and sustainable results. Stakeholders include citizens, civil society organisations (NGOs and CBOs), various interest groups, private and public companies, etc. Raising awareness among stakeholders is essential to promote engagement. Communication with stakeholders is generally the responsibility of the local authority at different levels.

Stakeholders involved in the planning process need relevant information as a prerequisite for meaningful participation. It is also necessary to raise public awareness regarding sustainability issues and an integrated systems approach. Communication and civic education programmes should combine various media and participation options.

Awareness raising is the starting point for participation and the quality of urban planning processes and their outcomes is significantly affected by the degree of openness and participation. For example, both producers and consumers need to be informed about environmental problems and engaged in solutions. Local authorities can engage stakeholders and communities in a participatory process to

> strengthen local democracy by actively involving more people in local processes
> increase transparency and effectiveness
> achieve a better understanding of citizens' priorities
> use citizens' knowledge as a planning resource
> inform citizens about the purpose and services of the municipality
> increase participation in local elections
> increase citizens' contributions to local development.

There are different methods of communicating and establishing dialogue, depending on the purpose and stage in the planning process, including

Dissemination of information – especially in the initial stages, to increase awareness
Consultation – when proposals are presented and stakeholders are invited to respond
Participation – in site and needs assessments and in formulating solutions
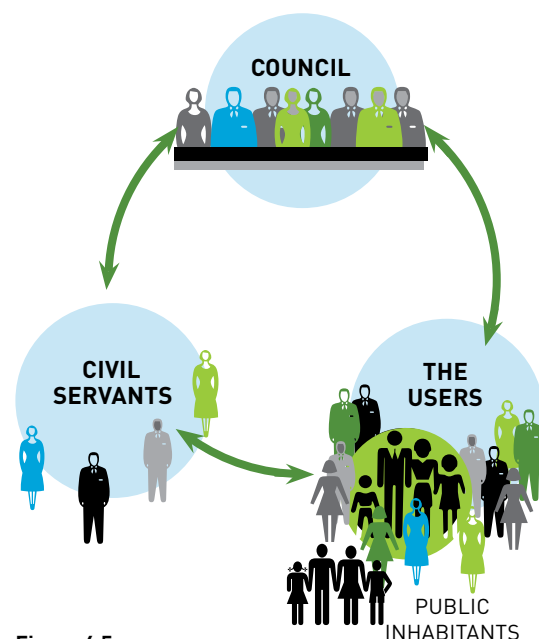**Mobilisation** – of stakeholders to participate in planning or implementation.

Figure 4.5
It is important to clarify the roles of different stakeholders and the communication links between them during a development and planning process.

PHOTO Leila Aalto

Citizens' dialogue regarding future urban plans in Gällstad, a suburb of Ulricehamn, Sweden.

Methods for participatory planning include targeted *planning forums, seminars and thematic workshops*, and open *public meetings or hearings*. Input and feedback can be obtained via surveys, focus groups and meeting, and information can be communicated via a range of methods and media, including radio and TV programmes. In a particular area or community, *site visits* and *learning visits* to good examples can be organised for stakeholder representatives, together with discussion sessions on opportunities, constraints and proposals.

As internet access increases, *websites* are increasingly used to distribute information, get input and feedback and host discussion forums. *ICT-based methods* are becoming more common in different types of planning activities. Mass media and social media are also important for awareness creation, public debate and dissemination of information.

Public participation in planning processes and efforts to improve the environment is crucial. Residents should be informed at the start of processes regarding consultation and participation opportunities during planning, implementation and follow-up processes. While it is not practical to expect involvement from everybody at all times, there are usually representative bodies and leaders in both formal and informal settlements, who should be involved.

Civil society's role in environmental planning should be strengthened via participatory decision-making processes, methods of judicial appeal and access to good quality environmental information.

One way of achieving broad involvement is to establish an information and communications venue in the area concerned, which can also host meetings and workshops, and where proposals and plans are exhibited and discussed with residents and other stakeholders. This could be in an existing public facility, e.g. a municipal office or library, or a new project-linked *Community Support Centre*. Examples of interactive tools to engage a community (or other stakeholder groups) in the dialogue and planning process are e.g. walking tours, open house events (exhibitions where you can meet with local politicians or civil servants), or open space seminars.

Civil society's role in environmental planning should be strengthened via participatory decision-making processes, methods of judicial appeal and access to good quality environmental information.

photo Ordbildarna

COMMUNITY SUPPORT CENTRES IN BUFFALO CITY, SOUTH AFRICA

People living in poor areas often have to travel long distances at significant cost to access municipal offices and services. To improve access to services and interaction with municipal officials, Community Support Centres (CSCs) were established in three townships in the city.

The CSCs are located where people live and work, and provide access to basic services and information, payment facilities and opportunities to interact, and customer care. CSCs also provide services relating to housing delivery, a pressing need in South African cities and towns, and also libraries, health promotion and space for community activities. They are located centrally and on major roads, with easy access via public transport.

Source: Klas Groth, Buffalo City Project, The Urban Development Programme 1996–2007, Swedish-South African Cooperation, Sida/SIPU International (2007).

PHOTO Klas Groth

ASPECTS TO CONSIDER

- How have the options for public participation been included in environmental management plans and governance strategies for the city?

- Have spaces for information, presentation, discussion and workshops been created in the areas where environmental improvements are planned?

- Have tangible and well-thought-out plans for public involvement been presented and discussed with politicians, officials and CSOs?

- What opportunities are provided for the public to express opinions and/or influence investments and developments that have positive or negative impact on the environment?

- What strategies and methods do the local authorities use for public awareness raising?

- What local institutions are there for information dissemination and training in basic knowledge on environmental and urban issues?

- What options are there for involving experts in programmes to improve the urban environment?

- What options are there to develop training and education regarding different subsystems and on an integrated systems approach?
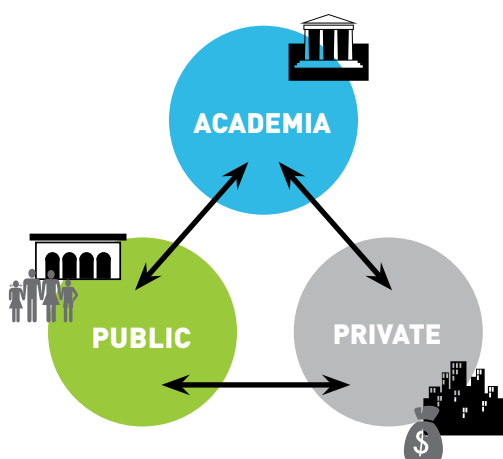
Figure 4.6
The Triple Helix Model promotes sustainable urban development cooperation between the public, private and academic sectors. It can be applied on a broad, general level, and in sector and local projects.

4.5 Private sector participation

In order to promote and enhance sustainable urban development, it is important to develop continuous cooperation between planning authorities and the business community. Multi-stakeholder dialogues should include private sector, civil society and community representatives. Incentives should be provided, e.g. for small businesses to be involved in local transformation projects. Consultants with competence in different fields and companies providing innovative, sustainable products should be involved in large-scale projects such as infrastructure development.

It is important that cooperation with businesses is transparent and subject to democratic regulation and proper procurement procedures where contracts are involved. Private sector involvement in service provision ranges from multinational water companies managing water and sanitation facilities to poor city dwellers earning a living from recycling waste [11].

To promote economic sustainability, the development of cities and towns also must support and provide opportunities for private sector investment and business development. One approach to encourage this is to stimulate interaction between the business sector, academia and the public sector (*Triple Helix Model*), which can also promote capacity building for all participating parties.

ASPECTS TO CONSIDER

- Is there formal or informal collaboration or coordination between the local authority and private stakeholders in connection with urban and environmental issues? What is the nature of this collaboration or coordination?

- Do the country and city allow private-public partnerships in the field of public infrastructure (energy, water, transport, etc.)?

- What are the options for the development of procurement systems focused on urban environmental issues and businesses? Can such systems inspire the local business sector, in collaboration with companies from other regions, to propose new, innovative systems which are also affordable for poor people?

- Does the local authority have the capacity and integrity to negotiate and manage construction contracts or concessions with private companies?

- Does the local authority have the interest and capacity to develop and manage contracts with local small businesses, cooperatives and community-based organisations?

[11] Experience from public-private partnerships in this field is discussed in Tannerfeldt & Ljung, page 115–122.

4.6 Financial resources and incentives

In urban areas, initial investments should target a combination of infrastructure and sectors of importance for the urban economy, e.g. manufacturing, knowledge intense services and education. Cities can also stimulate sustained economic growth for poor and underprivileged populations via labour-intensive public works and private construction projects. However, conditional cash transfers (CCTs) are the most efficient poverty reduction mechanism, as they enhance incomes in the short term and capabilities in the long run.

It is also important that investments in agriculture include transport to urban areas, and other urban-rural linkages. In the future, urban agriculture may play a more important role both as a means of livelihood for the urban poor (and others), and as a business sector producing local vegetables, fruit, etc.

Financing of public infrastructure

Proper financing is essential for urban environmental improvement. Expert advice should be contracted to provide a comprehensive and objective overview of financial requirements and funding capacity and risks, and to develop a financing plan to mobilise the optimum combination of financial resources. Financing plans should include

> infrastructure investments (water, sanitation, electricity and transport)
> housing finance services for the poor
> Increasing the efficiency of land and housing markets and provision of land for future urban growth.

In most developing countries, municipalities account for only a small share of public expenditure. Their borrowing may also be restricted, and municipal budgets often need to be approved by central government. Their limited resources are mostly used for operational costs, while little remains for capital investments.

When user fees are charged, they rarely cover costs for operation and maintenance, let alone delivering any surpluses to operating organisations. Towns and utilities have few incentives or capacity for infrastructure improvements, which in turn leads to under-investment. Modern, sustainable approaches to financing thus leverage capital, based on municipal utility balance sheets.

Tariff setting is an inherently difficult area, since distributional and efficiency goals tend to pull in different directions. From a distributional, pro-poor viewpoint, progressive tariffs are preferable. However, such tariffs are least efficient. The most efficient tariff structure would follow the structure of marginal costs, so

»Whatever the particular investment, the concept is the same: raise productivity above subsistence in order to trigger a self-sustaining process of economic growth.«
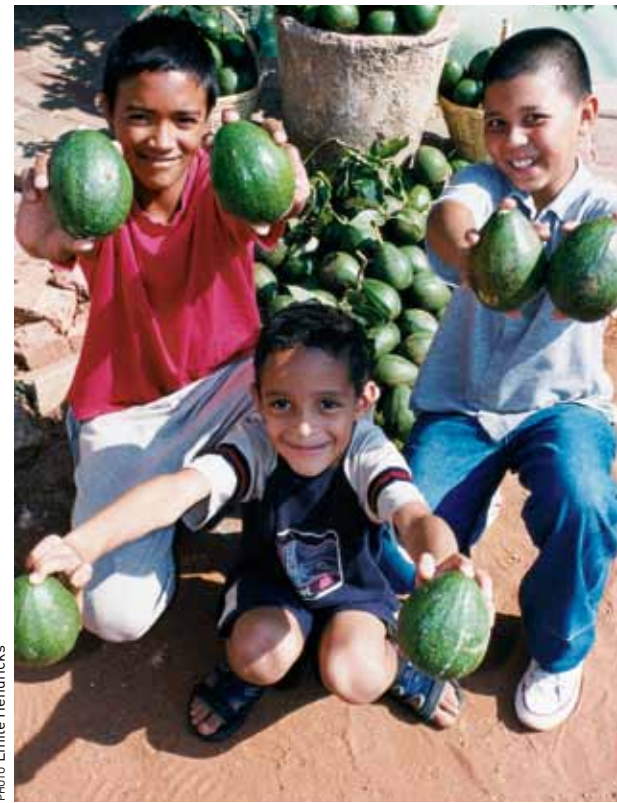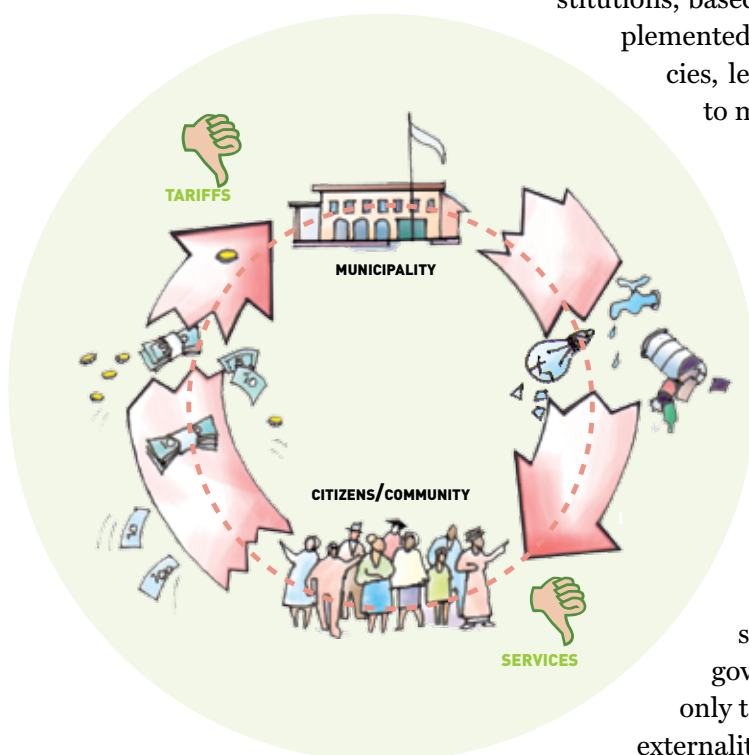
Jeffrey Sachs

PHOTO Emile Hendricks

In the future, urban agriculture may play a more important role both as a means of livelihood for the urban poor (and others), and as a business sector producing local vegetables, fruit, etc.

that major consumers, who cost less, pay less. Progressive tariffs imply that

> low-income, small consumers are not profitable and service providers have no incentive to supply them
> major consumers have an incentive to 'opt out' by buying their own water purification systems, generators, etc., which further weakens municipal finances.

One argument against progressive tariffs is that it is better to subsidise connections for the poor, instead of services. Whichever option a city chooses, it is important that decisions are transparent and consequences are known, and that effects on disadvantaged groups are recognised and mitigated. Traditional urban infrastructure financing comes from central budgets, where towns receive subsidies from governments or credit from financial institutions, based on sovereign guarantees. Projects are often implemented by parastatal organisations or independent agencies, leaving municipalities without clear responsibility to maintain assets or help finance debts.

It is thus essential to clarify roles and responsibilities of local authorities to develop and maintain infrastructure and to ensure that the needs of the urban poor are taken into account in budgets and investment plans. Access to affordable long-term debt, working capital and equity finance is critical to enable municipal infrastructure investments. This requires sound public investment planning, policies and regulatory frameworks.

As financial resources are scarce and unevenly distributed in developing countries, it is essential to optimise the use of resources by strengthening links between local and central government. Certain services need to be priced not only to cover local costs, but to avoid regional or global externalities. For example, from an energy sector perspective, buildings, roads and cities should be planned to minimise transport and other forms of energy use. This policy needs to be supported by high taxation of household electricity and fuels.

Housing finance for the poor

In many countries, microfinance has gained considerable recognition, and has developed into a mature and sustainable industry, although regulatory frameworks are often unsatisfactory. However, housing microfinance [12] – including housing improvements and investments in communal goods, e.g. the environment – has not reached the same status. In some countries, microfinance is limited to income generating purposes and enterprises, while

If municipalities do not raise enough revenue, they have to cut expenditure in order to balance budgets. This often means cutting expenditure on asset maintenance and rehabilitation. The result is a decline in the performance of assets and ultimately, asset breakdown, which in turn means that municipalities are no longer able to deliver good quality services. This can result in a vicious cycle, as citizens do not want to pay for poor quality services, and so revenue is reduced even further.

Illustration from Transparent Tariffs – A guide for local government in South Africa, Namibia and Botswana (2010), SALGA, ALAN, BALA

TARIFFS
MUNICIPALITY
CITIZENS/COMMUNITY
SERVICES

[12] Or the wider concept 'housing finance for the poor'.

housing microfinance is only granted under exceptional circumstances. Other challenges to housing microfinance are

> generally weak property rights enforcement and/or lack of such rights
> unwillingness by practitioners and financiers to provide long-term loans
> lack of stable income
> mismatch between affordable loan amounts and a potential mortgage of the entire house
> lack of loan products for used homes
> lack of information about clients
> less likelihood of repeat borrowing (unless incremental housing loans).

All of the above reduce the incentive to repay housing loans. While some of these are specific to housing microfinance, many also apply to normal microfinance. Another aspect of housing microfinance is its relationship to government or other subsidy schemes. Many governments understandably subsidise housing for the poor.

The unsound practice of channelling subsidies through credit schemes is generally being replaced by a trend towards separating subsidy schemes from credit activities, as is the case in other microfinance. Some housing credit schemes are linked to the provision of building material at low-cost, or participatory construction approaches – which can make it difficult to evaluate the sustainability of financial services.

In general, governments do best by creating a stable macroeconomic environment, an enabling policy framework and property rights adapted to the poor, while refraining from subsidising interest rates, setting interest ceilings, etc.

The role of donors in housing microfinance is similar to their role in microfinance in general, and should be guided by good business practice. Donors should focus on backing up governments in their macro role, strengthen the sustainability of promising financial institutions, and support refinancing mechanisms that provide medium-term funds for financial institutions (e.g. via loan guarantee funds).

ASPECTS TO CONSIDER

- How is the municipal budget constituted? From where does financing for investment come, and who finances operations and maintenance? Can financing be arranged differently? Are there reasons why the municipality cannot borrow on financial markets?

- How are tariffs constructed? How much of the investment costs (including debt servicing, operations and maintenance) do they cover, and from where does the remainder of the budget come?

- Do tariffs create incentives for, or place constraints on, the development of environmentally sustainable solutions?

- Has the issue of tariff affordability been considered, e.g. by consulting the public?

- Is the city eligible for international trading? If not, how are investments made?

- What financing options are available to the poor with regard to housing, environmental improvements and small-scale environmental solutions? Are these schemes sustainable?

Education and training are examples of interventions that can counteract corruption, while also contributing to more robust urban governance and general capacity building.

4.7 Transparency and accountability

The public should have access to information on how local authorities (and other public actors) use public budgets, i.e. authorities should be held accountable for using their budgets efficiently and in accordance with plans.

Transparency is also crucial to reduce fraud and misuse of public finances. Poorly functioning public systems and infrastructure are not always the result of a lack of resources or capacity. Patronage, nepotism and corruption are often significant contributing factors. For example, The World Bank estimates that 20 to 40% of water sector finances are lost through corrupt or fraudulent practices. The OECD reports that bribery occurs in 50% of public procurement processes[13].

Corruption in public procurement leads to increased costs, choice of second-best technologies, cover-up of emissions and pollution, excessive abstraction of water, and illegal dumping and use of hazardous and other waste. Corruption also harms transparency, as corrupt individuals have a vested interest in avoiding exposure. Education and training are examples of interventions that can counteract corruption, while also contributing to more robust urban governance and general capacity building.

ASPECTS TO CONSIDER

- What formal systems are there for auditing and control of contracts, resource flows, etc?

- Does the public have access to sufficient information about the authorities' management of resources? Are there channels for the public to file claims in cases of unsatisfactory management or suspicion of such?

- Are national initiatives to fight corruption effective at local level?

- Are functions and systems in place for transparent public procurement?

- Are there institutional or social structures or traditions that impede transparency, such as patronage and 'buying' of votes by promising investments in a community?

[13] Corruption in the Water Sector (2006), Stockholm International Water Institute (SIWI).

5.

SUSTAINABLE URBAN SYSTEMS AND POTENTIAL SYNERGIES
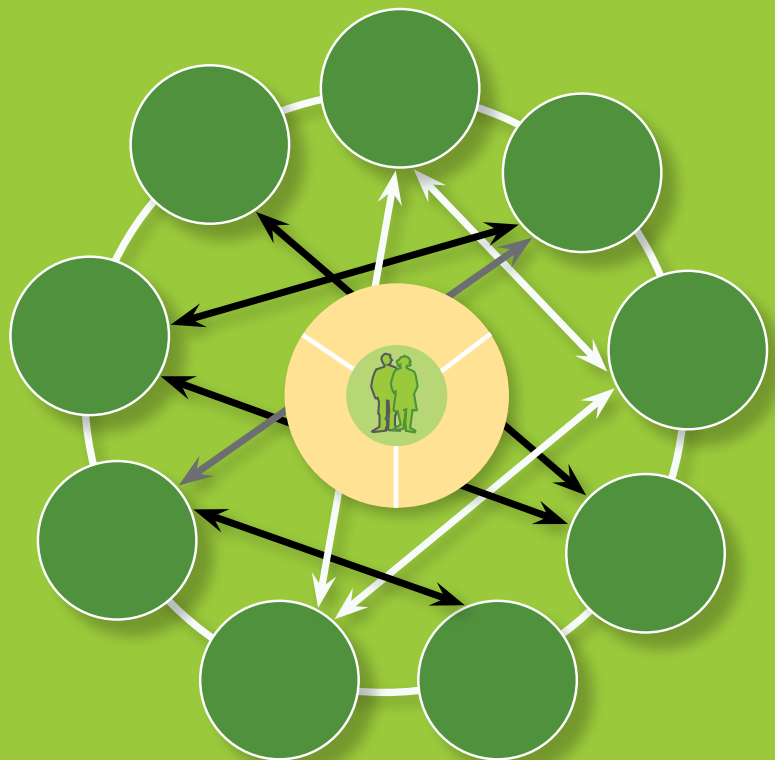
URBAN SYSTEMS SYNERGIES
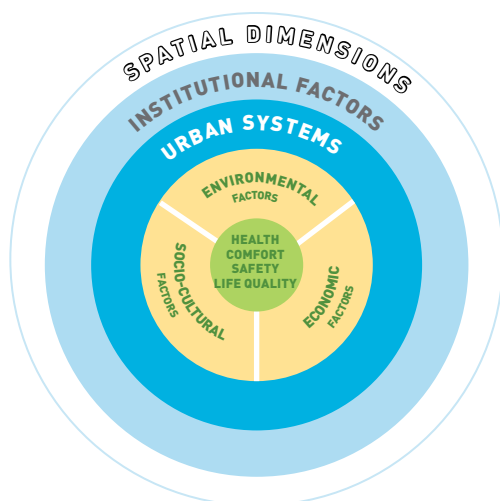
Urban functions and urban structure are considered as one urban system, while urban spatial planning is the institutional process that shapes the development of this system.

CITIES AND TOWNS INCLUDE VARIOUS SYSTEMS

and infrastructure that provide necessary functions and services, e.g. *water, waste and energy, the urban green environment and ecosystems, transportation and mobility, the built environment,* etc. In the *SymbioCity Approach*, urban systems also include urban functions that support citizens in everyday life, including s*ocial, cultural, educational and economic processes and services* (e.g. production, trade and commerce).

All these *urban systems* are of crucial importance for sustainable urban development. They relate differently to the four dimensions of sustainability, which suggests an integrated and inter-sectoral approach to development. In this regard, urban functions, municipal services and infrastructure systems should be made available to all – at affordable costs. As urban development requires significant investments, *adequate financing mechanisms* are essential. Good governance and institutional capacity are also crucial, and the needs of citizens, and particularly poor and disadvantaged groups, should be prioritised (*see Chapter 4*).

In this chapter, the various urban systems are described, with a special focus on the interfaces between and within systems, i.e. how they are linked and interdependent, and how synergies can be achieved. Traditionally, projects and interventions were planned and managed in separate sectors, which often led to suboptimisation. The *SymbioCity Approach* promotes *links and synergies* between different systems, to achieve optimal solutions and use of limited resources. However, synergies can only be identified and achieved by involving stakeholders in an integrated approach to development, which includes economic, environmental and socio-cultural aspects and needs.

In a development context, there are often contradictory interests or objectives that need to be managed, among both stakeholder groups and municipal functions. What is of benefit for one group or area may contradict or compete with the needs and priorities of another. This may be due to conflicting strategies, vested interests, poorly defined division of responsibilities or competition for limited financial resources. For example, contradictory objectives could be to reduce heavy transport in a neighbourhood and to improve waste collection using trucks.

Regarding urban systems technology, progressive development is possible, from small-scale/low-tech, to medium-scale/medium-

tech, to large-scale/high-tech solutions. However, appropriate technology choices in developing countries also need to consider socio-economic aspects such as employment creation through labour-intensive methods and intermediate technology options. The *SymbioCity Approach* promotes innovative approaches to integrated urban environmental development, and solutions that are optimum from an integrated and human, rather than purely technical perspective.

5.1 Urban functions and urban structure

Urban functions are intimately related to everyday life and have various links to and implications for environmental, economic and socio-cultural dimensions of urban development. In the *SymbioCity* context, urban functions include *housing and residential development; industrial production; commercial services; culture and recreation; education, health and other social services.* These functions are all integrated into the urban structure. In this framework, urban functions and urban structure are considered as one urban system, while urban spatial planning is the institutional process that shapes the development of this system.

Planning and development of cities and towns includes economic and socio-cultural aspects, e.g. inclusion of informal settlements and poor and disadvantaged groups. The increasing urban population and its demographic structure must be considered in urban structure planning and designing and locating functions, e.g. housing and other areas. *Access* to various urban functions for all groups in society is a key challenge, which also has environmental implications. In developing countries, the key challenge is to provide adequate housing and services for poor communities living mostly in informal settlements. Multi-stakeholder participation in development planning, that includes effective representation of the poor, is needed to address these challenges.

The *business activities*, markets and production systems of the full spectrum of industries, (heavy, medium, light and knowledge-intensive industry), must be studied with regard to employment, social considerations and environmental consequences. Sustainable industrial development should be based on energy and material-conserving methods and clean technologies, adapted to the circumstances of specific countries.

The necessary shift to environmentally friendly production and products requires long-term policies and action programmes supporting sustainable production and consumption. Even in the developing world, there is increasing awareness of the large market potential for local, small-scale, cheap, but environmentally friendly products in cities and towns.

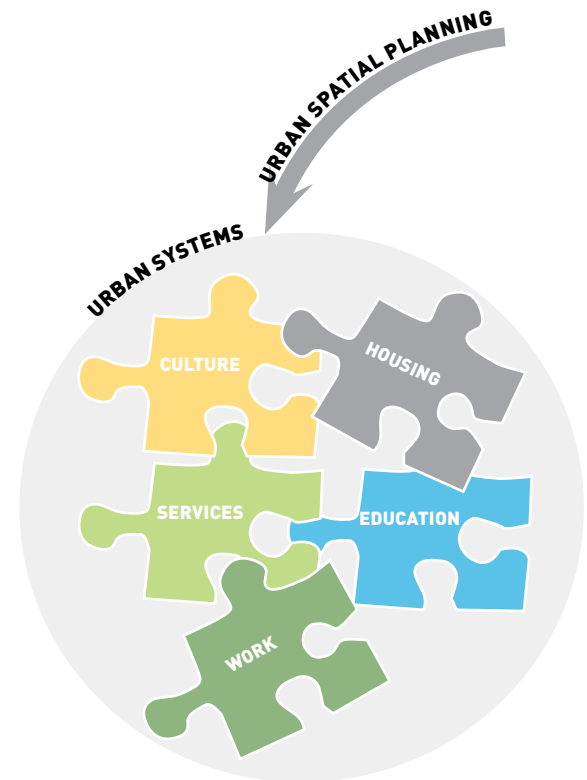**Figure 5.1**
Schematic illustration of different urban functions and their interrelationships.

PHOTO Ordbildarna

Access to various urban functions for all groups in society is a key challenge, which also has environmental implications.
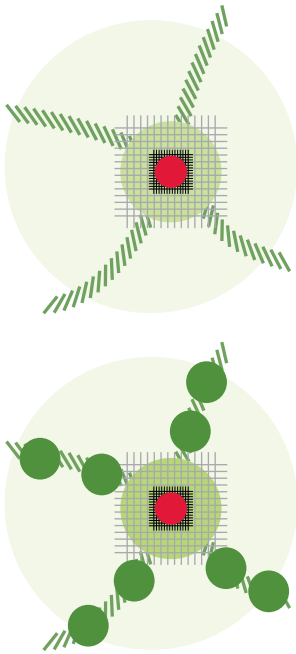
Figure 5.2
Development at nodes along transport corridors promotes access to mobility systems and services.
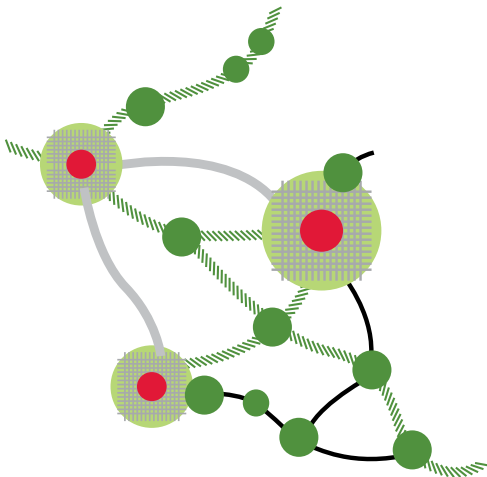

Figure 5.3
Efficient links between centres in a polycentric structure, with development at nodes and along corridors promotes increased sustainability.

Regarding *service functions*, it is important to relate the needs for commercial, cultural and social services to expected population development, commercial and industrial activities and residential areas. The *spatial distribution and location* of such services in the urban landscape needs to be analysed and planned to correspond with living, working and mobility patterns.

To meet the challenges of urban development, the *SymbioCity Approach* promotes strategic development of urban areas with *mixed land use and higher population density* along *transport corridors* and at *development nodes*. However, such strategies must be adapted to specific conditions, based on thorough analysis of the particular urban context. Urban densification increases access to services and service efficiency and can enhance *the socio-cultural environment*. In this regard, the design of the built environment and its integration with the natural environment and quality public spaces are crucial.

The overall *urban configuration* should incorporate varied densities and mixed land use. Different configurations,(concentric, star-shaped, semicircular, polycentric, etc.) seldom exist as pure forms, but rather in different combinations.

As cities develop and grow, there is often a need for *additional land* for housing, work places, services and infrastructure. Depending on the need and available resources, different strategies can be considered. In many cases, cities have expanded to a point where further expansion is restricted, e.g. due to scarcity of suitable land for development, over-extension of systems, or negative environmental or health impacts. In such contexts, densification is the primary strategy to accommodate continued urban growth.

Spatial planning should not regard cities and towns as separate entities, but rather as centres with surrounding hinterlands, to which they are linked by mutual formal and informal provisional systems for food, water, waste, energy, transport and other services. From an economic perspective, these linkages extend to the regional, national and global context, in terms of trade and other relations.

Urban spatial planning should promote access to different urban functions, systems and services, particularly for poor and marginalised communities. Identifying and mapping different needs is thus of crucial importance in the early phases of planning. The household and lived experience is the appropriate point of departure for sustainable community planning for an area or an entire city/town. Regardless of the urban scale, from a human perspective, mobility and accessibility are essential, and from a sustainability perspective, walking, cycling and public transport should be promoted and supported.

Mixed-use development should be promoted on city-wide,

community and household levels, to enhance access to services, income generation, social interaction and security.

Urban typology and density

The urban typology, density and design of cities and towns affects land use efficiency, and possibilities for economic development and socio-cultural sustainability. The typologies below show some of the key planning and design issues for new and regeneration areas. The examples are single blocks, but urban typology and density are equally important at area, district and city level.

PHOTO Sixten Larsson

Central area in a Sustainable Community Unit

ILLUSTRATION Vera Larsson
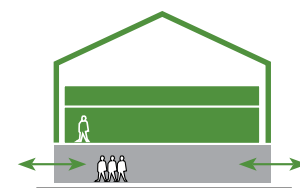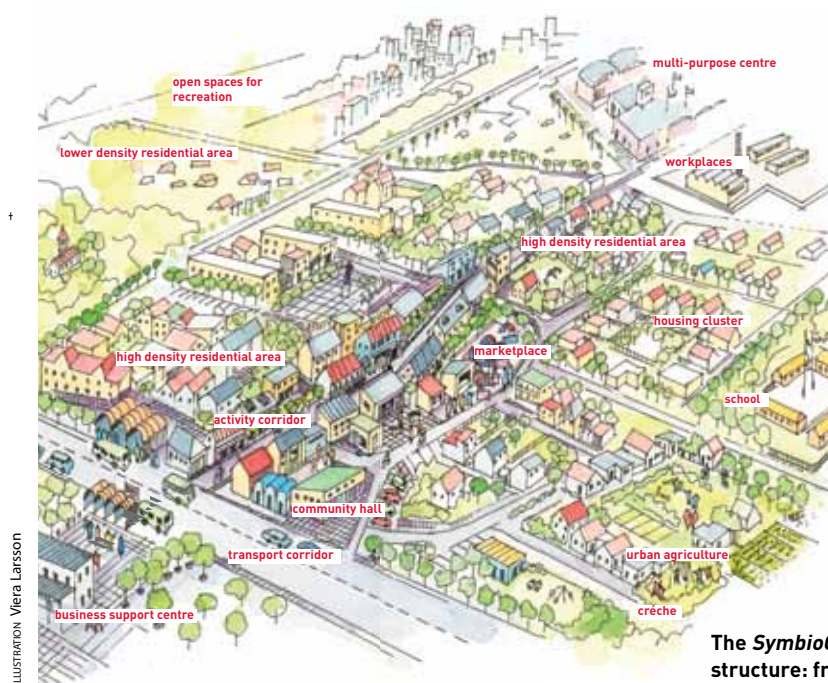
Example of multi-functional housing with spaces on the ground level for businesses, in Johannesburg, South Africa. Multi-functional buildings promote opportunities for income generation and provision of services within neighbourhoods.

The *SymbioCity Approach* promotes a mixed land use urban structure: from large monofunctional blocks to high-density, mixed-use structures.
Image from Sustainable Community Planning Guide, Nelson Mandela Bay Municipality, South Africa.
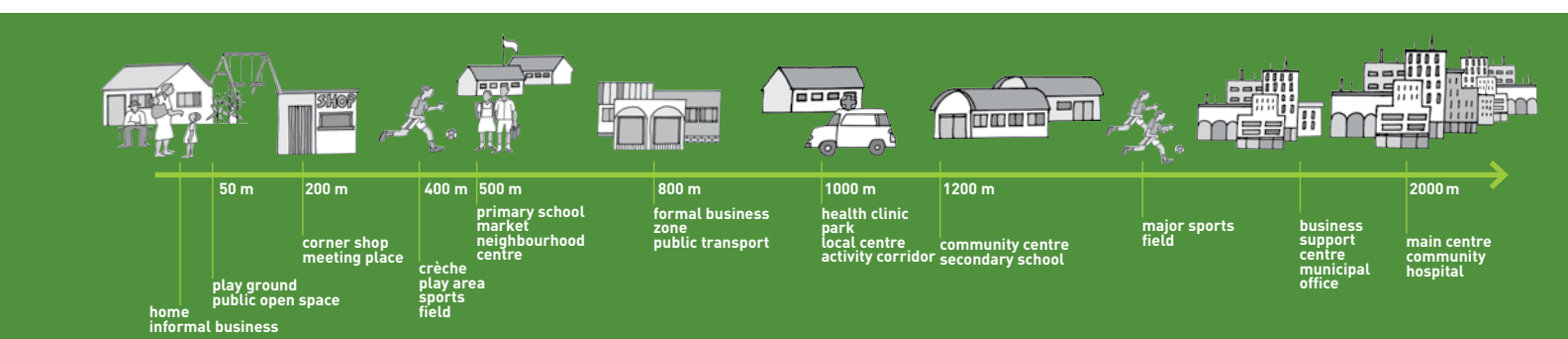
Figure 5.4
Integrated planning and design of urban area should promote access to services and mobility systems for all citizens. The image above indicates maximum desirable distances from any household to essential services and facilities.
Image from Sustainable Community Planning Guide, Nelson Mandela Bay Municipality, South Africa.

Many people believe that high urban density requires high-rise buildings. However, a compact yet varied and attractive built environment can be created by combining a range of urban typologies and building designs.

Figure 5.5

High-rise, low-coverage single point block
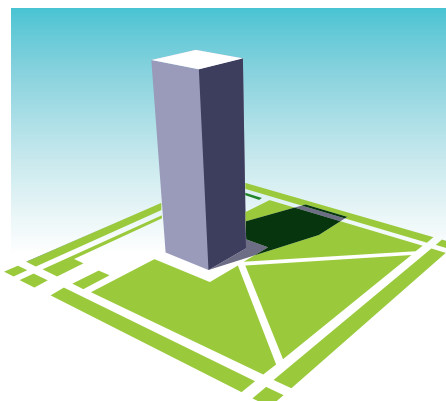
site 100x100 metres	1 ha
floor area/level	324 m²
levels	18
total floor area	5 832 m²
FAR (floor area ratio)	58%
no units (á 80 m²)	73

This solution does not offer private gardens or amenities. There is no direct relationship between the building and surrounding streets, and the large open space might require significant investments for maintenance and management.

Low-rise, high-coverage back-to-back terraces
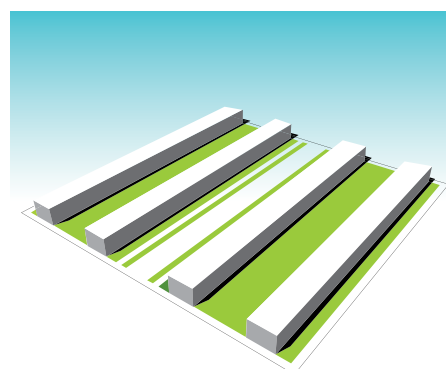
site 100x100 metres	1 ha
floor area/level	1 440 m²
levels	2
total floor area	2 880 m²
FAR (floor area ratio)	29%
no units (á 80 m²)	36

This solution offers a well-defined public space with clear division between public and private realms. All dwellings have direct access to private gardens. The high site coverage minimises the potential for communal space and a more varied urban landscape.

Medium-rise, medium-coverage urban block

site 100x100 metres	1 ha
floor area/level	3 500 m²
levels	3
total floor area	10 500 m²
FAR (floor area ratio)	105%
no units (á 80 m²)	131

The design has an active street frontage with potential for commercial and public activities at ground floor level. More space can be made available for private gardens, communal areas or a park. Different building heights and plot widths create variety.

URBAN FUNCTIONS –
POTENTIAL SYNERGIES AND INTERFACES

- The degree of density and provision of mixed functions supports and maintains a diversity of social and commercial services

- Identification of alternative development scenarios can stimulate synergies between integrated land use, mixed-use structures, green areas, public spaces, mobility systems and infrastructure

- Urban development along corridors and nodes creates economies of scale which can sustain public transport systems and other infrastructure and services

- Local collection of rain and storm water can enhance greening and improved ecosystem services, micro-climates, and an attractive built environment (cityscape)

- Improved public transport linked to services improves accessibility for residents in poor settlements to city centres, work places, and social and commercial services

- The location of industries, wastewater treatment plants and waste collection facilities should be coordinated with other land uses, and possible impacts on the health and well-being of the inhabitants and the environment should be considered.

ASPECTS TO CONSIDER

- How can mixed land use and densification be integrated in planning and design, to counteract mono-functional development?

- How can densities be increased without compromising cultural, historical or ecological features?

- Are there policies and strategies for developing social, commercial and cultural functions in housing areas, urban nodes and the city centre? How can access to green and recreational areas be improved, especially for the poor?

- How can the structure, design and location of urban functions reduce and minimise air, water and noise pollution and the environmental impacts of industry?

- Has the need for short and long-term provision of land for housing, workplaces and industrial development been assessed and integrated in policies, strategies and plans?

- How can informal housing located on unsuitable sites (landfills, landslide sites, embankments, wetlands, etc.) be relocated or replaced?
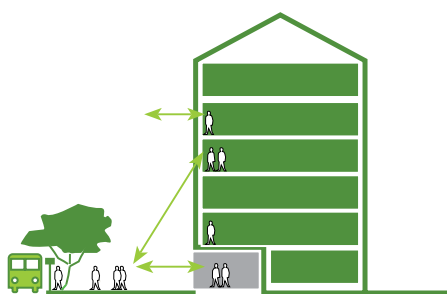
Figure 5.6
The interaction between public and private space increases safety and creates an attractive streetscape. In higher buildings, contact with street life decreases.

»By sharing space we will have more space!«

Dawn McCarthy, Director Land Planning & Management, Nelson Mandela Bay Municipality

Figure 5.7
The provision of and access to functional and attractive public space is especially important in dense and highly populated areas, including informal settlements.

5.2 Public space and the public realm

Cities and towns consist of a wide range of different urban systems and functions, which are spatially organised and distributed. *Public space, or the public realm,* can be seen as the *cohesive element* that connects all functions. Public space can be defined as *public and semi-public*, depending on it function, ownership and management. Other urban functions are private or semi-private.

The *SymbioCity Approach* regards all space that is not private as public space, i.e. *space in the urban landscape that is accessible and used by citizens for different purposes.* Public space can be described as 'the living room of the city' – where people meet and interact spontaneously or for various purposes. Public space needs to be available, accessible and safe, making the city an attractive place for both citizens and visitors.

Public space includes parks, green areas, squares and streets, as well as *public facilities* such as schools, libraries, sports grounds, and bus stations, while commercial buildings are semi-public. Public space is usually intended and designed for a specific purpose. The use of public space can also be unintended, as when citizens occupy a public space in protest, usually against existing conditions and/or the neglect of their needs or rights.

Public space relates in different ways to the environmental, socio-cultural, economic and spatial dimensions of sustainability. The layout and design of public places such as streets, squares and parks should support the *urban green environment*. The planting of trees and other vegetation enhances the urban ecosystem, biological diversity and attractiveness, and supports recreational and socio-cultural functions. An appropriate choice of vegetation combined with rainwater harvesting can reduce 'heat islands' and create pleasant microclimates in the city, as vegetation has a cooling effect.

Attractive and user-friendly public space encourages social interaction between different user groups. This can be enhanced if public functions, services and commercial activities are connected to public spaces. Social, cultural and economic aspects are relevant to all types of public spaces, as human meeting places.

Good physical and spatial design is of crucial importance in making attractive public spaces. Spaces that are too large can feel daunting and make people feel exposed, isolated and insecure. Public spaces should be 'human scale', with lighting, benches, trees and vegetation making them attractive, safe and user-friendly. A diverse mix of uses and users should be encouraged, as this creates a rich, varied and stimulating social environment.

Links and continuity between various spaces and places contribute to mobility and an attractive, interconnected and safe environment. Such links can be 'greened' or integrated with green areas that support the preservation and development of the urban ecology.

PUBLIC SPACE –
POTENTIAL SYNERGIES AND INTERFACES

- The provision, connectivity and design of public space in a city or area can support increased safety, security and social interaction

- Public space combined with greening and water management can have a positive impact on the urban climate and ecosystems and contribute to attractiveness

- Well designed public space, combined with social and commercial services create a vibrant and attractive urban environment

- The distribution and design of public space should encourage mobility, especially for pedestrians and cyclists.

- Public space has an important recreational and social function – especially in contexts where the private open space is limited

- Well designed and attractive public spaces contribute to the image and character of an area. They enhance the experience and quality of life of citizens and visitors, and attract visitors and users.

ASPECTS TO CONSIDER

- Has an analysis been made of the provision, distribution and use of existing public space? How have the results of the analysis been incorporated into strategies and plans?

- Are there strategies in place for the provision of public space, from metropolitan to local level?

- How do public spaces support mobility in local areas and on a city wide level?

- How can the connectivity of public spaces be enhanced to supports mobility and access to various urban functions?

- Has adequate public space been allocated in new developments or regeneration areas?

PHOTO Klas Groth

PHOTO Sixten Larsson

PHOTO Sixten Larsson

Public spaces have important social, cultural, recreational and economic functions.

5.3 Urban landscape planning and ecosystems

The provision of public space in towns and cities includes *landscape planning* and creating *robust ecosystems*, which contribute to climate change mitigation, strengthen ecological biodiversity and provide for recreational and social activities in urban areas. Landscape planning includes the provision of attractive *open space systems* in and around cities/towns, the *distribution and location* of parks and green corridors, and the greening of streets and public spaces. Landscape planning develops an urban landscape that contributes to

> human use for recreation and social, cultural and economic activities
> climate change mitigation
> biodiversity and ecosystem sustainability
> recycling of waste products by providing facilities.

The green urban landscape and ecosystems are normally integrated elements of the overall regional ecosystem, and should be treated as such in local area planning and development.

The pressure on the green environment, its configuration and size, and the consequences if it is not protected, is the subject of much research and often intense debate in many cities. For example, the recreational use of green areas depends on their accessibility from housing and working areas, as easy access results in high utilisation. The continuity of green areas is of great value also to flora and fauna, and thus to ecosystems as such. Urban landscape planning has the important function of integrating the natural and built environments in optimum ways.

It is useful to develop a hierarchy of green areas with links between green courtyards, urban parks and larger recreational areas. In many cities/towns, rivers, interlinked wetlands and ridges provide a natural 'skeleton' on which to develop an integrated network of green areas, with natural links to the urban hinterland.

Poor urban settlements should be linked to green corridors which include bicycle and walking paths, recreational areas, meeting places and sports grounds, etc. The *green spatial network* is an essential system and component of any urban spatial plan. It is an essential aspect with greater scope for development in new areas, but one that should also be enhanced in the existing urban built environment wherever possible.

Small-scale, easily accessible parks in dense built environments are more intensely used than distant large parks or green areas. It is thus important to balance the location of larger parks and green areas with small green area and parks in local neighbourhoods.

Figure 5.8
Illustration of how different landscape elements can be connected to provide attractive, green public spaces, and support ecosystem services in an urban area.

LANDSCAPE PLANNING –
POTENTIAL SYNERGIES AND INTERFACES

- Purification of water bodies connected to recreation and biodiversity, and use of local water resources

- Integrated planning of green areas and the attenuation of storm water via attractive, open ponds and rivers, streams and channels.

- Transformation of wasteland areas into green areas and parks

- Redevelopment of closed landfills as green areas for recreational purposes

- Using green areas to help school children understand ecology and the environment

- Green areas are the lungs of the city which are essential to reduce air pollution

- Green corridors should be planned in coordination with paths for cycling and walking

- The topography and vegetation of green areas can create moderated micro-climates, diffuse air pollution, reduce sun and wind exposure and influence energy demand

- The use of green areas for urban agriculture, e.g. in South Africa, cows often graze on green areas adjacent to informal settlements in cities.

PHOTO Mats Samuelsson

Now you can swim and fish in Växjö's lakes, which were once dangerously polluted.

ASPECTS TO CONSIDER

- To what extent are green areas valued as essential eco-assets, contributing significantly to health and well-being in the urban environment?

- How have the green areas as a resource for recreation been considered on various interlinked levels: courtyards amongst buildings, neighbourhood and city district parks and sports grounds, green corridors and wedges, and links to other parts of the city and its surrounding landscape?

- Small water bodies (streams, ponds, etc.) are vital to maintain biodiversity (plants, insects, fish, amphibians, birds, etc.). To what extent has this been taken into account?

- Is the importance of green areas and ecosystems recognised and enhanced in spatial plans?

- How is the relationship between rural and urban areas integrated in spatial plans?

5.4 Mobility, traffic and transportation

A key feature of sustainable urban areas is *access for all citizens* to functions, services and systems. This requires different mobility systems on regional, city/town, area and neighbourhood levels, with integrated transit opportunities between levels. An Integrated Transport System (ITS) includes management and operation of infrastructure of all mobility modes, (pedestrian paths, bicycle lanes, buses and bus lanes, roads and railways and waterways).

An ITS also includes traffic management and safety aspects. *Information and Communication Technology* (ICT) can contribute to an ITS (e.g. integrated ticket systems, use monitoring, surveillance to increase safety and identify problems, and public information and communication) These systems offer 'leap-frog' opportunities for developing countries, as cities such as Curitiba in Brazil have demonstrated.

The *SymbioCity Approach* promotes an *integrated approach to planning and design of mobility and transportation systems*. Combined land-use and transport planning can improve mobility options in cities and towns, especially in a long-term perspective. This key combination should be supported by technical capacity and innovation, institutional arrangements, legislation and policies, capacity building, and monitoring and evaluation.

Depending on the *level and scale* of the mobility system, various options can be considered. A hierarchy of mobility modes can be used as a guide to prioritise needs in a particular situation. For example, priority can be given to pedestrian and bicycle systems at neighbourhood level, and public transport systems on a city level. The *SymbioCity Approach* promotes a combination of different transportation systems to allow for choice, but also to create a more *robust and resilient mobility system*. Transport nodes often define general urban nodes where other functions and services are clustered, promoting the use of public transport and linking with pedestrians and bicycles routes, car pools, etc.

Different forms of traffic must be considered in every urban area. Heavy traffic should be minimized and restricted to routes and lanes to protect pedestrians and cyclists. Transport of goods (and particularly hazardous substances) should be coordinated with both land use and urban functions, to minimise safety and environmental risks.

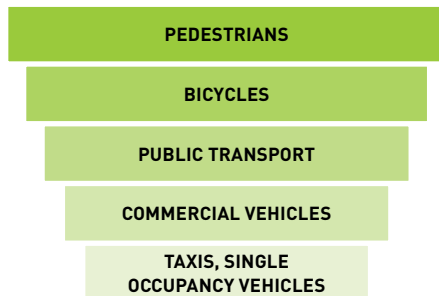**Figure 5.9**
A possible transportation and mobility hierarchy in a city, town or area. Depending on the local context, different aspects of a sustainable mobility strategy can be prioritised.

MAP Stockholm City Council
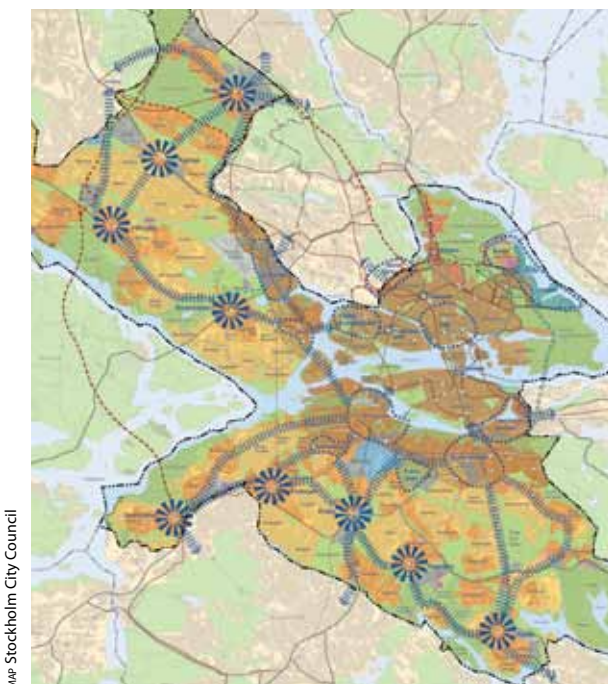
Figure 5.10
An integrated approach to land use and transportation planning can mitigate and minimise exposure of residents to noise, air pollution and safety risks.
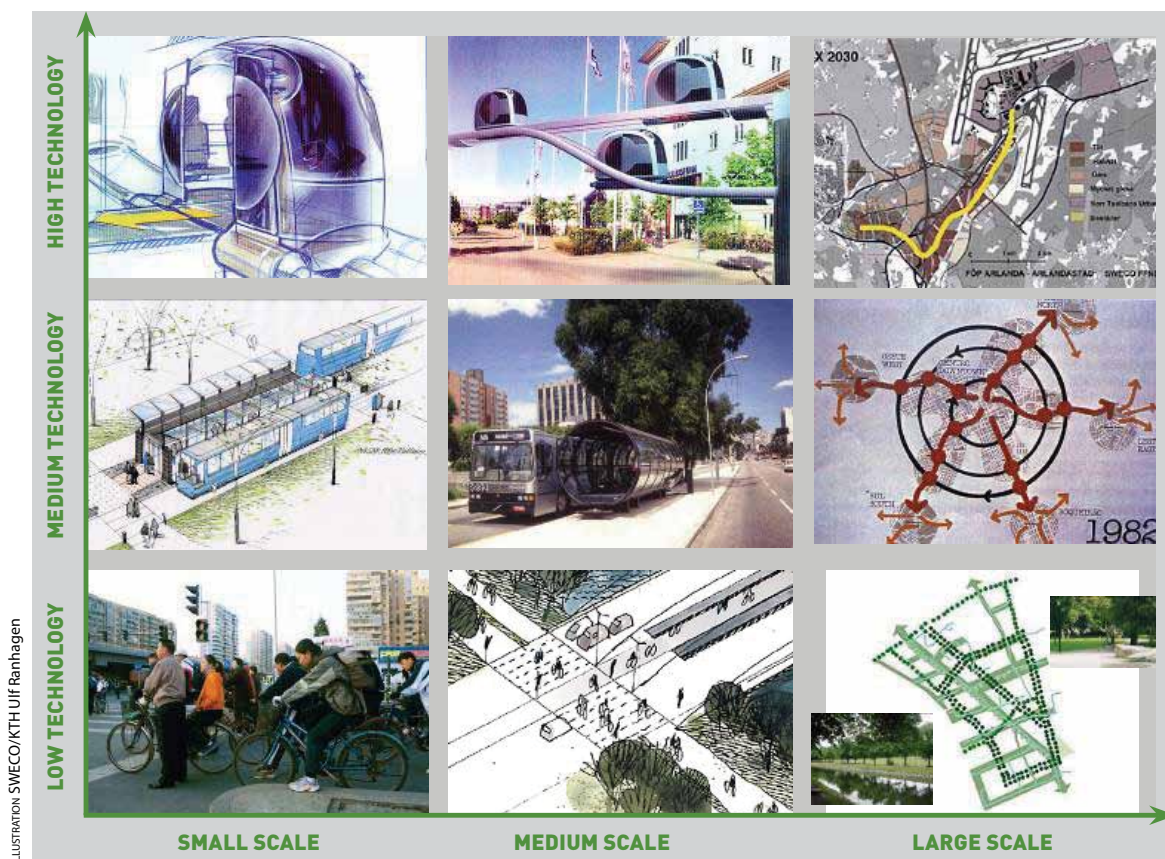
Figure 5.11
Mobility systems – scale and technological levels.

Private vehicles are the dominant mode of transport in most cities, and this is likely to continue, in spite of negative impacts due to CO_2 emissions, congestion and air and noise pollution. However, *future vehicle technology and renewable fuels* can address these problems. New fuels such as ethanol, biogas, hydrogen and electricity will reduce the environmental and health impacts of non-renewable fuels. Renewable fuels will become increasingly cost-competitive as global oil production peaks and then declines, driving up oil prices.

However, there is still a need to reduce the use of private cars due to congestion and lack of space for cars in cities. Car sharing should be promoted to reduce car use and the inefficiency of this mode of transport.

Urban areas need to be *thoroughly planned and designed* from a traffic perspective, to *increase road safety and security* for all users. Roads and streets should have a clear designation for different users, especially considering vulnerable pedestrians and cyclists. However, integrated shared-space solutions can sometimes be relevant, e.g. areas where driving is only permitted at low speed and with consideration for pedestrian traffic.

Space comparison – the space required for 60 people to travel by car, bus or bicycle – shows that these modes have a significant impact on the use of space in cities.
Image from City of Münster, Germany. (www.muenster.de/stadt/stadtplanung)

An integrated approach to mobility and transport *reduce urban sprawl* and improve public transport, thus reducing the need to use private vehicles. Economic opportunities are also promoted along public transport corridors and at nodes, and access to social, cultural and commercial services is improved. With good planning and design, a more attractive and lively built environment can also be created.

Redevelopment and improvement of green paths and connecting links in Sundsvall, Sweden.

EXAMPLE

The four principles for traffic planning, according to the Swedish National Board of Traffic.

1. Reduce the need of traffic movements

2. Better utilisation of existing system

3. Restoration of existing system

4. New system (the vision).

The vision of a new transportation system should guide long-term development and interim strategies and projects. The backcasting method (step 1–3) can be used in this context (*see Chapter 6*).

There are several interfaces between mobility systems and socio-cultural, health and environmental aspects. For example, the greening of a transportation system is essential to overcome the major environmental impact of cars. Citizens living close to traffic are at risk from toxic air emissions. Special bus lanes, light trains and cycle lanes contribute to sustainability and resilience. 'Green streets' where traffic is banned or has limited access have been introduced into areas with narrow streets, including in city centres, e.g. in Cape Town, South Africa, greatly enhancing the social and cultural ambience of the city.

EXAMPLE

Measures to stimulate public transport
- Congestion charges on certain major roads, e.g. in Stockholm, Sweden and London, England

- Integrated public transport systems, e.g. Curitiba, Brazil and Bogota, Colombia

- Urban planning and design that reduce the need for travel and car use (mixed land use, access to services, 'neighbourhood' planning, etc.)

PHOTO Boatadicts

A transport corridor in Curitiba, Brazil, supported by high-density and mixed-use residential development.

TRANSPORTATION – POTENTIAL SYNERGIES AND INTERFACES

- Mixed land use and a variety of urban functions in neighbourhoods minimise the need to travel, increase accessibility, improve energy efficiency and decrease air and noise pollution

- Providing urban functions along development corridors and/or at urban nodes, combined with increased density, supports the use of public transport

- Digestion of biomass generates gas, which can be used as fuel for vehicles

- A mobility network covering the city or area, can promote walking and cycling, which also improve the health and well-being of residents

- Coordination of traffic on certain routes (heavy traffic and transportation of hazardous goods in particular), can improve safety and reduce environmental risks.

ASPECTS TO CONSIDER

- Have current needs for transportation been measured or assessed? How have the results been integrated in the transport plan for the city or area?

- What is the current state of the public transport system? Does it cover the entire city, and is it appreciated by the users? If not, why?

- How can the public transport system be improved by alternative or supplementary systems or technologies?

- How is the network for public transport structured and designed? How does the system connect different urban functions and areas?

- Do all citizens have access to the system, particularly in poorer communities?

- Does the network of bicycle and pedestrian routes connect to the public transport system? How are these networks designed to meet the needs of different users (children, women, men) at various times (day, night, rush hour)?

- A mobility management system can increase efficiency and user-friendliness of the public transport system, particularly if there are different service providers. Has a mobility management system been considered?

- Has an integrated approach to land use planning and transportation/mobility planning been considered? How can this, in combination with densification, support increased mobility and access to services, workplaces, etc.?

Figure 5.12
Different interlinked aspects to consider in the planning, layout and design of sustainable buildings.

Solar power panels in the Eco Village in Galeshewe, Kimberley, South Africa.

PHOTO Emile Hendricks

1 Worldwatch Institute, 2007, State of the world. Our urban future.
2 Cities and climate change, 2011, p 38.

5.5 Building design and architecture

In the *SymbioCity Approach,* sustainable architecture includes all the relevant aspects to be considered when *planning, designing and constructing* all types of buildings. The adaptation of buildings to the micro-climate, ground conditions and surrounding buildings, traffic systems and green areas is of major importance, for the indoor and surrounding environment.

Good design can make buildings more energy efficient decreasing their environmental footprint and saving costs. Appropriate design of the structure and choice of materials and technical systems, especially for heating and cooling, are key aspects. The aim should be to reduce the use of energy that is piped, wired and trucked into cities. Globally, buildings account for more than 40% of total energy use[1] and some 15% of global CO_2 emissions[2].

The energy used by buildings differs dramatically, depending on their design and function. Well-designed buildings need less cooling in hot climates, and less heating in cold climates. In certain contexts zero-energy, passive energy (most traditional buildings) and even energy generating houses and buildings – so called 'plus-buildings' (e.g. solar-generated electricity fed back into the grid) are possible. Technical systems now also enable heating and cooling *exchange systems* within and between buildings in certain instances, e.g. linked to mixed land use. Such options open a new market in terms of distribution of energy.

A *comfortable and healthy indoor climate* depends on good design and technical systems. Sustainable energy, waste and water systems at building level (micro level) contribute to macro urban sustainability. Environmental assessment of buildings should include both internal and external environmental effects on people and the natural environment. Depending on the location and local climate, buildings can be designed to prevent the effects of, or make use of sun, wind and moisture exposure.

A key challenge in developing countries is to find ways of constructing simple, functional and healthy buildings from local, environmentally friendly materials, that offer protection from heat and/or cold, and that are affordable for poor people. Self-built houses based on traditional experience and know-how can contribute to this, and a physical environment that people own and feel proud of.

Cultural traditions and vernacular architecture can play an important role in building design, as they often have qualities that have developed over time according to the specific conditions in a particular local context, which can be transferred to contemporary designs.
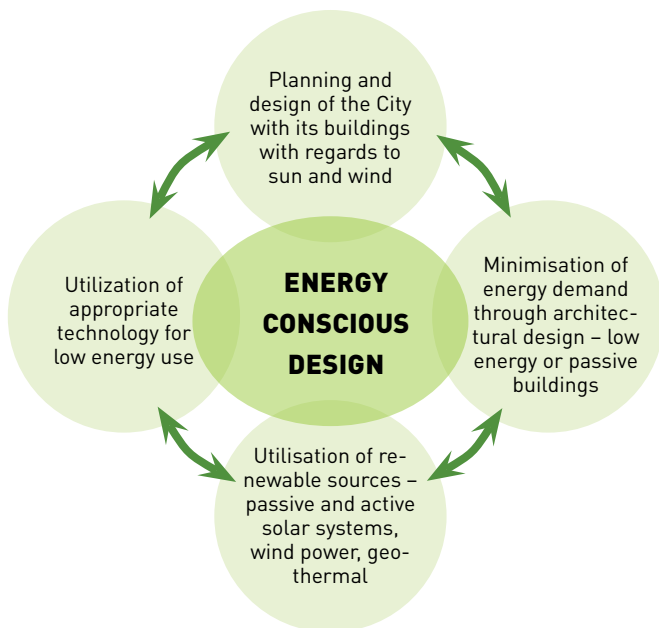
The sustainability centre – an example of sustainable design.
Tangshan Bay Eco-City, China, Sweco

BUILDING DESIGN – POTENTIAL SYNERGIES AND INTERFACES

- The design of walls, roofs and floors (insulation, space and design of windows, etc.) is important for reducing energy demand and costs

- Energy demand can be reduced by careful building design in relation to the surrounding landscape and microclimate (e.g. sun and wind protection)

- Green roofs can attenuate storm water flow and contribute to cooling in summer

- Buildings and their surroundings should be designed to facilitate separation and collection of waste, e.g. waste management centres on the ground floors of multi-family housing

- Buildings should be easily accessible from bicycle and walking paths and parking areas

- Multi-purpose buildings for both housing and small-scale business facilitate mixed use. This has social and economic advantages, and environmental problems can be solved at building level

ASPECTS TO CONSIDER

- environmentally friendly construction materials

- materials that minimise energy demand

- heat exchange (reuse of heat)

- solar water heating and solar electricity generation

- efficient shading and self-ventilation included (when relevant)

- orientation towards the sun for passive heating and solar panel/solar cell efficiency

- waste sorting and collection spaces and systems

- systems for collection, minimisation and reuse of storm water

- systems for reuse of grey water (in water-scarce areas)

- ways of reducing negative wind and sun exposure.

5.6 Energy systems

The energy sector includes *energy production, distribution and use* for different purposes. In a sustainable city, an environmentally safe supply of energy from renewable energy sources should be a priority, together with energy efficiency in all aspects and at all levels. Minimising the energy needs of buildings is a key factor for energy efficiency. Local authorities should involve all stakeholders in identifying sustainable solutions, from energy providers and distributors, to end-users in both commercial and residential sectors.

The first strategy is to minimise demand through *energy-efficient urban planning, building design, production processes, transport systems, vehicles, equipment, monitoring systems and lifestyles.* Energy conservation supports optimal and renewable energy solutions. Solar energy is relevant in most countries. District solutions for both heating and cooling are options in densely populated areas. Solutions at the level of single building and households are essential, and relevant technology is increasingly available. However, limited public awareness and household finances are often key constraints.

Transportation and construction also use large amounts of energy. Public transport reduces energy use and environmental impacts in terms CO_2 emission and air and noise pollution. Energy use accounts for the bulk of human CO_2 emissions.

Close to 300 million poor people living in cities lack access to electricity and other modern energy services. The majority depend on burning dung, wood, charcoal or other biomass, and the resulting indoor air pollution causes millions of deaths annually. Proper *building insulation* and *clean, renewable energy sources*, etc, can contribute to addressing this problem. Inefficient and unsafe fuels (including paraffin) and equipment for cooking and heating have both health and environmental impacts, including devastating fires in informal settlements, with poor people, and especially children and women, being most affected.

Sustainable urban development requires the provision of safe and affordable energy to all inhabitants at all times. Different *technical solutions* on city, district, local neighbourhood and household levels should be combined to create an *efficient and resilient energy system*, which increasingly uses renewable energy sources, to mitigate climate change and harmful local environmental impacts.

Clean, renewable energy sources can contribute to addressing the lack access to electricity and other modern energy services.

PHOTO courtesy SCP Guide, Port Elizabeth, South Africa

Figure 5.13
Energy systems – scale and technological level

HIGH TECHNOLOGY

MEDIUM TECHNOLOGY

LOW TECHNOLOGY

SMALL SCALE   MEDIUM SCALE   LARGE SCALE

SUSTAINABLE ENERGY –
POTENTIAL SYNERGIES AND INTERFACES

- Urban energy use can be reduced by energy-saving urban planning, building design, production processes and technologies

- Digestion of biodegradable waste can produce gas for cooking, heating, etc.

- Reduced burning of biomass reduces deforestation, protects ecosystems that absorb CO_2, and improves indoor environments and health

- Incineration of waste in large-scale CHP-systems (Combined Heat and Power) systems – but high emissions standards and the optimum technology are essential to limit dioxin emissions

- Alternative, affordable, energy efficient and environmentally friendly energy solutions can be developed through cooperation between the energy sector and local authorities, contributing to job creation, a better environment and a safe supply of energy.

ASPECTS TO CONSIDER

Is there an energy plan and strategy to supply all inhabitants, 24 hours a day?

- Is energy efficiency in all sectors included?

- Is substitution of non-renewable energy sources part of the plan?

- Does the plan include affordable energy supply for the poor?

- Have central or district solutions been considered for heating and cooling?

- Does the city have a plan to reduce household and other emissions?

- Does urban planning include energy conservation in area planning and building design?

- What renewable energy source options have been identified, planned or developed?

5.7 Waste management

In a *SymbioCity Approach*, sustainable waste management is essential to improve the environment, health and quality of life for inhabitants and to use waste as a resource for e.g. compost or provision of energy. Efficient and resource-conscious waste management depends on organisational, operational, technical and financial aspects and capacity.

The so-called waste hierarchy shows in which order waste should be handled and has been introduced in the waste directive adopted by the European union. It encompasses the following steps with formulations inspired by the directive

1. *Reduce (Minimise) the waste volumes* and hazardous waste in production, packaging, distribution and consumption

2. *Reuse waste* for example by marketing and selling second-hand products

3. *Recycling of waste* for example by using the material from packaging and other products as a source for the production of new products.

4. *Recovery of energy from waste* in order to replace other non-waste material

5. *Deposit and treatment of waste residues* in landfills – the last alternative when all other options have been used.

REDUCE/MINIMISE THE WASTE VOLUMES
REUSE WASTE
RECYCLING OF WASTE
RECOVERY OF ENERGY FROM WASTE
DEPOSIT AND TREATMENT OF WASTE RESIDUES

Household and industrial waste should not be mixed and hazardous or contagious waste must be incinerated, or contained in specially designed and protected landfills. It is important to identify, separately collect and treat the hazardous waste from industry, hospitals, etc. Households also need to be aware of what waste is hazardous, and have access to hazardous waste disposal or recycling facilities provided by local authorities and/or the private sector. A hazardous waste management plan is essential, and should include the reduction of hazardous substances in production processes and products, particularly in agriculture and food. In this regard, organic, sustainable agriculture should be promoted and supported.

Any waste dumping in open areas is unacceptable, and properly managed waste collection and environmentally safe and protected landfills are essential, particularly where scavenging by poor people is a problem. Public education and community and small local contractor participation is essential to improve waste management in informal settlements, which are often inaccessible for large municipal waste collection vehicles.

PHOTO Ordbildarna

Street cleaners are members of the 'Town Image Team'. From Kai !Garib Municipality in South Africa.

In 2008, only 15% of the total waste generated in Sweden was deposited at land fills* (42% reuse of materials, 37% used to generate energy and 6% untreated leachate). Only about 1% of Swedish household waste was dumped in 2010 – the rest was recycled or burned.

*Naturvårdsverket, remiss nationell avfallsplan, 2011, Avfall Sverige. *excluding the mineral sector.*

In many cities, waste separation, collection and control, including landfill standards, need to be improved. Old landfills should often be closed and the sites rehabilitated. Former landfills can be *transformed into green areas* that improve the *biological diversity* in an area, and can even be used as parks or for recreational purposes. New landfills should be developed with higher environmental and safety standards to improve environment and reduce health risks. Landfills can also include gas generation and recovery systems.

However, it is also essential to reduce the amount of waste that needs to be accommodated in landfills, by waste reduction, reuse and recycling measures and facilities at different levels.

Local authorities are mostly responsible for waste management. However, a sustainable waste management system requires cooperation among all stakeholders, including communities and the private sector, which can both play an important role in all aspects of waste management, and create opportunities in the formal and informal economy.

Figure 5.14
Waste systems – scale and technological level.

ILLUSTRATION SWECO/KTH Ulf Ranhagen

WASTE MANAGEMENT –
POTENTIAL SYNERGIES AND INTERFACES

- Waste collection creates a high transportation load. Waste utilities, private actors and traffic planners need to plan how to make waste transportation efficient

- In urban areas with no, or limited waterborne sanitation, efficient collection and /or disposal systems and services must be developed to protect community health, environments and quality of life. It is important that responsibility for dry toilet waste, septic sludge and other types of waste is clearly allocated.

- Minimisation of industrial waste and replacing hazardous substances requires collaboration between environmental and waste authorities and industry

- Water and drainage utilities and waste collectors need to cooperate to prevent dumping of waste and septic sludge in storm water and natural water systems

- Digestion of biodegradable waste (e.g. wastewater sludge) can produce gas

- In medium-income countries, waste incineration is an option, but environmental controls must be rigorous

- New landfills need to be carefully located in order to protect water sources and land from pollution and not be too close to existing or future residential areas

- Old waste dumps can be rehabilitated for ecological and recreational purposes.

ASPECTS TO CONSIDER

- Is the public informed about environmental and health effects of poor waste management?

- Does the city have a waste management plan that includes affordable solutions for the poor?

- Is management of hazardous waste and hospital waste part of the plan?

- Have private actors (formal and informal) been involved in planning and solutions?

- Have the needs of the poor been considered?

- What solutions are there for managing hazardous household, industry and hospital waste?

- How can cooperation between waste management, environment and urban planning departments be improved?

- How can knowledge about amounts, types and treatment of waste be improved?

- What are the objectives and targets for waste management and waste minimisation?

- Is there a sanitary landfill for hazardous waste, and if not, is one planned?

- Is there collaboration with neighbouring municipalities on sustainable waste management?

5.8 Water management and sanitation

Water supply and sanitation is a fundamental dimension of sustainability. It is a Millennium Development Goal to reduce the proportion of people lacking access to safe water and basic sanitation by half by 2015. In densely populated areas and in medium-income countries, water-based sewage systems and treatment plants may be feasible, while in peripheral locations and with inadequate resources, dry sanitation systems are often more relevant.

Wastewater management by water and sanitation utilities can also be improved by reducing wastewater volumes, improving treatment methods and incorporating gas generation systems.

Fresh water is a scarce resource in many parts of the world, and needs to be used carefully. Access and safe provision of potable water needs to be secured in urban areas. Water sources such as ground water, lakes or rivers need to be sensitively used and protected from pollution and contamination. Measures include closed systems, minimising release of wastewater and harmful substances into basins or reservoirs and controlled land use in catchment areas.

Potable water use can be reduced by minimising leaks in infrastructure systems and households, reducing its use by industries, and more efficient household water use. User awareness of the need to conserve water, and actual water saving are essential.

The combination of different water sources can also decrease the use of potable water, e.g. rainwater collected in ponds or tanks can be used for watering gardens and green areas, as can filtered grey water, if free of harmful substances. If separation of wastewater is an option from a technical and economic perspective, 'black' water can be used as an energy source, as it contains organic material.

The *SymbioCity Approach,* promotes identification of different water sources when conducting a sustainability review and planning new developments, and combining natural and human systems to create synergies that support sustainable water management.

An integrated approach to planning and design of urban areas should include efficient use of the various types of water, and minimising the use of potable water, particularly in water-scarce regions. Green areas, parks, streets and squares can be designed to retain water, which also has a cooling effect in hot climates.

Large systems solutions tend to be long-term and mostly irreversible. Weak management of water resources also leads to water shortages. Sustainable options need to be carefully considered from a total systems perspective, including issues such as water conservation, water, groundwater pollution, health and hygiene, socio-cultural aspects and affordability. Designing a just and transparent tariff system is essential, and should include consultation with all stakeholders.

PHOTO Viera Larsson

Fresh water is a scarce resource in many parts of the world, and needs to be used carefully.

Figure 5.15
Water supply and sanitation systems – scale and technological level.

ILLUSTRATION SWECO/KTH Ulf Ranhagen

HIGH TECHNOLOGY

MEDIUM TECHNOLOGY

LOW TECHNOLOGY

SMALL SCALE   MEDIUM SCALE   LARGE SCALE

Building/block Stormwater storage

Detention/ irrigation

green area

Urban waterscape/ green scape infiltration, wetlands

green area

District stormwater storage

District stormwater storage for irrigation, watering of green areas
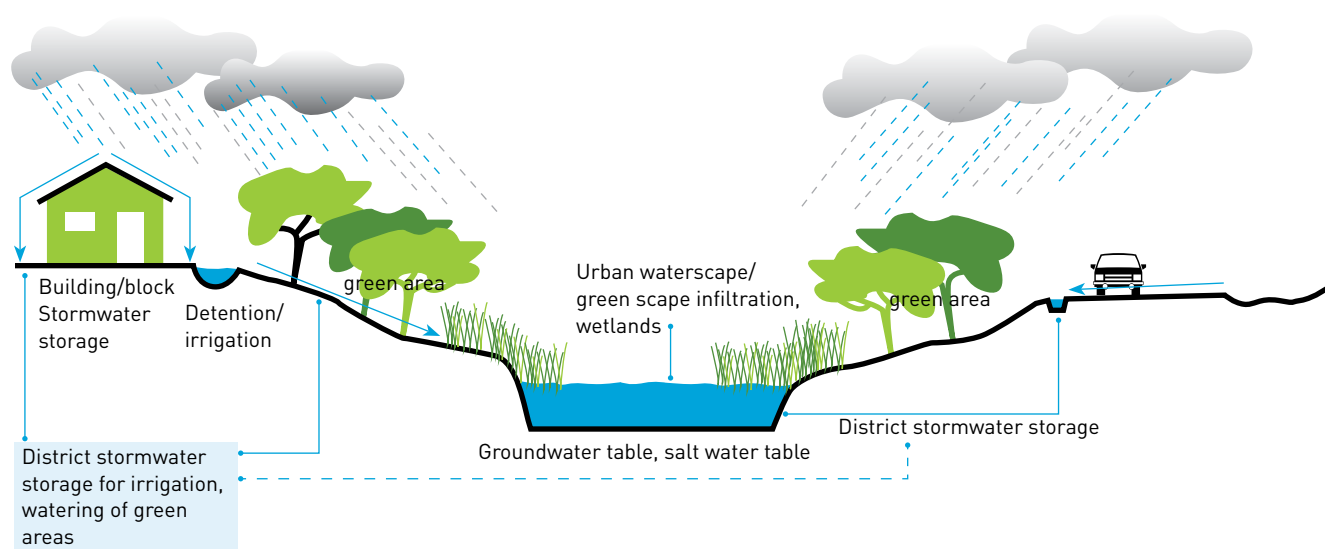
Groundwater table, salt water table

Figure 5.16
Schematic illustration of stormwater management
Based on illustration by SWECO

WATER SUPPLY –
POTENTIAL SYNERGIES AND INTERFACES

- Water and wastewater functions must cooperate, as water sources are often polluted by wastewater

- Dumpsites, landfills and industries must not be located where they can pollute water resources

- Water and wastewater treatment plants can decrease energy use

- Water supply, storm water and waste management functions need to cooperate to prevent dumping of waste and septic sludge in storm water collectors and natural water courses

- Digestion of biodegradable waste, wastewater sludge, etc. can produce usable gas

- Water and wastewater quality can be improved through collaboration with industry and other stakeholders, to reduce environmental problems 'upstream'

- Road, water and planning departments should cooperate on storm water management

- Water supply and sanitation departments need to include environmental health education to promote hygienic practices in poor communities, to mitigate waterborne diseases.

ASPECTS TO CONSIDER

- Have goals for drinking water quality, sanitation service levels, water conservation, etc. been established? Are they aligned with national goals and standards?

- Is there a plan for environmentally sound management of sewerage?

- Is there a program to reduce water leaks and losses in the supply system?

- To what extent and how are water sources protected?

- Do the city authorities have sufficient resources to implement strategies to meet goals, and enforce legislation to protect ground and surface water?

- Is water available to everyone 24 hours a day? If not, how can this be achieved?

- Can storm water peaks be minimised through e.g. green roofs and equalisation ponds?

- Has rainwater harvesting been considered?

- Has reuse of wastewater been considered?

- What are the organisational, financial, operational, and financial reasons for poor performance in water supply and wastewater treatment?

- How are water, sanitation, waste and energy systems integrated in urban areas (location of collection and connection points, areas for dry sanitation and waterborne systems, recycling areas and landfills, etc.)
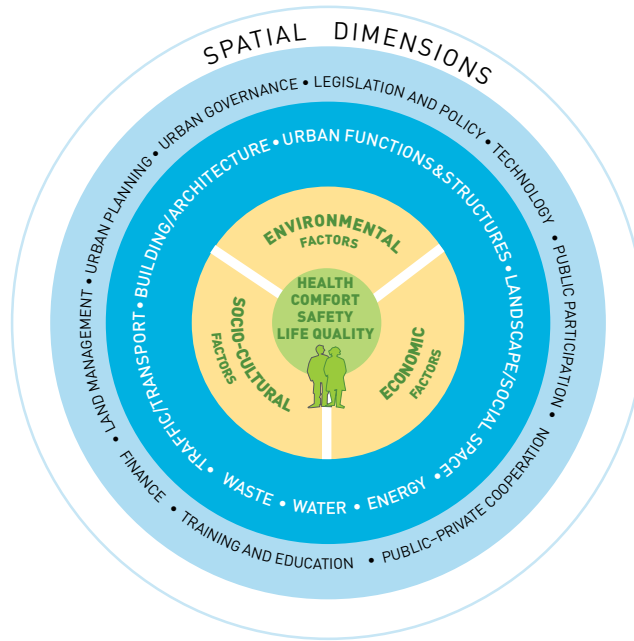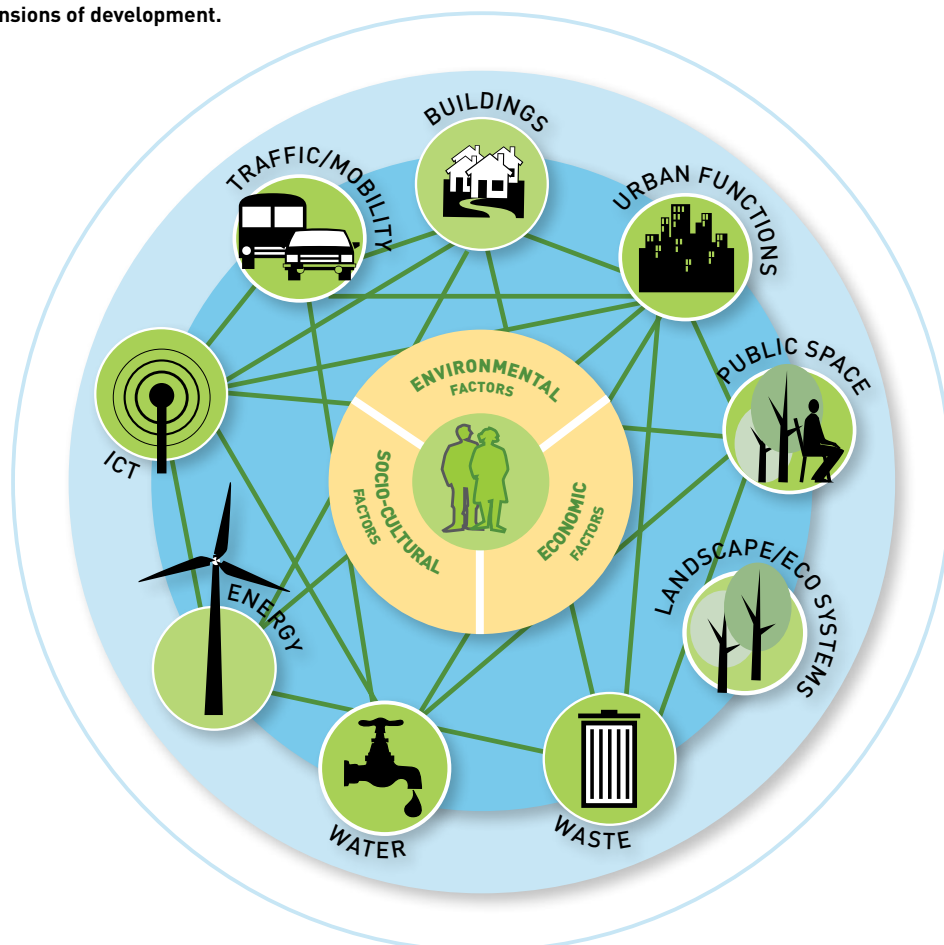
Figure 5.17
**The *SymbioCity Approach* promotes urban
review and planning processes that consider
potential synergies that can add value to the
environmental, economic, socio-cultural and
spatial dimensions of development.**

5.9 Urban systems – synergies and climate change

The *SymbioCity Approach,* promotes urban review and planning processes that consider potential synergies that can add value to the environmental, economic, socio-cultural and spatial dimensions of development. Synergies identified between urban systems such as energy, waste and water management can then be translated into systems solutions, i.e. an 'ecocycle model'.

However, synergies should be viewed from a wider perspective that includes urban functions, land use and transportation. Realising synergies depends to a high degree on the institutional framework and cooperation. When identifying synergies, conflicts of interest may appear between functions and systems, which need to be addressed at an early stage. Examples of the selection of potential synergies are presented below, and how they relate to climate change.
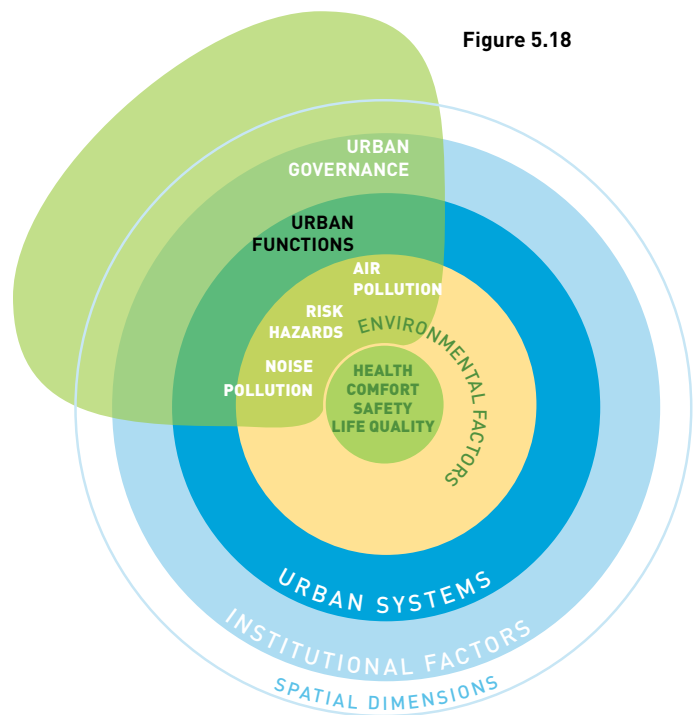
Synergies – planning of public transport and transportation systems with regard to the location of urban functions

Planning for integrated land use for different urban functions should be closely coordinated with the planning of the transportation system. Hereby, reduction can be made of the need for transportation, which will have an effect on the use of e.g. energy and thus the reduction of greenhouse gases. This planning approach is also the prerequisite for the introduction and development of efficient mobility and public transportation systems in a town or city. Urban density and proper configuration for different urban functions has a significant effect in overall transportation patterns. By comparing areas with the same level of car ownership per capita, but with different urban densities, transportation intensity decreases in direct proportion to urban density[3].

Developing an urban pattern with higher urban density at nodes and along transportation corridors, is an efficient way of promoting travel by public transport. This is a method of counteracting 'urban sprawl' – the trend of choosing peripheral locations where land is cheaper for development of commerce, offices and housing[4].

Advanced ITS-models may be used to calculate and illustrate these consequences and to facilitate the discussion on how spatial planning alternatives can be revised and refined.

Figure 5.18

URBAN GOVERNANCE
URBAN FUNCTIONS
AIR POLLUTION
RISK HAZARDS
ENVIRONMENTAL FACTORS
NOISE POLLUTION
HEALTH COMFORT SAFETY LIFE QUALITY
URBAN SYSTEMS
INSTITUTIONAL FACTORS
SPATIAL DIMENSIONS

---

[3] Newman, P & Kenworthy, J (1989) Cities and Automobile Dependence: a Source Book.
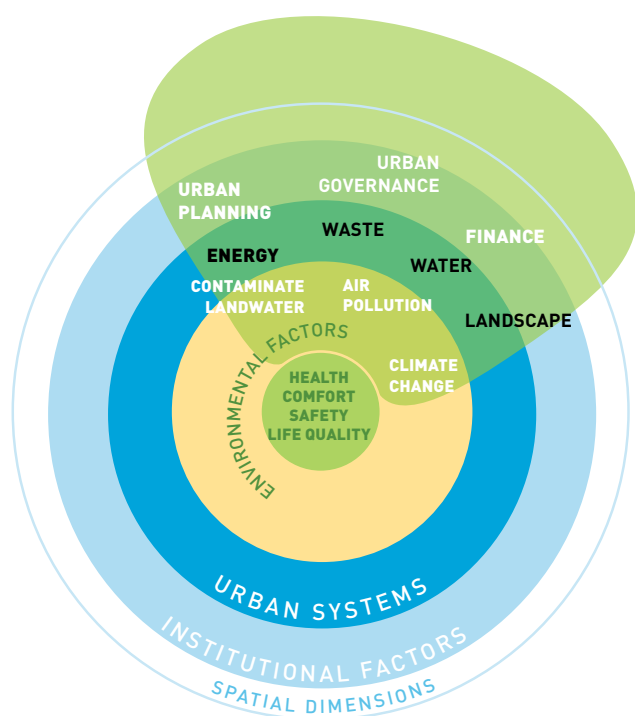[4] Hans Örn quoted in Tannerfeldt and Ljung, pages 99–102.

Figure 5.19

Synergies between energy, waste and water resource management and landscape planning

There is great potential for environmental, economic and social benefits by combining water supply, sanitation, energy and waste systems, e.g. organic waste from all these sources can be used to produce methane in biogas reactors. Depending on the quality, the residue can be used as fertiliser in agriculture or for urban greening. An alternative technology is to compost organic waste material, though this requires rather than generates energy. Another possible synergy is to use compost and treated wastewater sludge to fertilise biofuel crops for use in large, medium or small power plants. Possible risks due to toxic substances in the sludge should be considered.

Green areas are needed to manage residual products. Integrated landscape and ecosystems planning that includes water resources, wastewater treatment and waste management can deliver successful ecological solutions. Properly treated wastewater can be used in green and recreation areas, and former landfills can be converted into urban green landscapes.

In order to identify optimal solutions, it is crucial to involve and gain cooperation of communities, civil society and the private sector. Communication, education and training of both experts and residents is important in pursuing sustainable environmental solutions and quality standards.
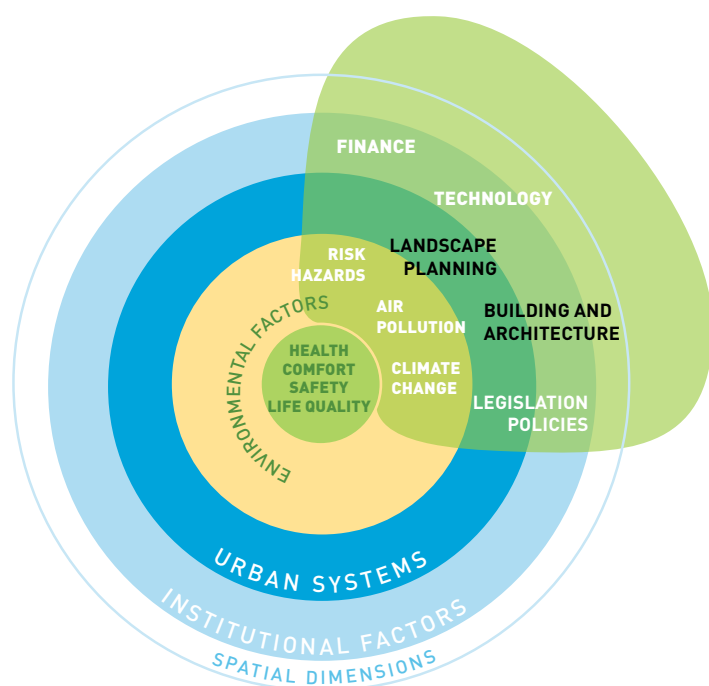
Figure 5.20

Synergies between building design and layouts and the microclimate and surrounding landscapes

The layout and design of buildings can optimise the use of solar energy for heating and electricity, and reduce energy demand caused e.g. by wind exposure. This needs to be promoted by urban planning policies, public awareness and cooperation between public authorities and private developers.

Synergies and climate change

Climate change mitigation and adaptation should be key urban planning objectives. Mitigation involves proactive measures to reduce and absorb CO_2 emissions i.e. to reduce sources and increase 'sinks' (ecosystems). Mitigation is the key strategy when planning urban form and structure, the built environment, infrastructure, transportation, energy systems, etc.

Adaptation refers to the adjustment of natural and human systems to changing environmental conditions. Both impacts and vulnerability can be reduced by adaptive measures. All urban systems planning should consider both strategies and integrated solutions based on inter-system synergies, to enhance efficiency and reduce costs. Institutional arrangements that support inter-functional collaboration should be developed.

Urban sprawl is a concern in developed and developing countries, as it contributes to increased reliance on motorised transport, and other urban inefficiencies. According to UN-Habitat, there are few mitigation initiatives that address urban sprawl in developing countries, and when attempted, they are often constrained by a lack of local government capacity to implement them effectively. However, the Bus Rapid Transit system planned in Nelson Mandela Bay Municipality, is one example that contributes to reduction of urban sprawl.

Adaptation to climate change should include the strengthening of capacities and resilience margins of existing and planned systems, in order to accommodate predicted future impacts without major redesign and redevelopment. Urban structures and infrastructure can be adapted in a variety of ways, not all of which require complicated technological solutions. Planned adaptation can include planned retreat, accommodation or protection measures.

The following table (*next page*) summarises how different urban systems can mitigate or adapt to climate change impacts.

The SymbioCity Approach promotes urban review and planning processes that consider potential synergies that can add value to the environmental, economic, socio-cultural and spatial dimensions of development.
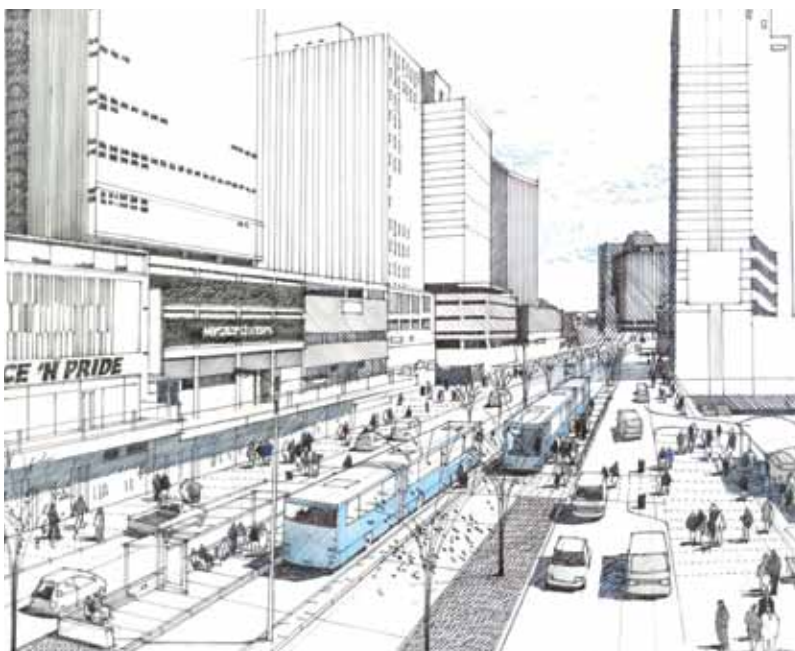
PHOTO SWECO Lars Hansson

The Bus Rapid Transit system planned in Nelson Mandela Bay Municipality will contribute to densification and reduction of urban sprawl.


ILLUSTRATION SWECO

Urban Systems	Climate Mitigation	Climate Adaptation
Urban structure and urban functions	Avoid urban sprawl and promote a compact city to reduce transportation. Promote efficient heating and cooling systems.	Avoid urban sprawl especially in low-elevation coastal zones and promote compact development on higher levels. Avoid high-density settlements on high-risk sites. Consider the three strategies: attack, defend and retreat in combination.
Landscape planning	Green areas contributing to renewable energy and as carbon sinks.	Prevention of heat-island effects and attenuation of storm water.
Building design	Building design and insulation to reduce energy demand.	Building design and insulation to withstand extreme temperatures and climate variations.
Traffic and transportation	Promotion of sustainable transportation – walking, cycling and public transport (also on water); green logistics; replacement of fossil fuels with renewable energy.	Realignment and relocation of threatened roads, railways, airports and ports.
Energy	Increased energy efficiency/reduction of energy demand and fossil fuel dependency.	Strengthen transmission and distribution efficiency; reduce dependency on single sources; promote decentralised systems.
Waste management	Reduce, reuse, recycle, recover; use waste as a resource and minimise GHG emissions.	Protect landfills from flooding and earthquakes to avoid pollution; Remove garbage from drainage channels to prevent pollution and increased flooding.
Water managament	Minimise energy needed for water management, and thereby GHG emissions.	Expanded rainwater harvesting, water storage and conservation techniques, water reuse, desalination, water-use and irrigation efficiency.

6.

WORKING PROCEDURES

APPLYING INCLUSIVE AND TRANSPARENT PROCESSES
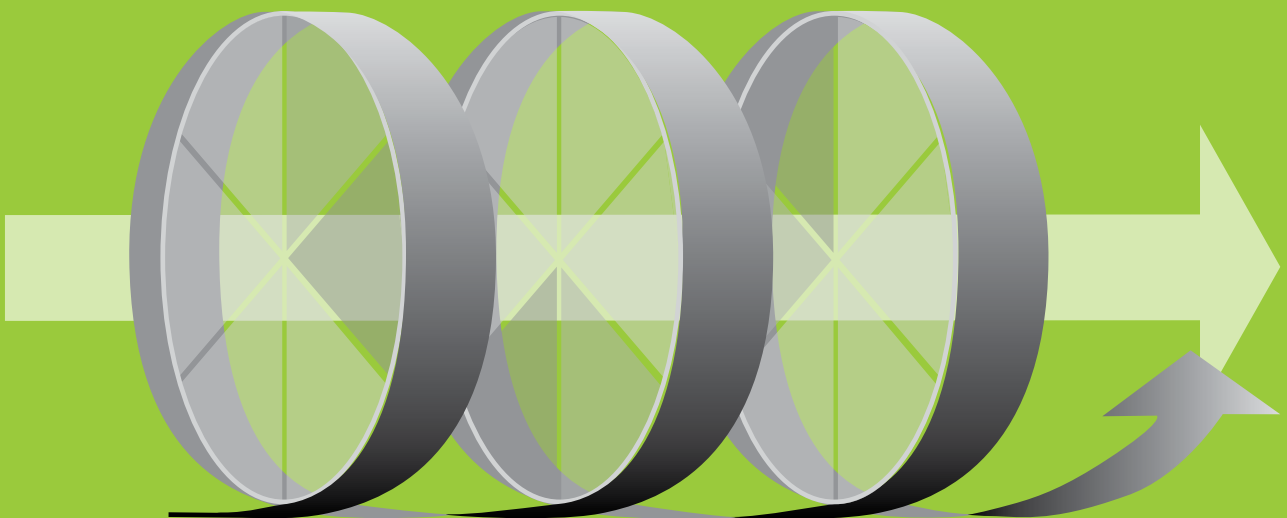
**VISION
VALUES
GOALS**

**NATIONAL
REGIONAL
LOCAL**

THE SymbioCity Approach includes a generic conceptual model promoting sustainable urban development (*see Chapter 3*). Application of the model, including the planning process and working procedures, should thus be adapted to the particular assignment or task, and to the local context and conditions. This chapter describes a *generic working procedure* for applying the conceptual model in sustainable urban development review and planning processes.

The working procedure provides a methodology for applying the *SymbioCity* Conceptual Model and proposes a process and Steps for an integrated, interdisciplinary planning approach. The suggested methods and tools can be applied in different planning contexts, e.g. conducting sustainability reviews, redeveloping existing areas, and planning new areas on different urban scales. The working procedure is a generic process, based on several years of research and development work in collaboration with Swedish municipalities, resulting, for example, in the SAMS Project.[1]
A similar working procedure has been developed and applied in the Swedish Sustainable Municipality Project, financed by the Swedish Energy Agency, which involves some 30 Swedish municipalities in improving the integration of sustainability and energy aspects at local level. The procedure intends to incorporate and enhance sustainability aspects within existing regulatory frameworks by suggesting a combination of different methods and tools. Another source for this section is the approach known as RUSPS (Rapid Urban Sector Profiling for Sustainability), which has resulted in urban sector profiles for a number of cities (UN Habitat).
A prerequisite for successful application of the working procedure is that the city or town develops an *overall political vision.* The vision should serve as a starting point for the systematic work of developing a review or proposal to improve sustainability. It is essential that elected representatives and senior officials in a local authority understand, embrace and communicate the vision.
A *definition of urban sustainability* in a local context needs to discussed and agreed with local stakeholders, including poor citizens and their representatives, and business and civil society, who should be actively involved in the planning process.

The Steps in the working procedure can be used for reviewing and evaluating proposals and projects, and to establish dialogue on

---

[1] www.environ.se – Ranhagen et. al. 2000, and Sustainable Municipality – Ranhagen, 2012.

sustainable urban development with partners and other stake-holders. The working procedure also includes tools for developing and improving approaches, policies, programmes and projects on regional and local level.

Prior to embarking on any planning or development activity, a set of overall goals for the activity should be defined, to guide the planning work. These goals should be aligned with the overall political vision of the city/town.

The main Steps of the proposed working procedure are
1. Define and organise the sustainability review
2. Make a diagnosis of the current situation
3. Specify key issues and objectives
4. Develop alternative proposals
5. Analyse anticipated, potential impacts
6. Choose a strategy for implementation, monitoring and follow-up.

The conceptual model (*see Chapter 3*) can be used as a guide and inspiration when discussing urban sustainability in any local context, as well as when defining overall goals. The model can also be used to identify relevant issues and questions regarding how to define and delimit the scope of a planning or development activity.

The *SymbioCity Approach* proposes a cyclical and iterative way of working, which can be applied in various ways, and should not be considered as a fixed pattern. In *Figure 6.1*, the generic and cyclical working procedure is illustrated in three loops, e.g. when conducting a sustainability review or planning a project.

LOOP 1

STEP 1 +2
ORGANISATIONAL SET-UP & PRELIMINARY DIAGNOSIS

LOOP 2

STEP 3 +4
KEY ISSUES, OBJECTIVES & ALTERNATIVE SCENARIOS

LOOP 3

STEP 5 +6
IMPACT ANALYSIS & IMPLEMENTATION STRATEGIES

ACTIVITY OF MAIN FOCUS

ACTIVITY OF SECONDARY FOCUS

ACTIVITY OF LESS FOCUS

APPLICATION OF THE MODEL – PLANNING PROCESS/WORKING PROCEDURES

LOOP 1   **LOOP 2**   **LOOP 3**

ORGANISATIONAL SET-UP & PRELIMINARY DIAGNOSIS, etc.

KEY ISSUES, OBJECTIVES & ALTERNATIVE SCENARIOS, etc.

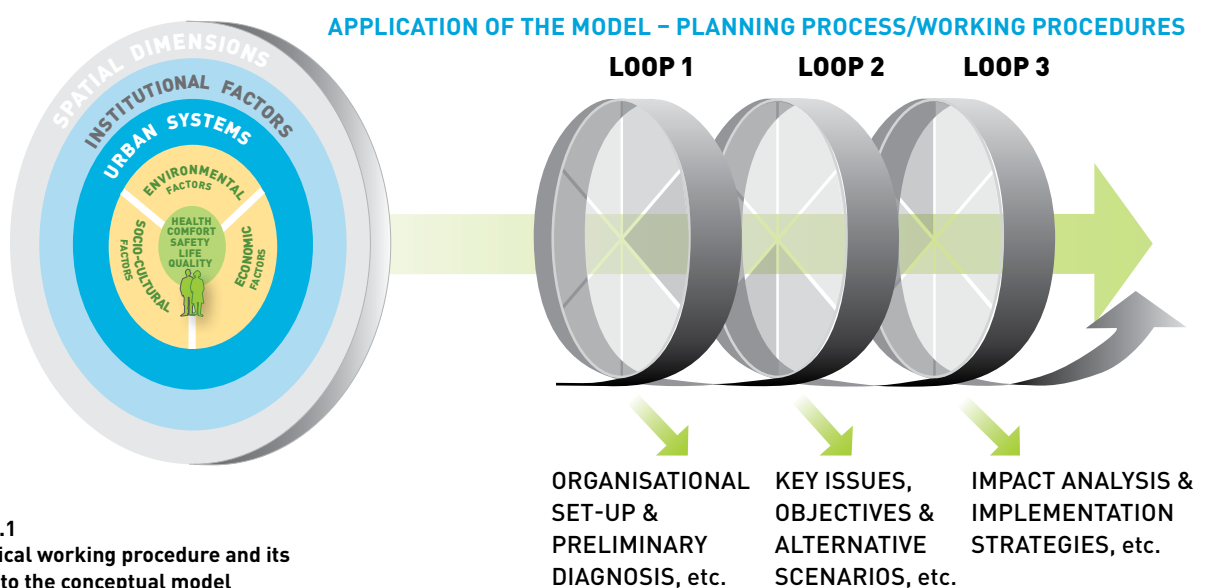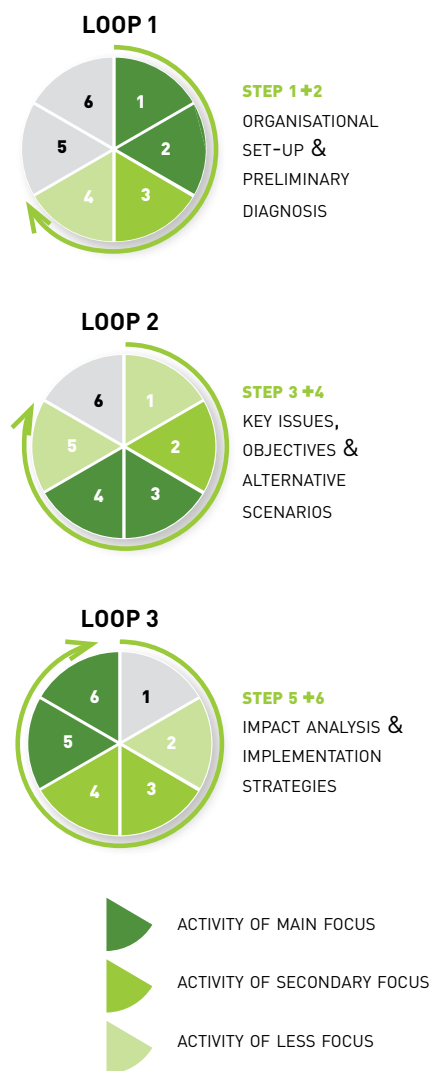IMPACT ANALYSIS & IMPLEMENTATION STRATEGIES, etc.

Figure 6.1
The cyclical working procedure and its relation to the conceptual model

> **THE FIRST LOOP** focuses mainly on Steps 1 and 2 – organising the planning and review work and diagnosing the current situation. However, this loop includes defining overall objectives and preliminary alternative proposals for environmental improvement.
> **THE SECOND LOOP** focuses mainly on Steps 3 and 4, but the diagnosis is supplemented by facts and figures needed to assess the future images in the first loop. Objectives and targets are also supplemented and refined, if need be.
> **THE THIRD LOOP** focuses mainly on Steps 5 and 6. Previous Steps are completed, based on findings and deeper analysis of certain sustainability conditions, formulation of planning and monitoring indicators, etc. Depending on the complexity of the project, further loops may also be considered.

As indicated, the working procedure should be adapted to the prevailing conditions. In most cases, it is neither possible nor recommended to work in a linear fashion through all the Steps. There are many advantages to be gained from working in a flexible, iterative or cyclical manner.

This approach facilitates the integration of sustainability issues into urban planning and review processes, and enables a fairly quick but comprehensive definition of the task during the first and second loop. Time-consuming and expensive detailed activities are left to the third phase (loop), when the main outlines have been established.

By formulating and discussing alternative development proposals for urban improvement already in the first phase (loop), relevant factors and aspects are identified. This enables baseline analysis that focuses on the relevant issues and factors – avoiding overly comprehensive investigations prior to the formulation of specific objectives and development proposals.

Figure 6.1 shows the cyclical working procedure related to the improvement of sustainability over time, and to the conceptual model. This shows that all sustainability factors should be considered and that the working procedure is applicable on a wide range of issues and multi-disciplinary tasks. It also promotes and facilitates participation of all stakeholders – city officials and politicians, citizens, academic and private sector specialists, and the business sector.

It is recommended that the process is documented throughout, e.g. activities performed, issues raised and conclusions reached, which enhances the quality of the process, and promotes transparency. Documentation should include notes, maps, sketches and photos. In a more advanced urban planning and development intervention or a review process, alternative development scenarios and proposals can be documented using CAD (*Computer Aided Drawing*) and GIS (*Geographic Information Systems*), or similar systems.

The working procedure can be applied on different planning levels – region, city, city-district, neighbourhood or single block. It is especially useful in the early phases of planning and review activities aimed at multi-disciplinary and comprehensive improvement of sustainability performance. In a city or town, planning and review work take part simultaneously on all these levels.

The *SymbioCity Approach* Toolbox

Each Step in the *SymbioCity* working procedure is supported by specific methods and tools included in the *SymbioCity* Toolbox. As illustrated in *Figure 6.2*, particular tools relate to specific Steps in the process, but some of the tools can also be used in several steps. SWOT can for example be useful in step 2 and step 5.
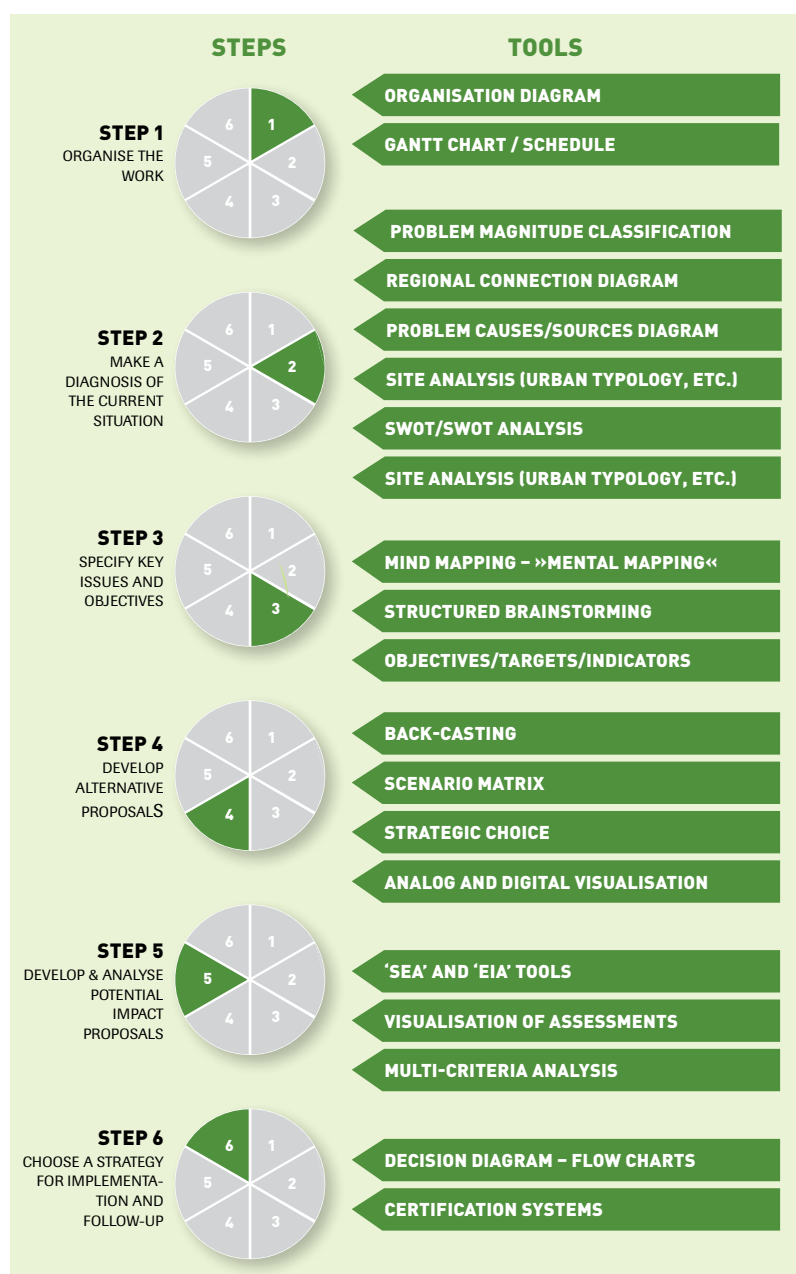

Figure 6.2
Schematic illustration of the *SymbioCity* Toolbox. The tools can be used in different stages of the planning process in a flexible way.

However, some of the tools can be used in more than one Step. It is also possible to combine the tools in a creative way, depending on the specific planning situation. The intention is to update and revise the toolbox in the light of future action-oriented research and practice. Development of digital tools for communication, including social media, should be considered in this context.

What is important is that most of the tools can be used in planning and design dialogues involving stakeholders. Some tools such as *swot, mind mapping, structured brainstorming* and radar graphs are easy to use in participative planning processes.

Tools such as the *objectives/targets/indicator diagram* and *multi-criteria analysis* are more intricate and require certain analytical skills, but with basic knowledge, they can also be used in dialogue situations. The *Space Syntax* tool requires specific computer programs and skills and is an expert tool, but the results of the analysis can be used in planning dialogues.

The Steps in the working procedure are described below in generic terms. Activities related to each Step in each loop are not elaborated, as they will vary in specific planning or review projects.

Figure 6.3
Possible experts that could play an important role in a sustainability review.

Figure 6.4
Possible organisational structure for an urban development sustainability review

6.1 STEP 1
Define and organise a planning or review task

An integrated and holistic planning or review task can be performed on different urban scales, but it is usually necessary to first *investigate, describe, document and illustrate* the prevailing situation, including environmental, socio-cultural, economic and spatial factors. The aim may be to identify possible future projects, propose improvements, or plan or review an actual sustainable development project.

Planning or review tasks normally arise from *an overall vision* of making a city sustainable, often with a special focus on poor and disadvantaged people. Sometimes the aim is to improve a specific urban system, but even in this case, an integrated analysis of related urban systems should be conducted. Thorough *definition and organisation* of the planning or review work is one of the keys to success, including a clear definition of the purpose and scope.

Representatives of *different functions* should be involved in planning the review or planning process, to engage expertise in relevant fields and sustainability aspects. Urban sustainability projects should preferably be undertaken by cross-functional teams, rather than within single departments. The conceptual model can also guide the identification of appropriate representatives.
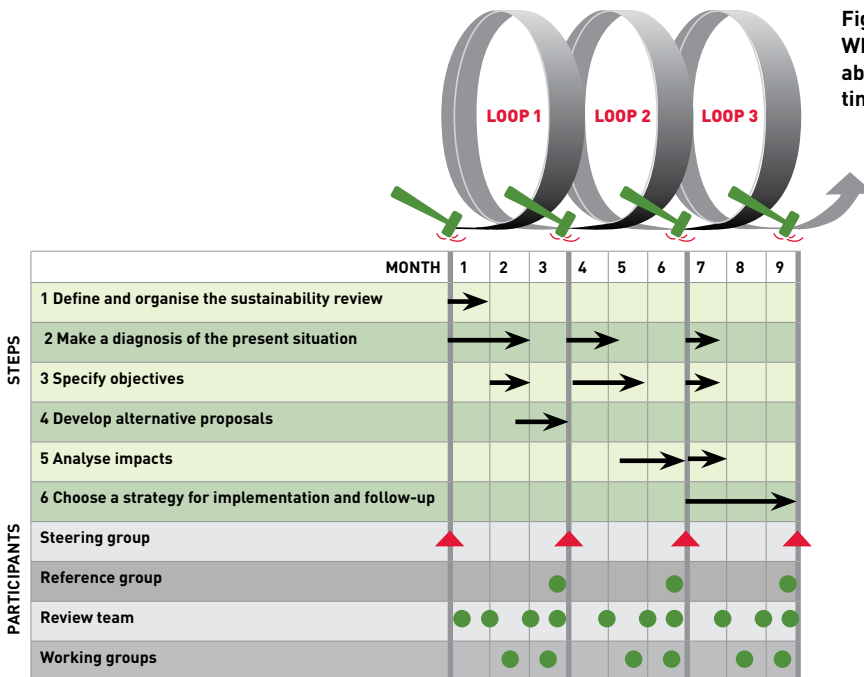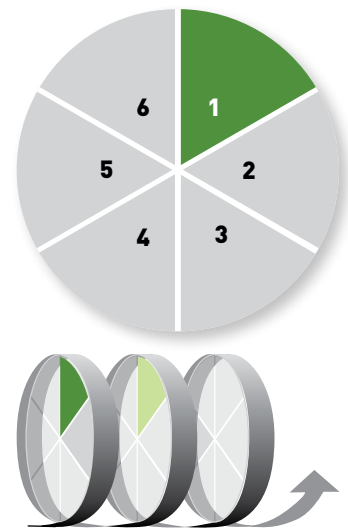
Figure 6.5
When organising a planning task or a sustainability review, an organisational chart and time schedule should be developed.

	MONTH	1	2	3	4	5	6	7	8	9
STEPS	1 Define and organise the sustainability review	→								
	2 Make a diagnosis of the present situation	→		→		→		→		
	3 Specify objectives		→		→		→			
	4 Develop alternative proposals			→						
	5 Analyse impacts					→		→		
	6 Choose a strategy for implementation and follow-up							→		→
PARTICIPANTS	Steering group	▲			▲			▲		▲
	Reference group				●		●			●
	Review team	●	●	● ●		●	●		●	● ●
	Working groups		●	●		●	●		●	●

The purpose of a sustainability review is to objectively assess the sustainability features in planned, ongoing or completed programmes, plans or projects. Once the task is defined, *a process plan* and *time schedule* are prepared, which identify and order the review (or planning) activities, and their links to one another and to sustainability issues (*see Figure 6.5*).

A diagram representing the organisation of a planning or review task is useful in order to achieve a full understanding and to discuss possible alternatives.

The organisation diagram in *Figure 6.4* is an example of how possible stakeholders can be involved in a review of a city district. A steering group consisting of the mayor and other municipal leaders, plus representatives from organisations and citizen groups in the area manage the process, supported by an appropriate project manager. The multi-disciplinary review team consists of planners and specialists in different fields. Two reference groups include representatives from national and regional bodies respectively and from NGOs and associations in the areas and its surroundings.

A project structure may differ due to specific local conditions, but typically includes a steering group to make decisions, a multi-disciplinary planning or review team, and involvement from local and regional levels.

The planning or review work should be organised to optimise opportunities to examine how sustainability issues have been considered in a development context, with special attention to the situation of the poor. It is important to facilitate and promote integrated approaches and collaboration between representatives of different fields and urban systems. By working in a cyclical manner, it is possible to successively integrate relevant issues. This has advantages compared with a linear working procedure, which may result in comprehensive fact-finding, but also in loss of focus on strategic sustainability issues and focus areas.

In order to undertake an efficient planning or review project with participation from different stakeholders, it is important to develop a transparent and flexible time schedule related to a budget. A GANTT *chart* or activity schedule shows when different work activities occur, and the key decision points. It should also show when stakeholder participation will happen in different phases of the process, *see Figure 6.5*. A schedule is the basis for allocating financial and human resources at different stages of a project.

In the upper part of the time schedule, different main activities and sub activities are specified according to the cyclical planning principle described above. In this case, each phase is about 3 months, but it is possible to apply cyclical planning to shorter time frames, e.g. a week or month for each loop/phase. In the lower part of the schedule, planned activities and meetings involving the different stakeholders are shown, related to activities in the upper part

of the schedule. Scheduling stakeholder participation in this way ensures that it is an essential part of the project, which cannot be neglected. The time schedules of different projects will differ, but the overall structure described can be used in most cases.

ASPECTS TO CONSIDER

- Has the institutional framework been identified to clarify various linkages to the planned intervention (institutional set-up, regulatory framework, environmental and planning policies etc)?

- To what extent have the links between different planning levels been considered with regard to sustainability issues? (National, regional, city/town level, city/town district, etc.)?

- Does the organisation have the capacity (financial and human) to implement the project in the planned time frame?

- Has all the necessary expertise been included to promote the integration of environmental, socio-cultural, economic and spatial dimensions of sustainability in the working procedure?

- How will citizens and other stakeholders be involved in different phases of the process (including NGOs, CBOs and the private sector)?

Mind mapping and structured brainstorming at a workshop in Rwanda.

PHOTO Ulf Ranhagen
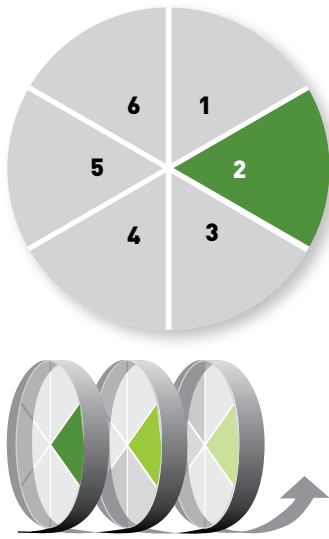
6.2 STEP 2
Diagnose the present situation

A major consequence of urban growth trends is that poverty tends to be concentrated in urban areas. *Urban environmental problems* usually affect the poorest and most disadvantaged, who often lack essential services to meet basic needs, e.g. adequate water, sanitation and health care. The specific sustainability challenges in a particular urban territory should always be mapped in order to identify conditions, needs, problems, opportunities and characteristics.

Even if problems tend to dominate in many urban areas, it is extremely important to also identify *assets and positive features,* e.g. related to socio-cultural and other aspects. Emphasising assets and positive factors motivates active participation and ownership by local stakeholders. The sources and causes of problems should also be identified, as a basis for discussing effective and integrated solutions. It is often constructive to use the term 'challenge' instead of problem when diagnosing a situation with local stakeholders.

Various tools can be used and combined when conducting a situation analysis and diagnosis, and at least the following sub-Steps should be included in the working procedure.

1. Overall graphic documentation of the planning or review area

Graphic documentation includes different types of plans and planning diagrams that show different aspects and functions, both separately and combined in integrated formats, e.g. land-use patterns, greenery, transportation, infrastructure for energy, water and waste, socio-cultural and economic services, income distribution, location of industry and commercial functions including marketplaces, cultural heritage sites, etc.

Maps can be both manual (drawings) and digital, e.g. *Geographic Information System* (GIS) based. The maps may exist or in some cases need to be created as a basis for assessing possible synergies and conflicts between different aspects. In a plan review, it is important to provide the planning proposals, which are the subject of the review.

If the analysis concerns a larger urban territory, e.g. a whole city, a regional connections diagram is useful to understand how the city is connected to adjacent cities, towns and rural areas. This is very relevant for visualising transportation patterns and different urban-rural linkages.

2. Documentation of both negative and positive features

It is important to analyse both negative and positive features of the area concerned. A *SWOT Analysis* (*Strengths, Weaknesses, Op-*

portunities, Threats) is a well-known tool which can be used to involve different stakeholders *(see Figure 6.6)*. Strengths (e.g. environmental, economic and cultural assets) and weaknesses are specific to the area (internal), while opportunities and threats may be external or internal.

This enables stakeholders to form a balanced picture of key factors and possibilities in the situation and its context, including what needs to change to enhance sustainability on different levels. Already in this stage, key aspects and possible objectives may start to emerge. It is often useful to involve people not familiar with the details of a particular context, to contribute to a more objective analysis and discussion. The inclusion of such resource persons should be considered when organising the planning or review activity.

In order to appreciate the full developmental potential of a particular area, it is important to balance the weaknesses and threats with all the strengths and opportunities. Socio-cultural and other qualitative aspects should be recognised and included in the analysis. This is also important in order to engage the community in the change process.

3. Analysis of the urban topology and cityscape

It is often valuable to analyse the urban and functional structures in order to discover and understand the urban pattern, including historical and modern urban typologies that influence the environmental, socio-cultural or economic situation. The typologies are often connected with a particular age or movement, expressing the vision and needs of a society at a particular time. Visualising and describing the different typologies, spatial characteristics and cultural layers of a city reveals how development has proceeded over time, e.g. spatially. A SWOT analysis can be used in combination with identifying urban typologies to get a comprehensive picture of problems and qualities of urban areas.

4. Detailed analysis of environmental conditions

Detailed and specific analysis of the environmental situation can be based on a SWOT analysis, which provides an overview of sustainability issues. Problems (e.g. emissions and other forms of pollution or disturbance) should be systematised and related to different urban scales or levels. It is also useful to rate causes and impacts in this phase, as a basis for prioritising and focusing activities and efforts, but also to illustrate and communicate the results. The example *(see next page, Figure 6.7)* uses a 1–5 rating scale. Each grade can be defined for each environmental factor, but the advantage of using the same scale for all factors is that this enables comparison.
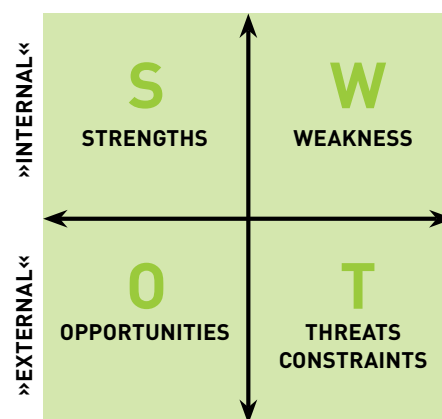

Figure 6.6
Example of how a SWOT Analysis can be structured.

Application of SWOT in combination with mind mapping and structured brainstorming.

Figure 6.7
Initial overview diagnosis of the urban environmental situation, using the following scale to rate factors
1. Seriously hazardous as a result of brief exposure
2. Hazardous as a result of long exposure
3. Safe, but unpleasant or irritating
4. Comfortable
5. Very comfortable.

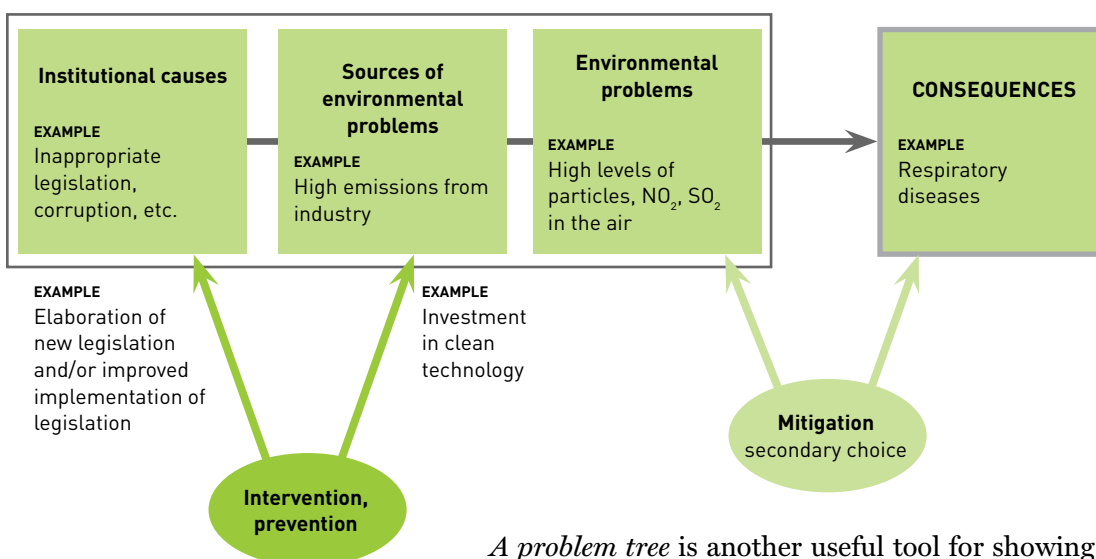| City District	Traffic noise	Industrial air pollution	River water pollution	Ground water pollution	Radiation
West	1	2	1	3	5
South	2	1	1	3	5
Central	2	4	1	3	5
East	3	2	1	2	5
North	2	3	2	3	5

5. Analysis of causes, sources and consequences of problems and assets

The consequences of problems should be observed and noted separately, e.g. respiratory diseases due to air pollution, high death rate amongst children due to waterborne diseases, or high costs for water treatment due to polluted water sources. It is often difficult to relate a certain health situation directly to a specific environmental problem. Many diseases are caused by the compound effects of a number of environmental problems, which can also be difficult to measure. When seeking to address these problems and consequences, it is important to identify the various sources and causes of environmental problems, and to establish why these sources have arisen.

The sources of the problems may be multiform and complex. For example, air pollution is caused by emissions from industry, traffic and fossil fuel power stations, and exacerbated by a lack of green areas and unfavourable topography, e.g. heavily urbanised valleys where pollution forms an inversion layer and cannot be absorbed by vegetation.

Figure 6.8
Illustration of the linkages between the causes of the problems, the sources of problems, and their consequences

Institutional causes

EXAMPLE
Inappropriate legislation, corruption, etc.

Sources of environmental problems

EXAMPLE
High emissions from industry

Environmental problems

EXAMPLE
High levels of particles, NO_2, SO_2 in the air

CONSEQUENCES

EXAMPLE
Respiratory diseases

EXAMPLE
Elaboration of new legislation and/or improved implementation of legislation

EXAMPLE
Investment in clean technology

Intervention, prevention

Mitigation
secondary choice

² In this context, consequences means 'the consequences of the problems', i.e. secondary effects such as poor health. In Step 5, the 'consequences of proposed interventions or solutions' are examined, which is termed impact analysis.

A problem tree is another useful tool for showing the causes and effects of a problem. Sustainable solutions must address the causes at the bottom of the tree. A problem tree analysis can be done with local stakeholders, who experience the effects, and in many cases have a good idea of the causes.
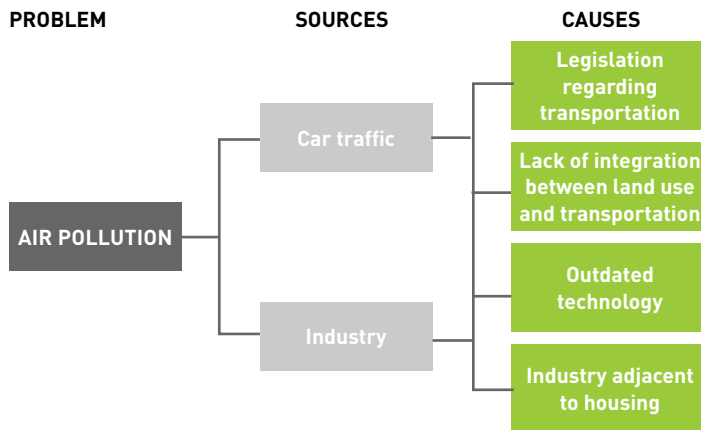
PROBLEM	SOURCES	CAUSES
	Car traffic	Legislation regarding transportation
		Lack of integration between land use and transportation
AIR POLLUTION		
	Industry	Outdated technology
		Industry adjacent to housing

Figure 6.9
The problem tree is a tool for analysing sources and causes of a specific environmental problem.

A central aspect of the *SymbioCity Approach* is to avoid examining single assets, environmental problems or causes in isolation, and to focus on interfaces between different factors and systems, e.g. how waste management and heating can be linked in order to use resources more efficiently. This integrated approach can also be applied in diagnosing a situation, by looking at how assets and problems are interrelated and linked to different kinds of sources and causes.

Some planning and review tasks focus on a specific aspect or urban system, but even in this case, it is crucial to analyse interfaces and linkages to other areas and subsystems in order to avoid sub-optimisation and to identify potential synergies and conflicts.

When examining the environmental situation in a specific town or town district, it is also important to relate the environmental situation to the wider global, national and regional context. For example, it is useful to have data on climate change related to population and GNP per capita.

It is important to include *institutional factors* when analysing the causes of environmental problems. Institutional conditions in a country, region, city/town often contribute to causes, and determine the capacity to develop solutions. For example, weak environmental legislation and/or enforcement are a reason why industry does not invest in sustainable technology. It is thus critical to identify institutional causes of environmental problems in order to develop sustainable solutions.

Institutional factors can be analysed with regard to the extent to which they present opportunities for, or threats to environmental improvement in relation to a proposal or project. *Chapter 4* provides an overview of institutional factors.

Environmental problems may also have *external source and causes*, which an intervention cannot directly influence. These factors should be identified and analysed, to assess their impact on the environment, and on project implementation and outcomes.

The *border between internal and external factors* is often unclear, but should be defined as far as possible during the process of identifying the central problem/s to be addressed by the interven-

PHOTO Ulf Ranhagen

tion. In an iterative process, the project preparation phase often includes redefinition of the intervention, and hence, of which factors are internal and which external.

For example, for a project to reduce air pollution by introducing clean technology, the usual external factors are legislation, urban plans and government incentives. However, if the intervention is redefined and broadened to address these factors, they become internal.

In summary, it is essential to identify and understand the fundamental causes of a focal problem in order to identify and develop sustainable solutions. When a problem analysis is done in a workshop with stakeholders, they usually identify many causes and effects. To identify all causes, keep on asking why a problem exists until there are no more answers, and then start looking at the opportunities.

ASPECTS TO CONSIDER

Examples of both internal and external issues and aspects to consider in a review or planning activity are given below.

- Which general sustainability and environmental aspects in the area are relevant to the project? Have the aspects been prioritised?

- What are the key factors for promoting sustainable urban development – including both challenges and assets?

- What are the sources of the challenges/assets (urban systems, institutional factors, etc.)?

- What are the consequences of the environmental problems/assets with regard to health, safety, comfort and quality of life?

- What general development trends are influencing the development of the region/country? Are these likely to have an impact on the project area? How?

- What external conditions, e.g. national, regional and local policies and plans (regarding economic, social, environmental and spatial development) are relevant for the project? Have they been analysed in a systematic manner?

- Has the situation for the poor in the areas and wider context been analysed? What are the key issues and needs?

- What are the main characteristics (strengths/assets and weaknesses) of the area? Have they previously been analysed? How has this been documented and followed up?

- What are the formal and legal planning conditions pertaining to the area? How does the land management and tenure situation influence the planning activity?

- Which aspects should be prioritised to enhance future sustainable urban development?

- What is the pattern of the built environment, the ecosystem and landscape pattern including vegetation, topography and hydrological features?

- What are the geotechnical conditions of the site? Has risk of landslides, earthquakes, flooding, etc. been considered?

- Has the cultural and historical heritage of the area been analysed and considered?

- Has a climate analysis been carried out? What are the microclimatic conditions?

- What is the current standard of the built environment, the traffic and transportation system and the infrastructure systems for water, sewage, waste and energy?

6.3 STEP 3
Specify objectives, indicators and targets

Step 3 formulates the aims and goals for the future of the area, based on the findings and diagnosis in Step 2. This is best done without developing detailed proposals and solutions. A *set of objectives, indicators and targets* is then developed for the intervention and area. This step focuses on formulating the desired future performance of the area in the short, medium and long term. The objectives, indicators and targets should focus on the planned intervention. However, they should not conflict with, but rather be aligned with objectives already defined in existing policies and plans for the city or town. Any deviations or differences should be identified, discussed and resolved.

Objectives should be based on the preliminary diagnosis and definition of *urban sustainability in the area.* Objectives can be both *quantitative and qualitative,* but are more specific than goals, and should include targets and indicators. It is important to apply these ideas to the needs of the specific city or town. There are four generic sub-steps in this phase.

1. Define urban sustainability in the local context

Developing a local definition of sustainable urban development can be based on the general concepts of the *SymbioCity Approach. Mind mapping* can be used as a basis for a creative discussion with different stakeholders on sustainability aspects, local assets, and linkages between different aspects. This exercise contributes to a deeper understanding of how the local situation is linked with the regional and global situation, and how wider discourses are relevant. The local definition should be related to the overall vision for the city. If this doesn't exist, a vision should be formulated for the project area.

> **EXAMPLE** of vision/definition: **Sustainable urban development should use all available resources (economic, human and environmental) in a balanced and efficient manner.**

2. Identify key issues for further planning and review

A *set of key issues* should be identified, related to the overall vision as well as the local definition of sustainability, to guide further analysis and planning. *Structured brainstorming* can be used to identify and formulate the key issues, which should be clustered and prioritised. Key issues can also be identified by *clustering the result* of the SWOT analysis, and considering how to mitigate weaknesses and threats, strengthen positive factors and assets, and take opportunities.
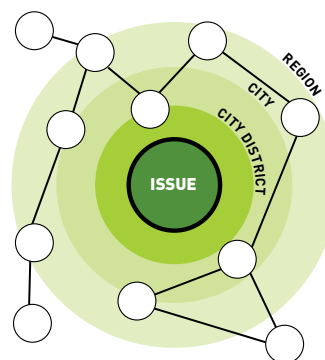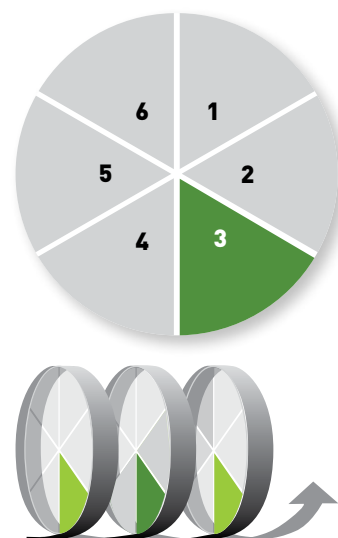

Figure 6.10
Schematic illustration of a mind map, where the aspects and links are also are related to different geographic hierarchies.

3. Formulate main objectives

Based on 1 and 2 above, an initial draft of *main objectives* for the area is formulated, which should be aligned to the overall vision for the city/ town. This process may also contribute to the overall vision. The main objectives should state how sustainability in the area will be improved.

4. Formulation of indicators and targets

Indicators and targets are now developed for the main and sub-objectives, making them SMART, i.e. Specific, Measurable, Agreed, Realistic and Time based. *Targets* should be formulated as ratios or principles not dependent on particular technical solutions, in order to promote and facilitate the development of alternative, innovative solutions.

PHOTO Ordbildarna

A targets can be, e.g.: 20–30% increase in people commuting by bicycle.

An indicator must not be mistaken for a target. An indicator is a technical term or way of expressing a certain phenomenon in a compressed fashion. An indicator may be the basis for formulation of quantitative targets, e.g. 20–30% increase in people commuting by bicycle. Establishing a target for an indicator makes it specific, realistic and tangible. Indicators can be used for
> formulating targets on different levels
> monitoring implementation progress
> evaluating results and impact.

An indicator and target for sustainable housing can be, e.g.: At least X% of new housing should be multi-family structures in a mixed-use built environment.
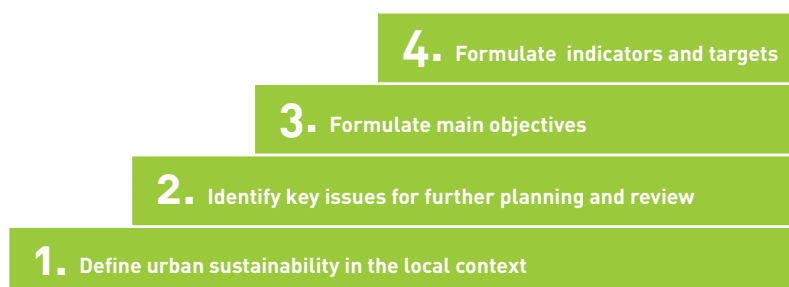
EXAMPLES of environmental indicators are **the percentage of the population that suffers from stress symptoms due to noise pollution, or the percentage of people using public transport.**

A planning indicator is related to spatial planning[3], and facilitates the formulation of targets for sustainability. Planning indicators describe future conditions in the same terms as the current situation, which then serves as a baseline, e.g.

> Planned proportion of the urban area with a bus stop or train station within x metres, relative to the current proportion

> Planned proportion of protected green areas for recreational use, relative to the current proportion.

Many indicators are *field indicators,* which can be used to monitor progress towards objectives, e.g. aquatic life in watercourses, as an indication of ecosystem health. The related planning indicator could be »the area of coherent, protected water bodies in the area that preserve aquatic life«.

There are four generic sub-steps in STEP 3.

4. **Formulate indicators and targets**

3. **Formulate main objectives**

2. **Identify key issues for further planning and review**

1. **Define urban sustainability in the local context**

---

[3] Ranhagen, U and Trobeck, S, 1999, The use of indicators in spatial planning. A situation report. The National Board of Housing and Planning and the Swedish Environmental Protection Agency.

PHOTO SWECO

EXAMPLE
SUSTAINABILITY INDICATORS FOR TANGSHAN ECO-CITY, CHINA

The overall vision of the Tangshan Eco-city is to be a world renowned, modern, people-focused, prosperous, climate-neutral and environmentally sustainable society. The indicator system of the Eco-city will guide and support the process of planning, design and production, and operating the Eco-city to fulfil this overall vision. The indicator system includes indicators on three spatial levels: the city level (30 sqkm), the city district level (12 sqkm) and the block level. The indicator system is relevant for both environmental and socio-economic sustainability.

It includes both planning and monitoring indicators related to environmental, socio-economic and spatial goals, with a focus on the planning phase and an integrated approach to the urban systems of the city. The complete indicator list has 140 indicators, and 30 indicators have been selected for management level information.

INDICATORS	TARGET LEVEL	FACTORS	GOALS
Urban functions			
1. Density	x persons/sqm		
2 Living space	x sqm/person		
3. Local accessibility to service	100% of housing areas		
4. Function mix	100% urban nodes		
5. Affordable housing	>5%		
6. Houses in risk areas	0%		
Urban space			
7. Urban environmental quality	100% of housing areas		
8. Block size	60–100 m		
Building and architecture			
9, Sustainable buildings	100% of buildings		
Traffic and transport			
10. Non motorised local transport	>50%		
11. Regional travel by public transportation	>70%		
12. Location strategies and parking restrictions	100% of city districts		
13. Time difference ration bike/car and public transport/car	<1,5 time		
14. Excess speed	0%		

INDICATORS	TARGET LEVEL	FACTORS	GOALS
Energy			
15. Energy demand	10 000 kW/capita	Factor 2	
16. Renewable energy	95%		
Waste			
17. Collection of City hazardous waste	100%		
18. Recycling	100%		
19. Reuse and recycling to agriculture	>90%		
Water and wastewater			
20. Water consumption	100–120 litre/person/day		
21. Water reservoir for drinking water	> 90%		
22. Sanitation coverage	100%		
23. Separated wet sanitation	>90% of buildings		
24. Water quality	100%		
25. Stormwater collection	>90%		
Landscape and open space			
26. Public green	20 sqm per capita		
27. Local accessibility to park and public space	100% of housing areas		
28. Preserved farmland	100%		
29. Preserved and restored wetland	100%		
30. tree cover	50%		

LEGEND	
Chinese standard by improvement factors	Factor 2 = Target level two times better than reference
Environmental goals	
Socio-economic goals	
Spatial goals	
14. Excess speed	

Source: Tangshan Bay Eco-City/Sweco

ASPECTS TO CONSIDER

- Is there an adopted political vision and strategy for development of the city/town/area? How has this been implemented up to date?

- What objectives have been identified to promote sustainable urban development?

- How do the objectives promote environmental, economic, socio-cultural and spatial development?

- How do local objectives relate to overall goals on the national and regional level?

- What targets and indicators have been formulated for sustainability aspect?

- Have the objectives, targets and indicators considered the needs of particular stakeholder groups, e.g. poor citizens, small and medium businesses, women?

PHOTO Ulf Ranhagen

The overall vision of the Tangshan Eco-City is to be a world renowned, modern, people-focused, prosperous, climate-neutral and environmentally sustainable society. Completed solar-powered nursery school, 2012.
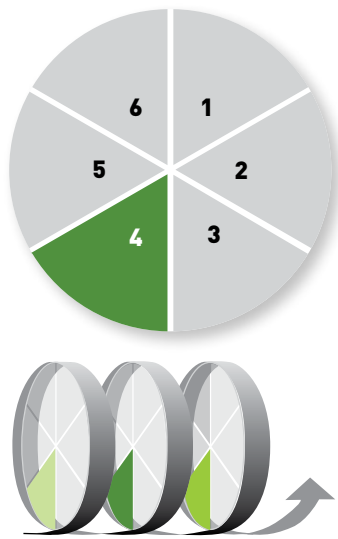
Location
north

Location
south

Location
east

Location
west

Figure 6.11
Four alternative proposals from the planning phase of the Loudian Town in Shanghai.
Sweco 2001

6.4 STEP 4
Develop alternative proposals

The diagnosis of the current situation and the defined objectives and targets serve as a basis for *identifying and formulating alternative development proposals*. As the challenges and problems in urban areas are often very complex, there is often a wide range of relevant alternative solutions to consider. Solutions which emphasise synergies between different urban systems should be evaluated in terms of their sustainability, as investments should be relevant for many years. This is particularly important in developing countries. In some instances, the *flexibility* of solutions is also relevant.

In many situations, the objectives and targets can be met in several different ways, and alternative solutions should be evaluated in terms of their costs and benefits in the short, medium and long term. Examples of solutions include urban redevelopment of housing areas, workplaces and services, investment in clean technology in heavy industry, and improved legislation regarding air quality or traffic safety.

Wherever possible, the focus should be on preventing problems rather than addressing their effects. Where this is not possible, it is justified to *mitigate* negative effects via measures that improve rather than replace existing technology (e.g. catalytic converters to reduce air pollution).

In many cases, mitigation is less costly and more practical in the short to medium term. However, it can also delay the implementation of longer-term sustainable solutions, e.g. greater use of public transport and vehicles using renewable energy. In a specific situation, it is it best to combine problem mitigation and prevention, to the extent that this is possible.

Backcasting is a tool for developing alternative scenarios for urban development *(see Backcasting Box, page 121)*. This facilitates the development of optimum and integrated solutions. Alternative scenarios can be developed in two ways.

1. Select *key issues* (*see sub-step 6.3/2 above*) and for each, define polar positions as a basis for the development of one-sided alternatives. *A tree diagram* can then be used to combine polar opposites to arrive at integrated solutions.
2. The *scenario matrix* method involves selecting two key issues and plotting extreme positions along two axes in a four-field matrix *(see Figure 6.13)*. Some examples of key issues and polar positions are
   - Structure – polycentric vs. monocentric
   - Structure – concentrated vs. scattered
   - Governance – centralised vs. decentralised
   - Density – high vs. low.

BACKCASTING – ITS LOGIC AND VALUE AS A METHOD

Backcasting is a method for visioning new innovative systems and solutions focusing on synergies between different urban systems and institutional factors. Backcasting involves imagining a sustainable future situation, without considering preconditions and restrictions imposed by current obstacles and problems. This future image includes different sustainable systems, e.g. transportation[4].

The next step relates the future image to the present situation, and attempts to find paths from the present situation to the future situation. This approach encompasses and integrates short, medium and long-term solutions.

Backcasting is useful for both large and small-scale improvement of poor areas in developing countries. Solutions developed through this approach can (after evaluating their impact in Step 5) become the basis for a more detailed implementation strategy in Step 6.

The advantage of backcasting is that it is easier to envisage the future in tangible terms when freed for present constraints. It shifts the focus away from often overwhelming problems, and can provide the basis for a balanced and realistic relationship with the future[5].

[4] A thesis on backcasting is: Wangel, J (2012). Making Futures – On Targets, Measures and Governance in Backcasting and Planning for Sustainability. Doctoral Thesis in Planning and Decision Analysis, KTH Royal Insitute of Technology, Stockholm.
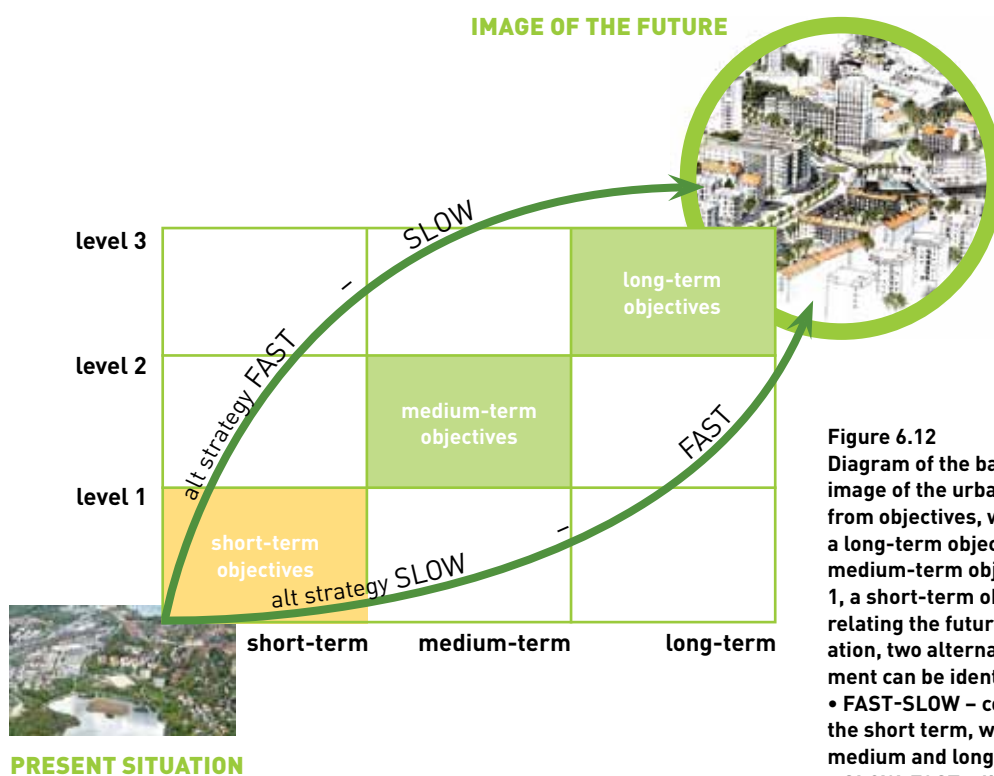[5] Jönsson, B (1999) Tio tankar om tid. Bromberg, cited in SAMS (2000).

Figure 6.12
Diagram of the backcasting process: A future image of the urban environment is developed from objectives, where level 3 represents a long-term objective (e.g. 2050), level 2, a medium-term objective (e.g. 2030) and level 1, a short-term objective (e.g. 5 years). By relating the future image to the present situation, two alternative strategies for development can be identified
• FAST-SLOW – considerable investment in the short term, with less investment in the medium and long term
• SLOW-FAST – limited investment in the short term with considerable investment in the medium and long term.

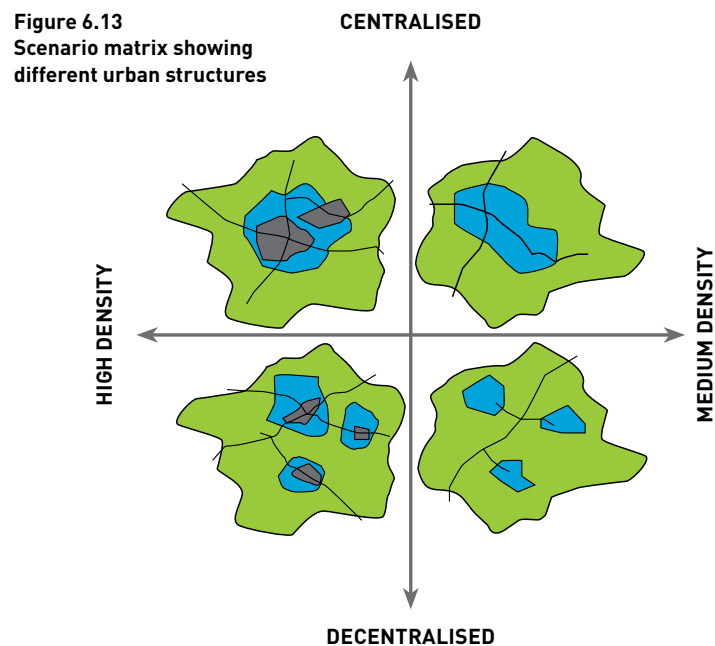Two different and polar principles for sustainable urban development are

> *Large-scale,* centralised solutions, e.g. large supply areas for energy and large-scale, highly specialised technology
> *Decentralised solutions*, e.g. neighbourhood-based, small-scale, differentiated energy technologies[6].

Evaluation of scenarios may result in a combination of solutions from both scenarios.

Working on a »Scenario Matrix« during a workshop in Rwanda.

**Figure 6.13
Scenario matrix showing different urban structures**

CENTRALISED

HIGH DENSITY

MEDIUM DENSITY

DECENTRALISED

DEFINITION OF TERMS

When working with future alternatives, it is important to define key terms. In the *SymbioCity Approach*, the following definitions are used.

- VISION – the desired future

- SCENARIO – possible future situations defined in relation to different external factors

- PROGNOSIS – forecasting of actual trends according to a deterministic view

- FUTURE IMAGE – tangible, spatial scenario, not necessarily linked to external factors

- STRATEGY – the path between the present situation and the vision, scenario or future image

- UTOPIA – a desirable ideal which cannot be realised

- DYSTOPIA – an inhuman, undesirable ideal (nightmare scenario)

---

[6] The scenario technique combined with backcasting presented in Wizelius, T. (1999) Sweden in the year 2021: toward a sustainable society. (Swedish Environmental Protection Agency) may also be a source of inspiration when developing sustainable urban proposals in developing countries.

**Identifying essential synergies between different urban systems**

The *SymbioCity Approach* emphasises synergies between different urban systems to achieve sustainable solutions. This is a key aspect when developing alternative proposals, with the following advantages

> *Sub-optimisation is avoided* when a solution solves two or more problems, which usually also has cost benefits.
> *A multi-disciplinary approach* and collaboration across formal sectors is necessary to *identify synergies*. This promotes knowledge sharing and collaboration, which is vital to achieve a cost-efficient and smooth planning process.

The conceptual model including the urban systems can be used to discuss and develop different kinds of synergies between urban systems when alternative proposals are developed. An integrated approach and resulting synergies also contribute to economic and social benefits. Examples of synergies are given in the case studies in *Chapter 7*.

ASPECTS TO CONSIDER

- What are the alternative proposals/strategies for prevention/ intervention to improve sustainability performance and the environment?

- How do these strategies relate to the overall political vision for the city/town/area?

- In which aspects is mitigation the only possible measure – or a complementary strategy? Has the potential risk of making an unfavourable overall urban situation permanent been considered? What opportunities are there to make changes at a later stage?

- Have alternative solutions/proposals been developed for integrated land-use and green areas, traffic/transportation and infrastructure planning? What are they and why were the chosen alternatives considered best?

- Have cross sector, multi-disciplinary approaches been considered when developing alternatives? What was the result?

- Have preliminary integrated, long-term scenarios been identified for the area?
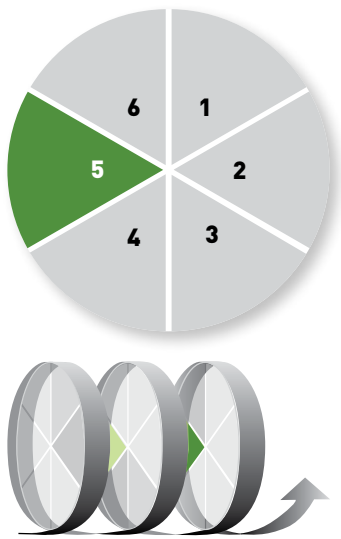
6.5 STEP 5
Analyse impacts

Sustainability assessment is a generic term for a variety of methods and tools used to examine proposals for sustainable urban development. Assessment can cover both strategic and project levels, to ensure *that objectives and targets* for increased sustainability have been included.

The *economic, social, environmental and spatial impacts* of identified alternative proposals and solutions should be studied and evaluated as a basis for informed decision-making. This can be done for a single alternative or combination of several alternatives. Impact analysis is an important Step in developing holistic and innovative proposals. It is also a core function of sustainability reviews.

The focus of this conceptual framework is the *assessment of environmental, socio-cultural and economic impacts* of alternative solutions, particularly for the urban poor.

A sustainability assessment should be a natural part and the *basis of decision-making* in all urban development interventions. The scope of assessments will differ depending on the objectives, the particular situation and the type of intervention or proposal being assessed. How assessments are carried out also depends on the legal *framework, policies and the planning praxis* in different countries, regions and cities.

In general, programmes, plans and projects with extensive consequences from a sustainability perspective require comprehensive and detailed assessments. In projects with limited impact, assessment may be very brief. The assessment of proposals and solutions to improve sustainability (developed in Step 3) should be based on the *objectives and targets* defined in

Environmental Impact Assessments (EIAS) are a proven tool with a good track record in evaluating the environmental risks and opportunities of proposed projects. The methodology is also applicable to limited urban development plans, including socio-cultural and economic impacts.

However, the need for a similar assessment process for decision making at the strategic level has not been recognised to the same extent, though the *Strategic Environmental Assessment* (SEA) is used in some contexts (*see below*). Limiting environmental assessments to the project level decreases opportunities to identify strategic choices that may lead to more sustainable outcomes.

A project assessment invariably takes place in a predetermined policy environment. For example, an EIA of a new fossil fuel energy generation plant is unlikely to consider renewable energy options. Consequently, alternatives for energy generation will be limited to location and technology choices within the framework of fossil fuel power generation [7].

[7] OECD (2006) DAC Guidelines and Reference Series. »Applying Strategic Environmental Assessment. Good Practice Guidance for Development Cooperation«, p 31.

Strategic Environmental Assessment (sea) is the collective term for methods and tools concentrating on the analysis of the environmental impact of policies, programmes and plans on a strategic level and for larger urban areas, often in a long-term perspective. Its strategic orientation is especially valuable in a review process which considers comprehensive alternatives for improved sustainability performance in a wider perspective, including socio-cultural and economic perspectives.

Strategic Environmental Assessment
SEA → WHY? WHERE? IF?
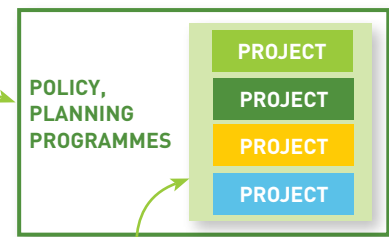
Environmental Impact Assessment
EIA → HOW?

Figure 6.14
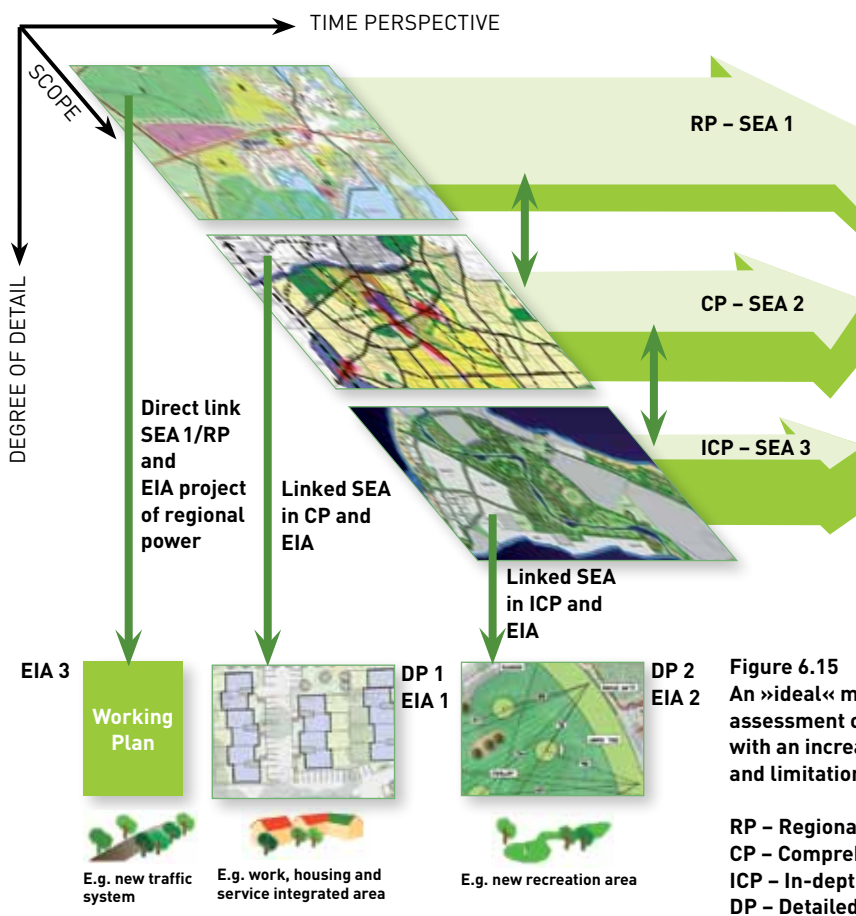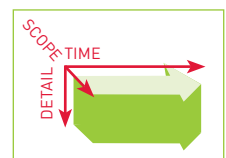**SEA focuses on the strategic level (policies, plans, programmes), while the EIA often focuses on projects.**

Figure 6.15
An »ideal« model for working with assessment of plans on all levels, with an increasing degree of detail and limitation of scope.

RP – Regional Plan
CP – Comprehensive (Urban) Plan
ICP – In-depth Comprehensive Plan
DP – Detailed Plan

Source: Ranhagen, U, et al. (2000)

A strategic environmental assessment should evaluate how the choices in a proposal affect the environment and achieve environmental objectives. An assessment should be done when it is still possible to modify proposed solutions. A sea is not a purely technical procedure but a *dynamic process* that include consultation with stakeholders that include environmental socio-cultural and economic aspects of sustainability.

A good sea can also contribute to increasing awareness and involvement in sustainability and environmental concerns, and generate new insights and solutions. It should also identify and assess probable or potential negative effects and question estab-
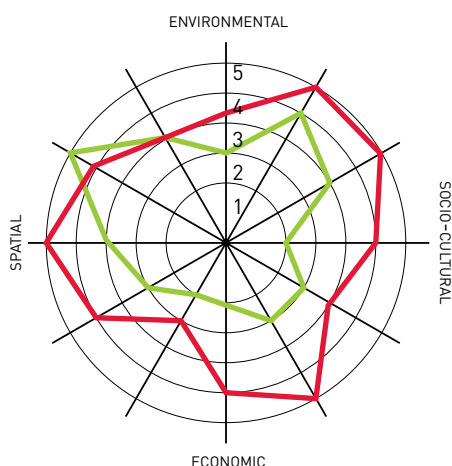
Figure 6.16
A spider diagram (radar graph) assessing two scenarios regarding the four dimensions of sustainability, using a 1–5 grading.

PHOTO Ulf Ranhagen

lished but unsustainable paradigms and assumptions.

As illustrated in *Figure 6.14,* seas focus mainly on the questions *Why, If and Where*, while eias focus on *How*.

A model for a sea process in an urban context is shown in *Figure 6.15*. In this model, the sea-process is integrated with regional and comprehensive planning on city/town level in order to cover e.g. environmental effects in a long-term perspective. The sea provides a basis for more detailed assessments and decisions managed in the eia process at the detailed planning and project level.

Various methods and tools can be used in assessing sustainability and environmental impacts of planning proposals, and in participatory planning processes, e.g.

> **A Spider diagram** (or radar graph) – Selected indicators are placed on the radial axes of a circle. The indicators can be clustered according to their environmental, economic, socio-cultural or spatial nature, unless being used only for, e.g. ecological aspects. Indicators are graded with optimum performance at the circumference (e.g. 3, 5 and 10) and minimal performance at the centre of the circle, s*ee Figure 6.16*.

> **Effect profile or ranking diagram** – Selected indicators shown as vertical columns, with different colours for different alternatives. Once the indicators are graded, they can be linked for each alternative to give graphic performance profiles.

> **Multi-criteria analysis** (mca) – a systematic procedure to analyse (weigh) the effects of different alternatives. mca is often used for more complex evaluations, as the selected indicators are weighted and their performance is graded, and these two factors are multiplied, to arrive at a score for each indicator. Indicator scores are then totalled for each alternative.

ASPECTS TO CONSIDER

• Has environmental assessment on the strategic level been applied to compare and evaluate alternatives? Have their recommendations been taken into account in the planning? Did the SEA-process included social-cultural and economic assessments?

• Has an Environmental and Social Impact Assessment (ESIA or EIA & SIA) been carried out at project level? What were the main recommendations for development of the proposals?

• Can advanced tools such as multi-criteria analysis (MCA) and life cycle analysis be used to assess a larger number of aspects and indicators?

• Have tools such as spider or ranking diagrams been used to evaluate alternatives?

• How have different stakeholders, including representatives of the poor, been involved in the assessment?

• What conflicts have been identified between different objectives, e.g. environmental and economic objectives?

6.6 STEP 6
Develop a strategy for implementation and follow-up

An optimum *final proposal* (that complements existing plans and is informed by the SEA and/or EIA) must also include an implementation and follow-up strategy. The proposal may combine elements from several of the alternatives considered, or a main alternative with some additions/alterations from others. If the first option is chosen, it is important to balance the elements to avoid sub-optimisation and a 'trade-off' solution of lower quality.

All sustainability aspects – socio-cultural, economic, ecological – must be integrated into all phases of the implementation process on all levels (spatial planning, building design, transport, services, public space and landscape planning, etc.) *See Figure 6.17.*

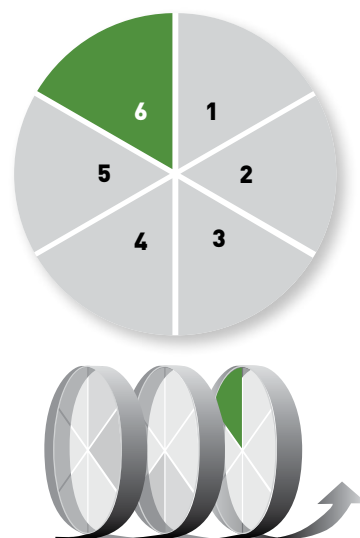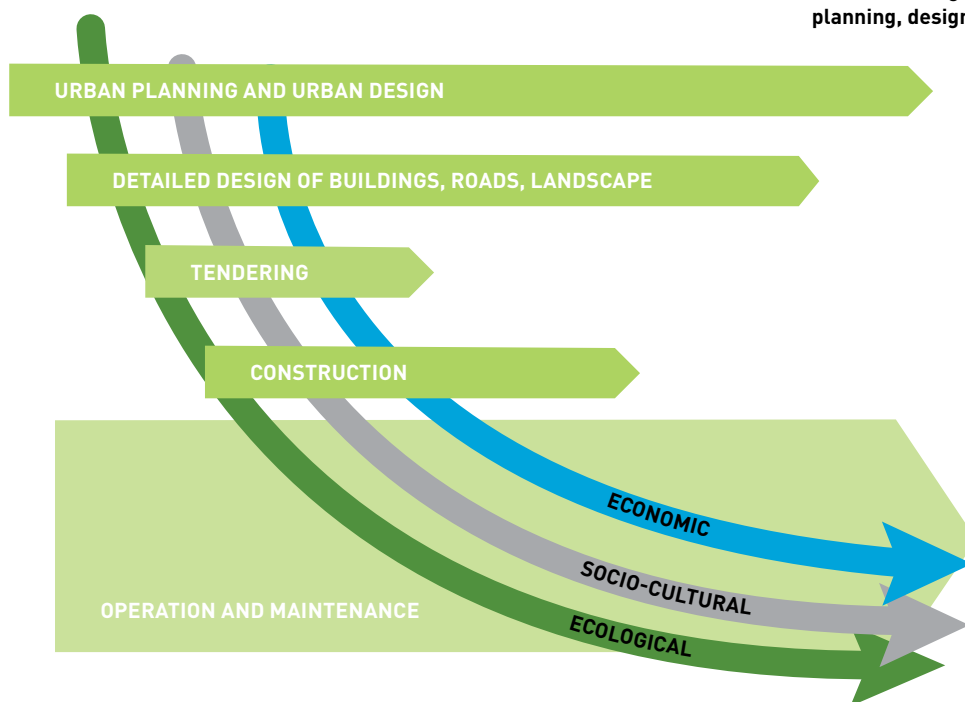**Figure 6.17**
Key sustainability aspects and objectives should be integrated into all phases of planning, design and implementation.

URBAN PLANNING AND URBAN DESIGN

DETAILED DESIGN OF BUILDINGS, ROADS, LANDSCAPE

TENDERING

CONSTRUCTION

OPERATION AND MAINTENANCE

ECONOMIC

SOCIO-CULTURAL

ECOLOGICAL

The final proposal does not plan all aspects in detail and it is thus necessary to define a number of *sub-projects* as part of the implementation strategy, e.g. planning of infrastructure, streets and public space, etc. Previously identified synergies between different urban systems are also relevant at this level.

Especially in larger urban development projects covering a long implementation time frame, *a number of implementation phases* should be defined. Careful planning can avoid sub-optimisation in implementation. Phasing of the development, with inbuilt evaluation, can result in learning that benefits subsequent phases. A pilot phase, specifically to test solutions on a small scale and learn lessons early, is often included.

It is important to *continuously assess the outcome* of the planning process i.e. the built environment. Operation and maintenance (O&M) is an ongoing phase which must be included in project planning (and financing), the neglect of which has made many otherwise successful infrastructure projects unsustainable, or shortened their design life.

O&M includes sustained, regular performance monitoring, periodic systems assessments, and maintenance and rehabilitation interventions to ensure the preservation and sustained performance of systems and infrastructure assets.

ENVIRONMENTAL CERTIFICATION SYSTEMS

There are a number of certification systems available on the market, for planning and monitoring the built environment from a sustainability perspective, for buildings and areas. Two third-party systems are widely used. BRE Environmental Assessment Method (BREEAM) is a British system for assessment of new and existing buildings, as well as development on a community scale.

The US Green Building Council LEED system (Leadership in Energy and Environmental Design) provides developers and property owners with a framework for identifying and implementing practical and measurable green building design, construction, operations and maintenance solutions.

Both BREEAM and LEED have developed certification systems for urban areas, which are gaining increasing recognition (LEED ND and BREEAM Communities). There are a number of other certification systems used internationally e.g. the Japanese CASBEE system. In Sweden, the Sweden Green Building Council offers similar services in the building sector.

Several of the certification systems are affiliated to national organisations, which are affiliated to the World Green Building Council. There is often a need to adapt such systems to the local context and to supplement a system with site-specific indicators.

There is wide interest in applying certification systems for follow-up, in order to safeguard qualities defined in review and planning processes. The criteria applied in these systems should be related to the targets and indicators defined in Step 3.

Decision-diagrams or *decision-trees* are useful tools for clarifying important future choices and making decisions.

The Logical Framework Approach (or a similar framework with a hierarchy of objectives, outputs, activities and indicators) is a very useful tool for project planning, monitoring and evaluation phase.

THE LOGICAL FRAMEWORK APPROACH

The suggested working procedure in the *SymbioCity Approach* has many similarities with the widely used Logical Framework Approach (Logframe or LFA) for project planning. The SymbioCity conceptual framework goes deeper into the analysis of challenges in an urban planning context and the development and evaluation of scenarios and solutions. The LFA Steps are

Step 1. Context Analysis – the project environment and background information

Step 2. Stakeholder Analysis/Participation Analysis – who should be involved in planning and implementation

Step 3. Problem Analysis/Situation Analysis – of the problem to be solved and its causes

Step 4. Objectives Analysis – a picture of the future situation/deciding intended impact and outcomes

Step 5. Plan of Activities and Outputs– means to achieve objectives and eliminate causes of problems

Step 6. Plan of Resources – inputs necessary in order to implement the activities

Step 7. Indicators – measurement of results

Step 8. Risk Analysis and Risk Management – analysis of the risk affecting the project objectives and plans to avoid these risks

Step 9. Assumptions – factors important to goal fulfilment but outside the scope of the project.

Steps 6–9 provide useful advice regarding resource planning in projects (Step 6), follow-up of implemented solutions and indicators (Step 7), potential risks related to implementation (Step 8) and assumptions regarding the institutional situation in a country, region or city/town (Step 9).

The *SymbioCity* working procedure can easily be combined with LFA, e.g. in urban planning projects defined by Logframes in initial proposals to donors. The *SymbioCity* working procedure pays

specific attention to the analysis of alternative solutions, potential synergies between different urban systems and the impacts of proposed solutions. The *Figure 6.18* below illustrates connection points between the two planning methods.

Figure 6.18
Comparison of the SymbioCity Approach and the Logical Framework Approach

Symbio City Log frame	Step 1 Organisation	Step 2 Diagnosis	Step 3 Objectives	Step 4 Proposals	Step 5 Impacts	Step 6 Strategy for implementation
1. Context		●				
2. Stakeholders	●					
3. Problems		●				
4. Objectives			●			
5. Activities				●		
6. Resources			●			●
7. Indicators					●	●
8. Risks					●	●
9. Assumptions					●	●

ASPECTS TO CONSIDER

- What plans have been developed, with measures in the short, medium and long term perspective?

- What systems or routines exist for follow-up and monitoring previously implemented plans?

- Has a systematic plan for implementation been established, with evaluation of different implementation steps?

- What indicators are used in monitoring and evaluation procedures? Do these include environmental, socio-cultural, economic and spatial aspects of development?

- Which stakeholders have been involved in setting the indicators and how has the process of defining and choosing indicators been organised?

- What financing mechanisms are important to further planning and implementation?

- What aspects need further investigation?

7.

GOOD PRACTICE EXAMPLES

GOOD PRACTICE EXAMPLES

THIS CHAPTER INTRODUCES a number of projects and approaches that promote sustainable urban development. The examples illustrate how strategies and policies can be developed and implemented, as the basis for urban planning interventions on a more detailed level. They also illustrate possible linkages between different urban systems, and how synergies can add value to interventions.

Most of the examples have been developed and/or implemented outside the direct scope of the *SymbioCity Approach*. However, they illustrate the core values of the approach and show the broad range of entry points to enhance the environmental, socio-cultural, economic and spatial performance of urban areas.

Hopefully, the examples will inspire future urban development interventions, and thus contribute to analysis, assessments and reviews, the development of policies and strategies, and the formulation and implementation of integrated urban plans, master plans and detailed development plans.

THE EXAMPLES

1. Regional Development Plan for the Stockholm Region, 2010
2. »The Walkable City« (Promenadstaden)
3. Climate Strategies – Retreat, Defend, Attack
4. The Western Harbour, Malmö (Västra hamnen)
5. Hammarby Waterfront (Hammarby Sjöstad)
6. Stockholm Royal Seaport (Norra Djurgårdsstaden)
7. Ulricehamn, Sweden
8. Urban Sustainability Review, Visakhapatnam, India
9. Urban Sustainability Review, Skopje, Macedonia
10. Integrated Development Planning, Buffalo City Municipality, South Africa
11. Integrated Transportation Planning, Nelson Mandela Bay Municipality, South Africa
12. The Sustainable Community Concept, Nelson Mandela Bay Municipality, South Africa
13. Bus Rapid Transport Systems in Curitiba and Bogota
14. Tangshan Bay Eco-City, China

1. Regional Development Plan for the Stockholm Region, 2010

COUNTRY	**Sweden**
CITY	**Stockholm**
URBAN SCALE	**Regional level**
KEY ISSUES	**Regional planning, strategic planning, metropolitan area**

For more information, see
www.tmr.sll.se/english/

THE REGION OF STOCKHOLM is growing by some 30 000 new citizens (1,5% growth) each year, which creates a number of challenges, including impacts on the environment and climate.

The vision for the Stockholm region is to become Europe's most attractive metropolitan region by
> improving living conditions for inhabitants in terms of access to labour markets, services and education
> using resources more efficiently while caring for the environment
> improving security throughout the region
> increasing accessibility and connectivity without compromising or degrading the environment and climate
> securing and improving capacity for mobility
> promoting social inclusion and gender awareness.

The regional plan outlines the following goals and strategies for development by 2030
> Increase sustainable capacity and quality within education, transport and the housing sector
> Develop ideas and the capacity for renewal
> Safeguard values for future needs
> Further develop a dense, multi-centre region
> Strengthen cohesion
> Liberate life chances.

The images (to the right) show planned development of the region along transport corridors, while preserving and enhancing the qualities of the green and blue wedges that surround the built environment. Radial connections are necessary to support the proposed regional structure.
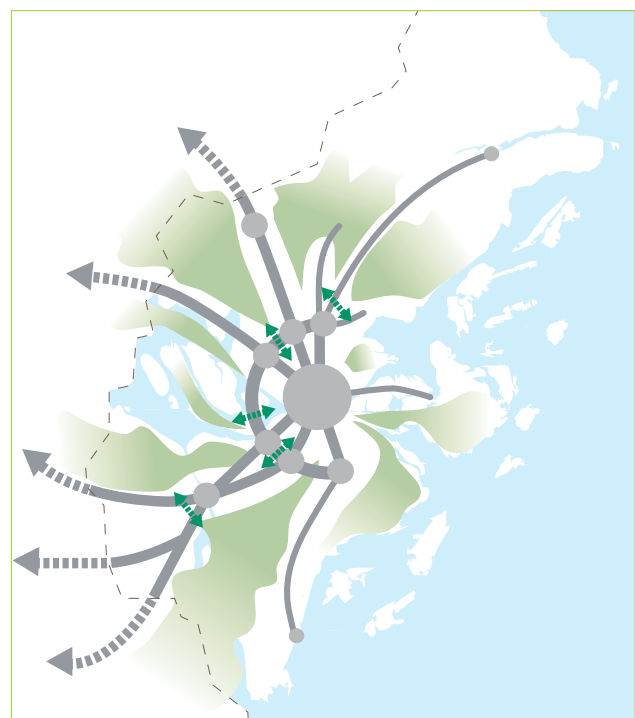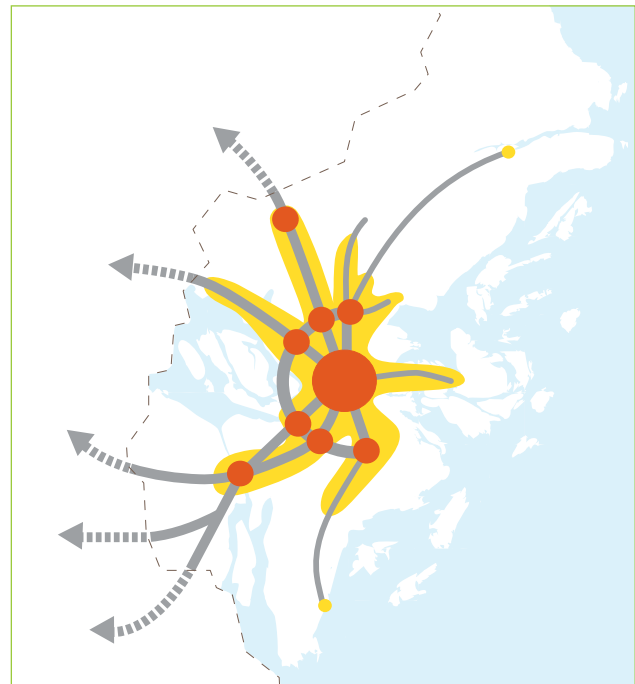
IMAGES The Regional Development Plan, Stockholm County Council

2. »The Walkable City« (Promenadstaden)

COUNTRY	**Sweden**
CITY	**Stockholm**
URBAN SCALE	**Comprehensive urban level**
KEY ISSUES	**Comprehensive planning, strategic urban development**

IN 2011, THE CITY OF STOCKHOLM adopted a new *Comprehensive Urban Plan – The Walkable City*, as a platform for future development of the city, in line with the regional development plan and the city's Vision 2030. Stockholm, as the capital of Sweden, is the economic, political and administrative centre of the region and the country, and thus attracts both new residents and new businesses.

Challenges to this expanding region include supporting a polycentric metropolitan region, adapting the city to a higher population density, using resources more efficiently, addressing environment and climate issues and addressing the socio-economic disparities, e.g. improving life conditions in marginalised areas. Densifying and developing the city on already developed land and using existing infrastructure has been a strategy for the last decade.

To meet the challenges and to promote a vibrant and attractive city, four key strategies are outlined in *The Walkable City*.

> Maintain and develop the city's competitiveness by densifying and diversifying central Stockholm in strategic development areas, adding new to already existing housing areas to promote social cohesion in the city.
> Develop strategic nodes in the metropolitan area to support the poly-centric urban fabric and provide inhabitants with a robust range of services, cultural opportunities and jobs.
> Improve connectivity and mobility in the city and region by improving infrastructure, including different modes of public transport, and bicycle and pedestrian routes.
> Develop a secure and dynamic urban environment by increasing the density of the city while creating high quality public space and adequate space for public services, etc.

The plan is intended as a strategic navigation tool, to provide clear guidance on different intentions and objectives to meet the Vision 2030, rather than a traditional land use plan. It will be continuously updated to reflect new situations, and to support and reflect an ongoing dialogue regarding the city's future.

IMAGES Stockholms stad /Översiktsplan (the Walkable City)
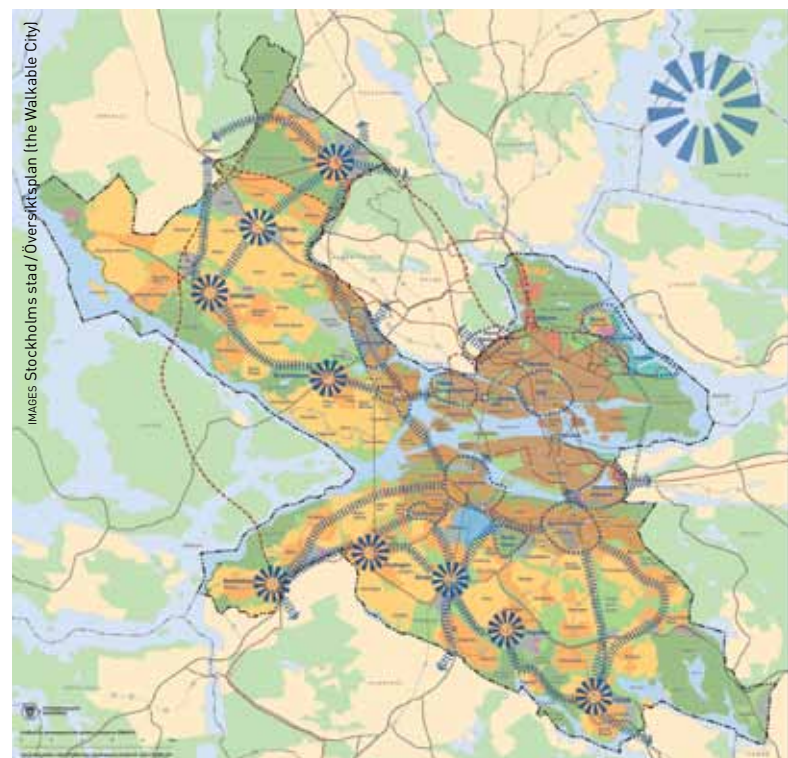
3. Climate Strategies – Retreat, Defend, Attack

COUNTRY **Sweden**

CITY **Mistra Urban Futures / Gothenburg Municipality**

URBAN SCALE **Comprehensive level / area level**

AS AN EXERCISE TO EXPLORE the consequences of climate change, Mistra Urban Futures (a centre for sustainable development) conducted a transdisciplinary study resulting in possible development strategies for the City of Gothenburg. The study was based on three strategies to adapt to climate change, designed by the British Building Futures and ICE (Institution of Civil Engineers).

Many coastal towns and cities are exposed to raising sea levels and flooding as a consequence of climate change. Depending on geographical location, cities may also experience raising temperatures and dryer summers, and more and heavier rain in winter, which may pose additional threats to the built and natural environment.

The three strategies, *Retreat, Defend and Attack*, propose a planned withdrawal of settlements from exposed coastal zones (retreat), the construction of flood protection walls or dykes (defend), and using water bodies for development (attack). The three strategies are summarised below.

The Retreat Scenario implies that the existing built environment is moved from the area in focus, including buildings, infrastructure and other types of urban functions. With this approach, the risk of exposing the built environment to flooding is minimised, while at the same time increasing the safety of the inhabitants. If the »abandoned« areas are converted into wetlands, parks, etc, opportunities may be created to manage temporary water in the

city, as well as supporting the ecological diversity in the area. This strategy entails the costs of removal, as well as less interest in new investments in the area. On the upside, there is no need to invest in expensive protection walls.

The Defend Scenario proposes flood protection walls to prevent water from flooding into the city. If properly designed, these walls can be integrated into the natural and urban landscape, and provide useful public spaces, e.g. as walkways along the coastline. Such walls can be either permanent or temporary, depending on construction methods and levels of investment. This approach protects vulnerable land and building stock, and minimises the costs of post-flood rehabilitation. Potential negative impacts may be changes and possibly damage to the natural coastal zone, and less access for inhabitants to the seaside.

The Attack Scenario uses the water body for development, and allows possible flooding and raising water levels to take place, as buildings and infrastructure are designed to accommodate and adapt to such changes. One possibility is to build on pillars, and design flood-proof entrances and ground floors of buildings. Floating constructions are another option. The strategy may lead to innovative solutions and technological development which has wider benefits. However, it may provide resilient new settlements, but at significant cost, while other parts of a city or town may remain unprotected.

IMAGES Mistra Urban Futures/SWECO

4. The Western Harbour, Malmö (Västra hamnen)

COUNTRY	**Sweden**
CITY	**Malmö**
URBAN SCALE	**Urban district level**
KEY ISSUES	**Redevelopment, integrated urban development**

For more information, see
www.malmo.se

IN A COUPLE OF DECADES, the western harbour in Malmö has been transformed from an industrial park into an area for sustainable living, working and knowledge generation. The vision for the redevelopment area is to create a national and international example of sustainable and integrated urban development, accommodating housing, services, workplaces and learning facilities. The area should stimulate the transition to a knowledge city. The district is a leading example of a densely built environment and Malmö's striving towards economic, social and environmental sustainability.

The western part of the area was developed in connection with the Bo 01 European Housing Exhibition in 2001. This phase set the standard for the next phases of development through its quality programme, high standards for public areas and large variety of developers.

The ecocycle systems in Bo 01 include waste minimisation, recycling and reuse, and creating energy from waste and wastewater sludge. In has two parallel systems for organic/food and other waste, vacuum transportation of waste, and waste grinders.

The area aims for 100% locally produced renewable energy based on wind power, solar energy and heat pumps which extract heat from the sea and an aquifer. These energy production units are linked to the district heating and cooling system of the city. Depending on the time of year, energy is delivered from or to the larger system – resulting in a 1:1 renewable energy production to consumption ratio on an annual basis.

The Bo 01 area is a car-free area, giving cyclists and pedestrians priority, and residents are encouraged to use environmentally friendly transport such as the bus service, which links the area to most important urban nodes in Malmö.

PHOTOS Malmö Stad

5. Hammarby Waterfront (Hammarby Sjöstad)

COUNTRY	**Sweden**
CITY	**Stockholm**
URBAN SCALE	**Urban district level**
KEY ISSUES	**Integrated urban development, redevelopment, ecocycle model**

For more information, see
**http://vision.stockholm.se/ hammarbysjostad
www.hammarbysjostad.se/**

HAMMARBY SJÖSTAD (Waterfront) was the first environmental profile area in Stockholm, and experience gained will be used and refined in the development of the Stockholm Royal Seaport (*see next page*). Hammarby is a natural continuation of the inner city of Stockholm, and this has shaped the infrastructure, urban planning and design of the buildings. An old, heavily polluted industrial and harbour area has been transformed into a sustainable city district. When completed in 2017, Hammarby Sjöstad will have about 11 000 housing units for 25 000 people, and some 10 000 workplaces.

The environmental programme for the district aimed to decrease environmental impacts by 50% compared with a normal area built in 1995, which required completely new urban and environmental solutions. The integrated and multidisciplinary approach in all phases from comprehensive to detailed planning has accelerated decision-making and increased project efficiency. The area is characterised by a unique combination of modern, semi-open, block-based urban structures, and the traditional inner city character of Stockholm.

Traffic and services, including light-rail and BRT buses, are concentrated along a 3 km avenue connecting Hammarby Sjöstad internally and with surrounding areas. Public transport accounts for 75 to 80% of peak hour travel. Parks, quays and walkways of varying character and design connect areas within and around Hammarby Sjöstad.

Hammarby Sjöstad has an eco-cycle model with integrated environmental solutions for waste, energy, water and sewage. The design of the eco-cycle model has clear linkages to the planning and urban design of the area, such as public space, landscape planning and the transportation system.
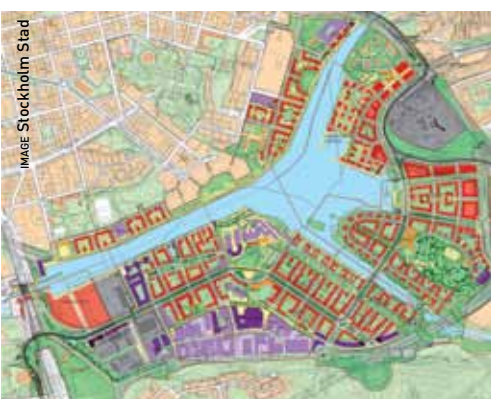
6. Stockholm Royal Seaport (Norra Djurgårdsstaden)

COUNTRY **Sweden**

CITY **Stockholm**

URBAN SCALE **Urban district level**

KEY ISSUES **Integrated urban development, redevelopment, environmentally sustainable city district**

THE STOCKHOLM ROYAL SEAPORT is the largest city district to be developed in central Stockholm (and Sweden) in coming years. When completed in 2030, it will accommodate some 11 000 new housing units and 30 000 new workplaces in a mixed-use built environment. The development will take place on former industrial and harbour land, though the harbour will remain as a feature in the new district.

The district is profiled as a next generation climate-positive area with innovative and sustainable environmental solutions. The goal is a climate neutral and fossil fuel free district by 2030, with CO_2 emissions per capita below 1,5 tonnes annually by 2020. The following focus areas have been identified as central to achieving the sustainability targets.

1. *A green and climate adapted public environment* – The district will be resilient to a changing climate and rising sea levels; biological diversity is maintained and strengthened.

2. *An energy efficient built environment* – Passive houses or 'plus houses' with renewable energy sources, e.g. solar and wind; a smart electricity grid enabling use according to fluctuations in availability via adapted consumption patterns, etc.

3. *Recycling and closing loops for waste, water and energy* – Nutrients in wastewater are extracted and used in agricultural production; Waste grinders are installed in every apartment, to process organic waste to be used to produce biogas.

4. *Sustainable transport systems* – The district will have a wide range of transport modes, from pedestrian and bicycle routes to buses and trams, enhancing accessibility and connectivity.

5. *Integrated living and working* – Raising awareness and creating opportunities to choose this option, e.g. varied and advanced ICT solutions.

PHOTOS Stockholms stad

7. Ulricehamn, Sweden

COUNTRY	**Sweden**
CITY	**Municipality of Ulricehamn**
URBAN SCALE	**Comprehensive level**
KEY ISSUES	**SymbioCity/Sustainable Municipality method, comprehensive planning, participatory processes**

For more information, see
www.ulricehamn.se

THE SWEDISH MUNICIPALITY OF ULRICE-HAMN (23 000 inhabitants), is an example of where the *SymbioCity* methodology has been applied in planning interventions for the town and one of its suburbs. Ulricehamn is a small urban town facing typical challenges such as generation of employment opportunities, migration, etc.

The Ulricehamn comprehensive plan was adopted in 2008 and has been partly implemented through new developments and transformation of existing buildings and land use. Larger development areas have been connected to district heating in central areas. Multi-family structures have been developed in central locations, rather than implementing large redevelopment areas.

The planned strategy is to densify the town, with additional housing opportunities in central location, as well as development of the main infrastructure such as rail and highways. As a result, most of the housing development has taken place in central locations and a decision has been made to implement the highway. The railway will probably be implemented in the long term.

During the first planning phase, the focus was on interdisciplinary work among civil servants in the municipality. In developing the suburb, inhabitants were involved via public meetings, and politicians played a key role in facilitating the participatory process, as part of preparing the way for development of the whole municipality. The approach was successful in terms of public participation in processes, and in linking different planning levels.

Tools proposed by the R&D project Sustainable Municipality were used in the urban planning process, e.g. structured brainstorming to identify key resources/strengths and development issues. The result was then used to formulate a local definition of sustainability, and to define key issues and indicators in a strategic assessment. The politicians have also been using backcasting, and have identified four development scenarios for 2050.

This work will contribute to the comprehensive urban plan, with a particular focus on housing and infrastructure. By using the tools on a strategic level, it has been possible to prioritise and not get stuck in details. The initial strategic planning is part of the first loop in the *SymbioCity* cyclical planning procedure.

IMAGE SWECO
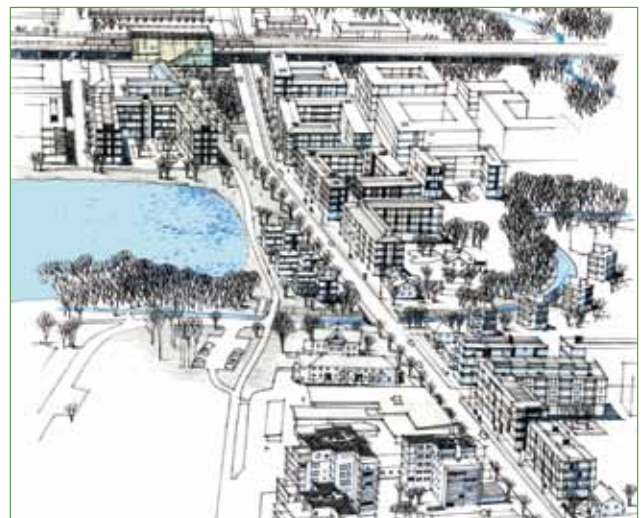
MAP Ulricehamn Kommun

8. Urban Sustainability Review, Visakhapatnam, India

COUNTRY **India**
CITY **Visakhapatnam**
URBAN SCALE **City level, metropolitan**
KEY ISSUES **Urban sustainability review, master plan, consultation**

A SUSTAINABILITY REVIEW was conducted by Sida in Visakhapatnam during 2008–2009. The City is the main urban centre in the Greater Visakhapatnam Municipal Cooperation (GVMC). The aim was to conduct a rapid review of the current situation, with the following objectives

> to contribute to a deeper understanding of the benefits of a holistic approach to improving the urban environment

> to achieve a comprehensive and updated picture of the City's urban environmental situation

> to apply an asset based analysis of the urban situation as a basis for further planning.

The review was organised with a steering committee and a review team, with members representing different commissioners and heads of departments, as well as officials. Prior to the fieldwork, the review started with analysis and studies of the institutional framework, including a development framework consisting of the VUDA (Visakhapatnam Urban Development Authority) Master Plan, the City Development Plan and the City Development Strategy.

Workshops were held with various stakeholders, who jointly identified a number of prioritised issues to address, i.e. *waste management, water and sanitation, traffic and transport, air pollution, coastal development, including risk and climate change issues, and finally, governance.* Focal studies followed the initial workshop, to describe in more detail both sources and impacts of the various challenges, which were then the basis for the second round of participatory discussions, assessments and identification of the way forward.

Short, medium and long-term recommendations were then discussed regarding the future development of Visakhapatnam. These included strengthening financial and human capacities, fi-

nancial and project management support to address some of the focal areas, development of appropriate methods and tools adapted to the local context, and further studies, e.g. a rapid urban environment appraisal study.

In the longer term, it was suggested that a review be undertaken to strengthen governance structures in terms of using resources more efficiently, increasing transparency and inclusiveness, developing recycling models for waste and water, etc. The sustainability review was carried out according to the Sida manual on *Support to Environmentally Sustainable Urban Development.*

PHOTOS Ulf Ranhagen

A group of women involved in entrepreneurial activities.

In the City of Vizag the installation of common tapping points for water has greatly improved the life quality, health and safety of poor people in the urban settlements.

9. Urban Sustainability Review, Skopje, Macedonia

COUNTRY	**Macedonia**
CITY	**The City of Skopje**
URBAN SCALE	**City level**
KEY ISSUES	**Urban sustainability review, transportation strategies**

For more information, see
www.skopje.gov.mk/EN

A SUSTAINABILITY REVIEW was conducted in Skopje during 2008–2009, in two phases. The first analysed the overall urban environment and identified key issues and areas/sectors for improvement. The second phase focused on the urban traffic and transportation system.

The objectives were to illustrate the relationship between transportation, land development, environment, social cohesion and economic progress, and to develop a plan to progressively improve the traffic and transportation situation. The first phase concluded that there was a lack of control over the growing use of private cars, and an almost anarchic parking situation. The public transport system was also in severe decline, due to a lack of financial resources. Alternative scenarios were developed for a 30-year time horizon. The scenarios were fundamentally different, and would have different environmental impacts.

The ad hoc scenario involved limited resources, inconsistent policies, uncoordinated institutions, deteriorating mobility for cars owners, and unacceptable public transport standards.

The car scenario involved a high-class road network, high traffic volumes, a neglected public transport system, urban sprawl and low standards for vulnerable groups.

The public transport scenario involved a consistent mass transit network supplemented by an attractive feeder system, including bicycle and pedestrian networks, increased densification and less private car use.



The following strategies were developed, based on the public transport scenario: 1. Transform the existing bus system. 2. Develop a segregated, high-class mass transit system, preferably based on Bus Rapid Transport (BRT). 3. Improve the road network. 4. Implement a parking policy.

The sustainability review was carried out according to the Sida manual on *Support to Environmentally Sustainable Urban Development.*

PHOTOS/IMAGES u-PLAN Tor Eriksson
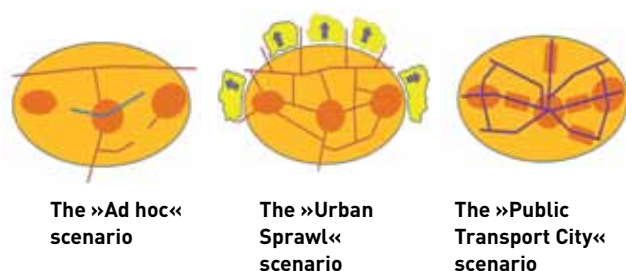
The »Ad hoc« scenario

The »Urban Sprawl« scenario

The »Public Transport City« scenario

10. Integrated Development Planning, Buffalo City Municipality, South Africa

COUNTRY   **South Africa**
CITY   **Buffalo City Municipality**
URBAN SCALE   **Comprehensive level**
KEY ISSUES   **Integrated development planning,**
                     governance, environment

THE ADVENT OF INTEGRATED DEVELOPMENT PLANNING (IDP) constituted a major watershed for local authorities in South Africa. The national legislation on IDP in the Municipal Systems Act, 2000 was the basis for the reorientation of municipalities to play a greater role in service delivery and development. During the late 1990s, integrated planning was introduced to enable municipalities to move towards a more holistic and sustainable development approach, and to coordinate spatial, social and financial planning.

The IDP was intended as a method to address the deficiencies and unequal service levels in poor communities, via an inclusive and transparent process. All South African municipalities prepare IDPs as strategic development plans for a five year period, and update them annually.

The IDP process in Buffalo City Municipality was initially conducted in a unique situation of transition and a new, emerging identity for the municipality, as the municipal boundaries had been redrawn to include a larger area characterised by very different features and historical and cultural layers.

Within the IDP framework, and with Sida support for Comprehensive Urban Planning, environmental issues were addressed through analysis and assessments, including community needs assessment. Priority issues that were identified and addressed, included housing, water and sanitation, waste management, transportation, and water, soil and air pollution. As part of the IDP, an environmental development framework was developed, including short and long-term objectives, strategies, programmes and projects.
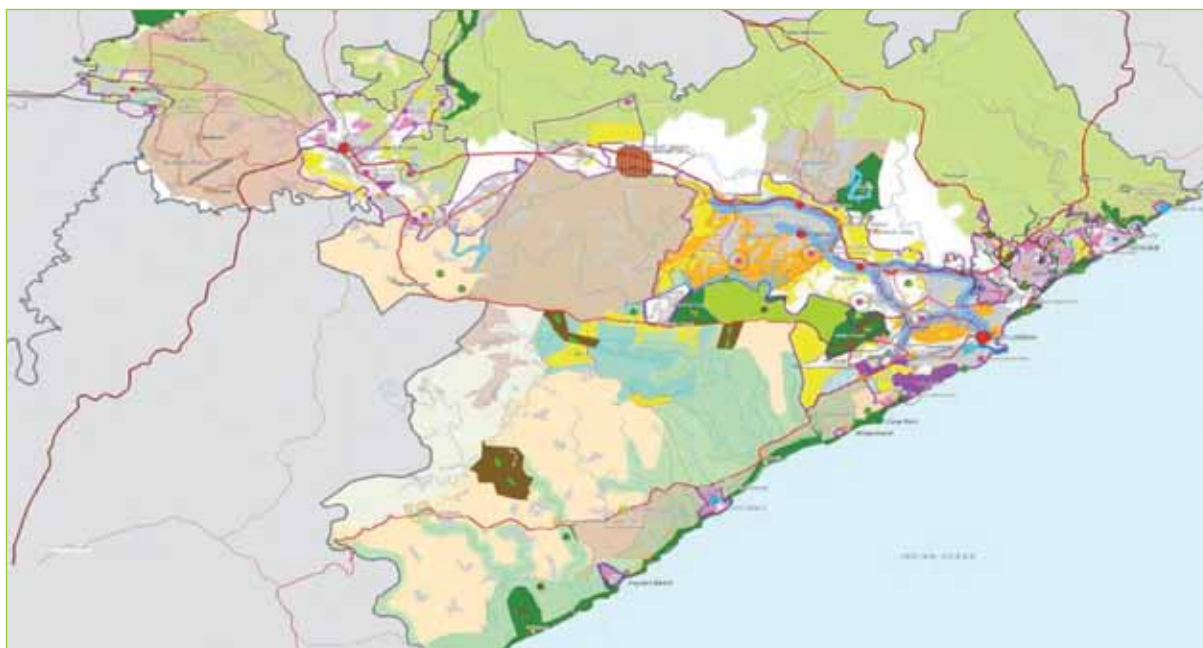

IMAGE Buffalo City Municipality, South Africa

11. Integrated Transportation Planning, Nelson Mandela Bay Municipality, South Africa

COUNTRY **South Africa**

CITY **Nelson Mandela Bay Municipality**

URBAN SCALE **Comprehensive level**

KEY ISSUES **Integrated development planning, transportation, public transport**

AS PART OF ONGOING SWEDISH SUPPORT to Comprehensive Urban Planning and Integrated Development Planning in Nelson Mandela Bay Municipality, two interesting initiatives were identified and launched.

A new Integrated Public Transport System is being developed to replace the current competing subsidised buses and non-subsidised minibus taxis. BRT routes along defined development corridors will be supported by local feeder buses in suburbs. Buses will be given clear passage by providing dedicated bus lanes and signal priority. A uniform ticketing system will allow multi-transfer journeys on one ticket.

A new transport authority is being established to govern and monitor operating contracts, and provide citizens with safe, comfortable and affordable services. Improved access for the poor to workplaces and public and commercial services will support economic growth and contribute to a sustainable integrated transport system.

Today, 33% of commuters are pedestrians, 41% use private vehicles and 26% use public transport. However, this is the average, and travel modes differ significantly between poor and better-off communities. In a typical township, only 10% of people use private cars, while 90% use public transport or walk.

In order to support economic growth, it is essential that people have good access to various activities in the city, no matter their economic situation. It is also of vital importance to the development of a sustainable transport system that people, when their economic situation improves, continue to use public transport as their first choice. The system must also be designed to persuade people in more wealthy areas to use public transport.
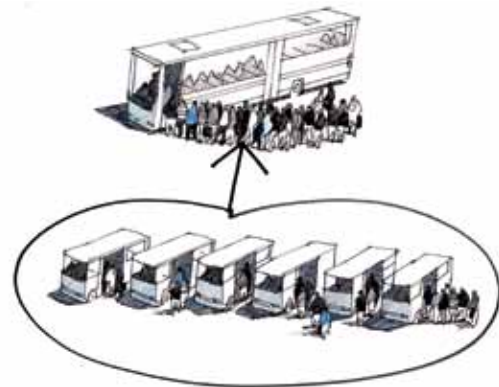
PHOTOS/IMAGE Nelson Mandela Bay Municipality/SWECO

12. The Sustainable Community Concept, Nelson Mandela Bay Municipality, South Africa

COUNTRY	**South Africa**
CITY	**Port Elizabeth / Nelson Mandela Bay Municipality**
URBAN SCALE	**Community level**
KEY ISSUES	**Integrated development, community participation, mixed land use**

For more information, see
www. nelsonmandelabay.gov.za

NELSON MANDELA BAY MUNICIPALITY has developed the Sustainable Community Concept (scu) to fill the gap on an intermediate planning level between citywide integrated development planning and detailed neighbourhood layouts, e.g. housing areas. The scu approach is instrumental in guiding municipal budgeting and resource allocation to reduce inequality and promote integration and urban sustainability at community level.

The scu identifies six functional areas with direct and indirect linkages to spatial planning: Housing, Work, Services, Transport, Community, Character and Identiy. The scu promotes a wide range of socio-economic neighbourhoods, housing types and tenure options to promote diversity and flexibility over time. To stimulate economic development, employment and income generating opportunities, it promotes business activities in and near residential units and areas, the development of economic centres and commercial corridors, and access to public transport.
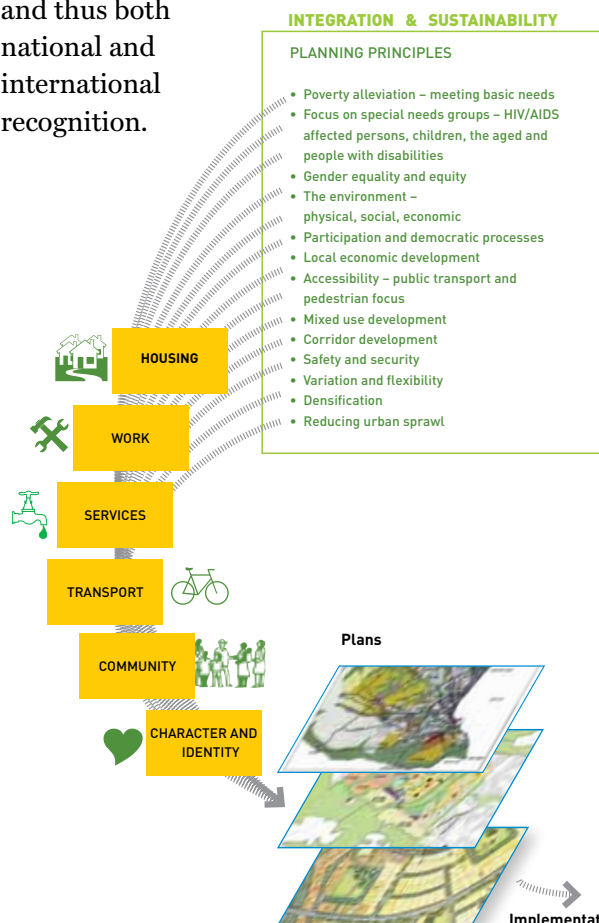
The concept promotes social, commercial, recreational and municipal services in community areas within convenient and safe walking distance, and based on standards that are adequate, sustainable and affordable. Mixed and diversified communities with access to local services and work reduce the need for urban transportation.

Safe pedestrian and cycle routes, and improved access to public transport promote walking and cycling. Community ownership and responsibility are promoted by involving local communities. This strengthens a sense of community and the character of an area, giving a sense of place, pride and identity. This requires community participation in planning, decision-making and implementation of interventions.

The Sustainable Community Concept contributes to poverty alleviation and improved living conditions, including for special needs groups such as those affected by HIV/AIDS, children, the aged and disabled. Equity and gender mainstreaming constitute core values in the participatory and democratic processes. Mixed-use development, corridor development, densification, local economic development, safety and security, and variation and flexibility create an improved environment and reduce urban sprawl.

The Sustainable Community Concept won the World Leadership Award, and thus both national and international recognition.

INTEGRATION & SUSTAINABILITY

PLANNING PRINCIPLES

- Poverty alleviation – meeting basic needs
- Focus on special needs groups – HIV/AIDS affected persons, children, the aged and people with disabilities
- Gender equality and equity
- The environment – physical, social, economic
- Participation and democratic processes
- Local economic development
- Accessibility – public transport and pedestrian focus
- Mixed use development
- Corridor development
- Safety and security
- Variation and flexibility
- Densification
- Reducing urban sprawl

HOUSING

WORK

SERVICES

TRANSPORT

COMMUNITY

CHARACTER AND IDENTITY

Plans

Implementation

PHOTO/IMAGE Nelson Mandela Bay Municipality

13. Bus Rapid Transport Systems in Curitiba and Bogota

COUNTRY	**Brazil and Colombia**
CITY	**Curitiba and Bogota**
URBAN SCALE	**City/metropolitan scale**
KEY ISSUES	**Integrated transportation planning, bus rapid transit**

For more information, see
http://www.curitiba.pr.gov.br/idioma/ingles
www.bogota.gov.co

SUCCESSFUL BRT SYSTEMS (*Bus Rapid Transit*) have been developed in Curitiba, Brazil and Bogota, Colombia, as part of an integrated land use and transportation approach.
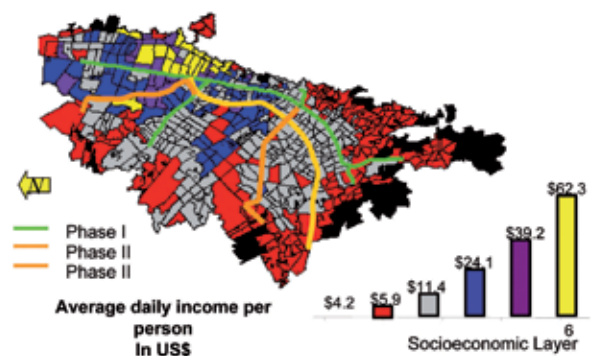
In Curitiba, an integrated land-use and transportation plan was adopted in 1968, for future expansion of the city along a linear axis with public transport routes in the centre. A fully integrated route network was designed, and is constantly upgraded. The entire system and different busses are colour coded: red for express buses, yellow for suburban feeder buses, and green for inter-district buses linking the concentric suburbs.

Bi-articulated buses with a capacity of 270 passengers are used on major trunk lines. Bus terminals are well developed, and serve as community and commercial centres. The Citizen Streets Project aims to rebuild the areas around large terminals to provide more services, which in turn promote more use of public transport. Since these areas are accessible to many people, they become commercially viable and generate revenue, which goes back into the public transport system.

The public transport system is used by more than 1.3 million passengers daily, and attracts nearly 2/3 of the population. Curitiba's buses carry 50 times more passengers then they did 20 years ago. The public transport system has contributed to the city enjoying the lowest rate of air pollution in Brazil, little congestion and a pleasant and attractive urban environ ment.

The Transmilenio Bus Rapid Transit system in Bogota is a cost-effective transport solution that serves as a model for other cities. The systems features dedicated lanes, large doors to permit rapid boarding and disembarking, and bus stops similar to subway stations. The BRT connects poor areas with other areas of the city, and the system now covers 82 of a planned 355 kilometres. Between 1997 and 2005, private car use dropped from 17 to 12 %. Bogota also boasts one of the largest dedicated city cycle networks in the world, covering 330 km.

Phase I
Phase II
Phase II

Average daily income per person In US$

$4.2 $5,9 $11,4 $24,1 $39,2 $62,3
1   2   3   4   5   6
Socioeconomic Layer

PHOTOS/IMAGE SWECO

14. Tangshan Bay Eco-City, China

COUNTRY   **China**
CITY   **Tangshan Bay Eco-City**
URBAN SCALE   **City/Comprehensive level**
KEY ISSUES   **Eco-city, integrated planning, environment**

For more information, see
www.www.en.tswstc.gov.cn

THE TANGSHAN BAY ECO-CITY Project is strategically located in the centre of a potentially strong regional development context, embracing Tianjin, Qinhuanghou and Tangshan. The development of southern Tangshan is based on the development of a new international deep-sea harbour, and a large industrial area that will demonstrate 'a closed-loop economy'.

Nine central features are the basis for planning and design of the Eco-City, reflecting a holistic and interdisciplinary approach to sustainable urban development. The Eco-City has a compact and varied mixed-use structure, in which different layers are interwoven to create an inspiring entity. The urban nodes serve as centres for city districts and have distinct profiles such as innovation, trade, science and sports.

The urban functional mix contributes to an innovative atmosphere that has a positive influence on both business and culture. The structure supports the development of sustainable transportation modes, prioritising walking, cycling and public transportation. The green and blue structures are integral parts of the public space.

The climate-neutral energy systems are based on achieving the lowest possible energy demand through construction of energy-efficient building and systems. Renewable power is produced locally, mainly by wind turbines and waste incineration, with the option of increasing other renewable energy sources such as solar cells and tidal energy.

The ecocycle model includes proposal for integrated management of energy, waste and water, and the use of upgraded biogas as a vehicle fuel. One advantage is the possibility use upgraded biogas as a vehicle fuel. Public awareness and information are combined with user-friendly systems. The city has a general structure that allows for rapid or slow implementation, and also variation in the division and design of blocks and buildings. The integrated urban environment aims to support quality of life, liveability, social security, inclusion and health.

IMAGE SWECO

PHOTO Ulf Ranhagen

PHOTO Ulf Ranhagen
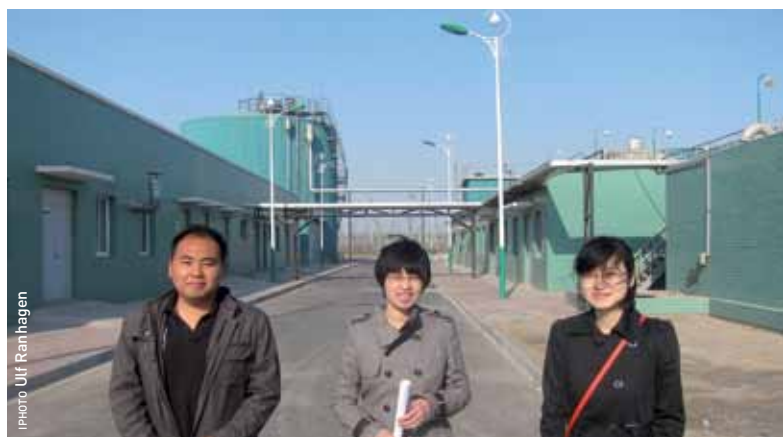
REFERENCES AND BIBLIOGRAPHY

Avfall Sverige (2011), *Swedish Waste Management 2011.*

Benewick, R & Donald, SH (2009), *The State of China Atlas, Mapping the fastest-growing economy*, University of California Press, Berkley Los Angeles.

Burdett, R & Kanai, M (2006), *The concret dragon, China's urban revolution and what it means for the world*, Princeton Architectural press, New York.

Burdett, B & Sudjic, D (2010), *The Endless City*, Phaidon Press Limited.

Campanella, Thomas J (2008), *The concret dragon. China's urban revolution and what it means for the world.* Princeton Architectural Press New York.

Centre for Strategic Urban Research (2009), *Sustainable Compact City* Arkitekturskolens Forlag, Narayana Press, Denmark.

Cities Alliance (2006), *Guide to City Development Strategies*, Improving Performance.

Davies, M (2006), *Planet of Slums*, London, Verso.

Delegationen för Hållbara Städer (2011), *Hållbara Städer – Delegationen för Hållbara Städer – erfarenheter hittills*, Edita Västra Aros.

Dow, K & Downing, T E (2011), *The Atlas of climate change. Mapping the world's greatest challenge*, Earthscan.

Energimyndigheten (2011), *Uthållig Kommun – Fyra stora steg och tjugo små steg, Idéskrift om Fysisk Planering*, Statens Energimyndighet.

Geddes, P (1915), *Cities in evolution*, London, Williams and Norgate.

Gehl, J (2010), *Cities for People*, Island Press.

Government Communication, 1999/2000:114, *A strategy for an Environmentally Sound Product Policy – Swedish Guidelines for an integrated product policy.*

Government Offices of Sweden, Sida and the National Board for Building, Housing and Planning, *Perspectives on urban governance.*

Hall, P & Pfeiffer, U (2000), *Urban Futures 21, A global Agenda for 21st century cities*, E & FN SPON, London.

Hammami, F. (2012), *Heritage in Authority-Making. Appropriating Interventions in Three Socio-Political Contexts.* Doctoral Thesis in Planning and Decision Analysis, with specialisation in Urban and Regional Studies, KTH, Stockholm.

Healy, P (2006), *Collaborative Planning, Shaping Places in Fragmented Societies*, Palgrave MacMillan.

Hårsman, B & Rader Olsson, A (2005), *Economic development and sustainable urbanization in China*, Component Group draft submitted to the CCICED Sustainable Development Task Force, KTH Urban and Regional Studies.

Innes, Judith, E & Booher, David, E (2010), *Planning with Complexity. An Introduction to collaborative rationality for public policy.* Routledge.

International Centre for Local Democracy/SKL International (2011), *Developing Sustainable Cities in Sweden.*

Jacobs, J (1992), *The Death and Life of Great American Cities*, Vintage Books, New York.

Jenks, Mike & Jones Colin (ed.) (2010), *Dimensions of the Sustainable City.* Springer.

Jönsson, B (1999), *Tio tankar om tid*, Bromberg.

La Biennale di Venezia (2006), *Cities – Architecture and Society, 10th International Architecture Exhibition.*

Larsson, S & Tyrstrup O and others (2007), *Sustainable Community Planning Guide*, Sida /Nelson Mandela Bay Municipality.

Li, Yuheng (2011), *Urban-rural relations in China. A study of the Beijing-tianjin-hebei Metropolitan Region.* Doctoral thesis in Infrastructure with specialisation in Planning and Implementation, KTH, Stockholm.

Lindström, P & Lundström, M (2008) *Sustainability by Sweden*, National Board for Building, Housing and Planning.

Ljunggren, B (2008), *Kina – vår tids drama (China – the drama of our time)*, Hjalmarsson & Högberg.

Malmqvist, Per-Arne and others (2006), *Strategic Planning of Sustainable Urban Water Management*, IWA Publishing, London.

Newman, P & Kenworthy, J (1989), *Cities and Automobile dependance: a source book*, Gower.

OECD (2006), *DAC Guidelines and References Series, »Applying Strategic Environmental Assessment. Good Practice Guidance for Development Cooperation«.*

Ranhagen, U & Trobeck, S (1999), *The use of indicators in spatial planning – A situation report.* National Board of Housing, Building and Planning, Swedish Environmental Protection Agency.

Ranhagen, U (2000), *Planning with environmental objectives – a guide.* National Board for Building, Housing and Planning, Swedish Environmental Protection Agency.

Ranhagen, U et.al. (2002), *Sustainable City – A Swedish Partnership Initiative*, Swedish Ministry of Foreign Affairs, Swedish ministry of the Environment, Swedish Trade Council, Stockholm.

Ranhagen, U et.al. (2007), *The Sustainble City Approach,* Sida Manual for support to Environmentally Sustainable Urban Development in Developing Countries.

Ranhagen, U et.al. (2010), *The Symbio City Approach. Conceptual framework for support to sustainable urban development in low and middle income countries.* Sida and SKL International.

Ranhagen, U (2012), *Sustainable Municipality – 4 big leaps and 20 small steps. Conceptual guidelines on sustainable spatial planning.* Swedish Energy Agency.

Regeringskansliet (2010), *Policy för miljö- och klimatfrågorna inom svenskt utvecklingssamarbete 2010–2014.*

Sachs, J (2008), *Common Wealth Economics for a crowded planet*, Penguin Books.

Satterthwaite (2008b), *Climate change and urbanization. Effects and implications of urban governance,* United Nations Expert Group Meeting on Population Distribution, Urbanization, Internal Migration and Development.

Sida (2002), *Towards an urban world, Urbanization and Development Assistance.*

Sida (2003), *It's about creating sustainable communities, Ecological Community Housing.*

Sida (2004), *Checklist to Sida Strategy for Water and Sanitation.*

Sida (2004), *Pure water. Strategy for Water and Sanitation.*

Sida (2005), *Caring for the Historic Environment,* Guidelines for Sida's Development Cooperation.

Sida (2006), *Fighting Poverty in an Urban World - Support to Urban Development (*policy).

Sida (2006), *Sustainable Energy Services for Poverty Reduction* (policy).

Sida (2006–2007), *Issue Papers* on various topics (*Chemicals management, Industrial environment, Financing urban infrastructure, Public environmental management, Urban solid waste management, Municipal utility reform, Urban water supply and sanitation, Air pollution, Urban transport, and, Poverty reduction strategies*).

Sida/SIPU International (2007), *The Urban Development Programme 1996–2007*, Swedish-South African Cooperation.

Steen at al. (1997), *Färder i framtiden, Transporter i ett bärkraftigt samhälle*, KFB-rapport 1997:7, Kommunikationsberedningen, Stockholm.

Stockholm International Water Institute (2006), *Corruption in the Water Sector.*

Sveriges Kommuner och Landsting (2011), *11 tankar om medborgardialog i styrning,* Alfa Print.

Sveriges Kommuner och Landsting (2011), *Samhällsbyggande för klimatet – kommuner och landsting som visar vägen,* Edita.

SWECO (2008), *Caofedian international deep-green Eco-City, Nine themes of planning.*

Swedish Association of Architects, (2010), *Architecture For Everyday Life. Everybody Every Time. Sustainability by Sweden.* Stockholm.

Swedish Association of Architects and FORMAS, (2010), *Knowledge Exchange Sweden-China,* Stockholm.

Swedish Energy Agency, (1999), *Sweden in the year 2021. Toward a sustainable society* (Booklet) item no. 9842, Stockholm, Sweden.

Tannerfeldt, G & Ljung, P (2006), *More Urban Less Poor – an introduction to Urban Development and Management*, Sida and Earthscan.

The Worldwatch Institute (2007), *2007 State of the World, Our Urban Future*, W.W Norton and company, London.

Tornberg, P (2011), *Making Sense of Integrated Planning. Challenges to Urban and Transport Planning Processes in Sweden*, Doctoral Thesis in Planning and Decision Analysis, with specialisation in Urban and Regional Studies, Stockholm.

Trafikverket (2010), *Den Goda Staden (kortversion),* Trafikverket.

UNDP (2006), *Human Development Report 2006*, Beyond Scarcity.

UN-Habitat (2008), *State of the World's Cities 2010/2011, Bridging the Urban Divide*, Earthscan London Washington.

UN-Habitat (2009), *Planning for Sustainable Cities*, Global Report on Human Settlements, Earthscan London Sterling, VA.

UN-Habitat (2010), *The State of African Cities 2010 – Governance, Inequality and Urban Land Markets,* United Nationa Human Settlements Programme, UNON.

UN-Habitat (2011) *Global report on Human Settlements 2011. Cities and climate change.* United Nations Human Settlements Programme, Earthscan.

UN-Habitat (2011) *Global report on Human Settlements 2011. Cities and climate change.* United Nations Human Settlements programme, Earthscan. Abridged version.

Wackernagel & Rees (1996), *Our Ecological Footprint, Reducing Human Impact on the Earth*, New Society Publishers.

WECD (World Commission on Environment and Development) (1987), *Our Common Future*, Brundtland Commission, Oxford University Press, Oxford.

Wheeler Stephen, M. (2004), *Planning for Sustainability, Creating liveable, equitable and ecological communities.* Routledge.

Williams, K & Burton, E, Jencks, M (2000), *Achieving Sustainable Urban Form*, E & FN SPON, London.

Wizelius, T (1999), *Sweden in the year 2011: towards a sustainable society*. Stockholm, Swedish Environmental Protection Agency.

World Bank, Hiroaki, S, Arish, D, Moffatt, S, Yabuki, N (2009), *Eco2Cities – Ecological Cities as Economic Cities,* The International Bank for Reconstruction and Development.

Wangel, Josefin (2012), *Making Futures. On Targets, Measures and Governance in Backcasting and Planning for Sustainability*. Doctoral Thesis in Planning and Decision Analysis, KTH, Stockholm, Sweden.

World Water Day (2007), *Coping with Water Scarcity, Challenge of the twenty-first century.*

Örn, H (2002), *Urban Traffic and Transport,* Lunds University.