The SymbioCity Approach

Conceptual framework for support to sustainable urban development in low and middle income countries
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The SymbioCity Approach

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Some scenarios predict that 60 percent of the world’s population will live in cities by 2030. The strong urbanization trend is particularly apparent in low and middle income countries in East and South Asia and Africa. Further, the rapid urbanization is, in many cities, strongly interrelated with a deteriorating environment and a wide spectrum of health hazards. At the same time, cities - if well managed - could provide an opportunity for economic growth, improved liveability and eradication of poverty among poor men and women. Combined, this situation of both threats and opportunities calls for local governments to improve city governance, develop a more holistic planning system built on integrated environmental solutions, social sustainability and economic growth.

On this background a Swedish initiative entitled the Sustainable City concept (now called SymbioCity) suggesting an integrated planning approach, was launched by the Swedish Government in 2002. Already at an early stage, the Sino-Swedish collaboration was emphasised as a very important part of the concept.

In 2006 Sida developed a policy for its support to urban development called ‘More Urban – Less Poor. Based on that policy, Sida developed this conceptual framework for sustainable cities to concretize the planning approaches. The conceptual framework is not a blueprint that could be applied everywhere but rather an example and an inspiring tool to grasp the complexity of the planning process. The planning framework makes it possible to handle a number of issues and relationships of relevance to sustainable urban development.

The Swedish Government has continued to develop the SymbioCity model into an approach to development of sustainable cities that is based on holistic and integrated methods, that have emerged from Swedish experience. Not least in China has this approach been welcomed and used by ambitious and foresighted cities, assisted by the Swedish Embassy to China and by the Sino-Swedish Environmental Technology Cooperation.

The SymbioCity Approach in its current form is to be seen as a working draft, which will and can be revised. Experiences from two pilot cities, Viasakpatnam in India and Skopje in Macedonia, as well as experiences from Sino-Swedish collaboration regarding sustainable urban development, will serve as input for a first modification of the concept. For those who need to get an overview of the concept, there is also a short summary of ‘The SymbioCity Approach available. This document is available in English on Sida’s website.*

It is our firm belief that this conceptual framework would contribute to building more sustainable cities and towns to meet the paramount challenges that climate change, environmental degradation, poverty and urbanization poses to the world in the coming decades.

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1. Introduction
1.1 Background

With the increasing scale of urban growth – especially in some areas of Asia and Africa – there is immense need for more holistic planning and governance of city development, including environmental system solutions. There is also an urgent need for improved management and operation of municipal environmental infrastructure. This situation formed the background for the Swedish initiative and presentation of the Sustainable City concept by representatives of the Swedish Government and the Swedish Trade Council at the World Summit on Sustainable Development in Johannesburg in 2002.

Sustainable urban development is one focal area 2010–12 in the Swedish Policy for Global Development under the heading of the climate change and environmental challenge, as outlined in the Government bill on a coherent policy for development to meet the global challenges (2009/10:129).1 It is also one of four suggested focal areas for a new Government Policy for Environment and Climate Change (to be decided on 2010). It is also a central aspect of Sida’s policy on support to urban development, Fighting Poverty in an Urban World (2006–11),2 whose overall objective is “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.” Since 2008 the Sustainable City concept has been renamed as Symbio City Concept serving as a communication platform for dissemination of Swedish environmental technology in close linkage with sustainable urban development including institutional arrangements and planning processes. This book is an integral part of the communication platform.

One of the primary objectives of the Symbio City concept is to promote an integrated and multidisciplinary approach by focusing on possible synergies between different subsystems or fields of action, as this may contribute to better solutions in the end and a more efficient use of natural resources for sustainable urban development coupled with poverty alleviation. Out of 3 billion urban dwellers today, approximately 1 billion are living in “slums”, defined as habitation with insufficient clean water or durable housing. Due to the lack of access to clean water and sanitation, an estimated 1.5 million urban residents die each year, most of them young children.

Parts of the concept have, for example, been applied in China as the basis for a development of principles for green city districts including eco-cycle models, integrated land use, transportation and green area planning, sustainable building design as well as strategies for reduction of air pollution, for waste management and for district heating/cooling. In the cities of Wuhai and Hohhot in China the approach has, to date, been used in contacts between a group of Swedish companies, together with the Swedish Trade Council, with local and central authorities. Hitherto, the largest application of the Symbio City concept in China is the planning of the Caofeidian EcoCity in Tangshan serving as a large-scale example of integrated systems solutions developed in close collaboration between Swedish and Chinese experts.

Sida believes that the Symbio City concept may be a starting point for further development of methods and tools for sustainable urban development in developing and transition countries, paying

special attention to the conditions and needs of poor women, girls, men and boys. One important factor behind this Sida initiative is the option to mobilize the Swedish resource base to contribute to integrated solutions of the problems in close collaboration with the local resource base. A number of stakeholders should be involved in the processes – municipalities, other public authorities at national, regional and local level, institutes, universities, companies and the extensive networks among all these stakeholders.

1.2 The purpose of the conceptual framework

The primary focus of this book is on sustainable urban development and in particular on the urban physical environment. The main purpose of the conceptual framework is to;

• serve as a basis for dialogue with cooperation partners regarding sustainable urban development aimed at practical and integrated solutions and environmental system solutions with links to social and economic aspects
• support a proactive method of working by promoting a holistic and integrated approach in such dialogues
• serve as a basis for multi-disciplinary or sectoral sustainability reviews on all levels of a city – the city as a whole, city districts and delimited urban areas
• contribute to the development of city-wide strategies for short term, medium term and long term improvements of the environment related to both economic and social dimensions
• facilitate the evaluation of proposals elaborated in collaboration with different developing countries concerning a number of aspects in order to contribute to a more comprehensive support
• contribute to capacity building by mutual sharing of knowledge and experience between Sweden and other countries, and thus provide opportunities for Swedish involvement in fields where Swedish competence is deemed to be strong

This conceptual framework should be used in a flexible and adaptable manner in order to reflect local conditions and the specific needs of a certain region, city/town or city/town district. Sida’s existing policies relevant to sustainable urban development should provide an obvious starting-point and complementary framework.

As sustainable urban development is a very complex field which includes a number of difficult areas, the conceptual framework provides an overview of many issues instead of going deeply into each separate field. Special focus will, however, be placed on systematic working procedure and on the interfaces and synergies between different fields of action. One ambition is to contribute to an approach that facilitates working with the entirety, as a supplement to specialised guidelines and materials dealing with individual fields. Whereas the conceptual framework focuses on urban development related to urban environmental issues, the application of guidelines within this vast field may result in partnerships aimed at the improvement of economic and social conditions including democracy, human rights, decentralization and fiscal flows, disparities between rich and poor, gender equality etc. The systematic approach and manner of structur-
ing the material used may be applicable in an extension of the conceptual framework to include social and economic issues.

Any analysis and action related to the urban environment necessarily needs to take into consideration the situation of disadvantaged women, men, girls and boys, and must ensure that their needs are taken into account. This is particularly important bearing in mind that the poor often lack a voice and are not involved in plans and decisions regarding the development of their city or country. It is however outside the scope of this text to discuss these issues in detail – there are other specific guidelines elaborated by Sida and others for these areas.

This conceptual framework will encompass poverty analysis and proposals regarding poverty alleviation as issues of basic importance to low and middle income countries. The intention is that this conceptual framework should be used by different Swedish actors involved in international relations. Such contexts could be bilateral and multilateral development cooperation, partner driven cooperation, training/knowledge programs, research cooperation, export promotion and visiting programs. Other possible groups that have been considered when developing and applying the conceptual framework include:

- dialogue partners in developing countries, for example mayors of cities and towns, other decision-makers and NGOs,
- financiers of urban environment and planning programmes and projects,
- the business sector and stakeholders in industry.

1.3 How to use the conceptual framework

The conceptual framework is presented in three parts: Working procedure (part 1), Subsystems (part 2) and Institutional factors (part 3). The three parts are closely interconnected but each part may also be used independently in the work of preparing a sustainability review and analysing projects and proposals with regard to environmental planning.

In many cases it will be useful to combine the three parts, and this combination may be carried out in many different ways. When planning for a project concerning specific subsystems such as water, waste or energy, institutional factors including urban governance and urban planning are often vital to the success of the project. It is possible to initiate a sustainability review using at least two different approaches:

1. A multi-disciplinary approach where a city or city district is analysed from a number of perspectives in order to identify synergies between different aspects in the integrated planning framework. The proposed working procedure can be used to support this review.

2. A sectoral approach where a specific aspect such as water, waste or transportation is analysed in detail, for example when there already is a practical solution or project proposal on the table. A successive broadening of the scope of the review is promoted, aimed at identifying potential synergies with other aspects from the starting-point of one specific aspect. This way is often neces-
sary as it is usually very difficult to exchange institutional barriers for a multi-disciplinary approach in a short term perspective. By using this approach, the mindset of decision-makers may successively be shifted in order to embrace the multi-disciplinary approach. The proposed working procedure, combined with the other two parts, can be used to support this review.

In both types of approaches the sustainability review can be supported by the systematic working procedure combined with information from Part 2 (Sub-systems) and Part 3 (Institutional factors). This conceptual framework can also be used in change and development processes within a city or a town:

1. In an early phase of planning of new cities (towns) or renewal of existing cities (towns) where the review may serve as a valuable input for making a city or a city district more environmentally sustainable. This “window of opportunity” to make the city sustainable can be utilised.

2. As a follow-up and improvement of newly prepared, comprehensive or strategic plans where a review can result in environmental solutions in the detailed planning and design which can enhance the sustainability of the city or city district.

3. As part of revision of old plans in a sustainable direction.

1.4 The urban environmental challenge

Urban growth tendencies in transition and developing countries

Since the beginning of this century the majority of the world’s six billion people have lived in cities.

The world population may rise from the current six to nine billion people in 2050. Some scenarios predict that 60 percent of the world population will live in cities by 2030. The urbanisation trend is apparent especially in the developing countries or countries in rapid transition. The future growth of the world’s population will take place almost entirely in the urban areas and it is mainly in the cities and towns of the less developed countries where these people will live. Each year 50 million people move to urban areas, most of them into shanty towns.

The urban population in developing countries will soon surpass the rural population according to UN statistics and projections. The rural population began its decrease in absolute numbers in the 1950s – soon after 2015 this will also occur in less developed countries. At the beginning of the 21st century, the average annual urban growth rate in the least developed countries was 4.3 percent but some of these countries experienced rates of 6 percent and above.

Some large cities experienced an annual growth rate of 7–10 percent for the second half of the 1900s. Between 1985 and 2003 the urban population in these countries increased from 1.2 – 2.1 billion and is expected to reach 3.1 billion by 2020. Behind these global figures there are important differences between regions and countries and also within countries and cities.

Latin America’s developing countries represent the most urbanised areas in the world. Approximately 75 percent of the population lives in urban areas. The figure for South America is 81 percent and for Central America 69 percent. Urban growth is slightly lower
than in other developing countries, less than 2 percent. Like many other mega-cities, the annual rate of population growth in Rio de Janeiro with 12 million inhabitants has slowed down and is expected to average only 0.9 percent throughout 2000–2015.

In Africa, being the least urbanised continent, almost 40 percent of the population today live in urban areas. The figure for 2025 is predicted at 60 percent showing an urban growth rate of approximately five percent. In South Africa, 54 percent live in urban areas whereas only 26 percent are urbanised in eastern Africa. In Uganda, Ethiopia, Eritrea, Malawi, Rwanda and Burundi 80 percent still live in rural areas.

As it is for Africa, the urbanisation level in Asia is almost 40 percent. Urban growth is, on average, 2.5 percent with the highest figure in Cambodia (5.5 percent).

China is undergoing the largest internal migration in the history of the world. Since year 2000 the urban population will increase its share of the total population from 36 to 45 percent with an average yearly increase of 15.3 mill people. Twenty years ago only 27 percent of the population lived in cities. Between 1980 and 2007 the number of cities with over 1 million residents has increased from 15 to 118! China has 45 very large cities with populations of between 1–10 million people. A large share of of Chinas´s workforce (about 150 million people), the so called “floating population”, is working another place than where they have their registration (hukou). Within the next decade, China will be transformed from a predominately rural society into an urban one, and by 2020 at least 60 percent of the population is expected to be living in cities and towns.

Urbanisation means new opportunities for humankind
The flow of people toward cities seems unlikely to stop or even slow down. One of the reasons for this is that life chances and economic opportunities are often better in cities, even for many of the disadvantaged. Cities attract settlers. Urbanisation provides a crucial opportunity from this perspective; to create living patterns harmonised with nature’s rhythms as people continue to create urban habitats. Cities with their high density also offer economy of scale for public transport, and for recycling of water, waste and materials as well as for efficient energy use.

Cities attract settlers and retain residents because they offer opportunities for employment and education. Often, people will do things they could not have done in rural settings and sometimes this will push the urban community and economy in a new direction, for example by opening up new kinds of businesses. Cities offer a wide range of attractive cultural activities and open up opportunities for social networking with many different kinds of people.

Though cities employ about 45 percent of the country’s population, they are responsible for generating close to 70 percent of the country’s GDP. Potentially, urbanization can lead to a more equitable social society and a more sustainable natural environment. In the long term, social and environmental sustainability are critical to economic development. Therefore China’s challenge is to find ways to promote urbanization that satisfy the need for sustainable social, environmental and economic development.

3) UN Habitat (2008)
4) Ljunggren, B (2008)
5) Benewick, R & Donald SH (2009)
6) This discussion is based on texts in Worldwatch Institute, 2007, State of the world. Our urban future, p 6 and onwards
7) Hårsman, B & Rader Olson A (2005)
In both India and China, the five largest cities contribute to approximately 15 percent of the national GDP (2004) which is roughly three times what could have been expected solely on their relative shares of the population.8

Environmental problems related to urbanisation and urban growth

In spite of all real and potential opportunities that urbanisation offers, the impression is that it is the problems related to urbanisation that dominate. The city’s opportunities are seldom realised, evident especially in cities in the developing world. Today’s high-income cities should possess the economic resources to solve many problems for their disadvantaged residents as well. Yet the use of resources is mostly unsustainable and the high consumption approach is plainly unaffordable for slum dwellers.

The environmental impact of cities is enormous, due both to their increasing demographic weight and to the amount of natural resources they consume. Every aspect of urban living has significant implications for the planet. From the billions of people driving cars or two-wheelers along metropolitan highways to the energy required to either heat or cool buildings and to bring in food, often from the opposite end of the earth.9 Energy supply based on fossil fuels and low energy efficiency in buildings are often a major cause for environmental problems as CO2 emissions and other kinds of air pollution contributing to climate change.

Poor people are often the most affected when the environment is degraded, or inaccessible due to weak environmental management, since they more commonly directly depend on a range of natural resources for their livelihoods. Exposure to water and air pollution, toxic chemicals and environmental hazards such as floods, droughts and landslides are severe problems that poor people often cannot counteract. Furthermore many urban poor, living in unofficial slum areas without land title and not registered as inhabitants of the city, often lack a voice and are not involved in plans and decisions regarding the development of their city or country.

In Eastern Asia, 28.2 percent of the urban population dwell in slums. In fact, China is home to a full one-fifth of the world’s slum population – the same as the the country’s share in the global population. Thanks to China’s own significant achievements, Eastern Asia as a whole reduced slum incidence by an estimated 25 percent.10

The ecological footprint is an instructional tool representing the area of productive land required for supply of energy, foodstuffs and other resources. The ecological footprint, calculated on the rich populations of the world, increased by 400 percent during the 20th century. During the same time period, the land in the world available for organic production fell by a quarter of what it was at the start of the last century, from around six ha per capita to around 2.1 ha per capita. The area of land available is here calculated on the basis of the global population.

The wealthy proportion of the world’s population consumes about three 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 at least in India and China.

The ecological footprint may be relevant for the description of urban environmental problems in an overall perspective. It may be used as an alarm clock that urges us to do all we can to improve our environment. The ecological footprint helps to put issues into a larger perspective. The footprint can be interpreted as the total area that would have to be enclosed within the city under a glass capsule in order to sustain the consumption patterns of the people of that city. This mental image illustrates one important reality: as a result of high population densities, the rapid rise in per capita energy and material 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. One drawback of the ecological footprint is that there is no agreed upon way to measure it for cities. As the resources needed for a specific city are located in many places around the globe it is difficult to use the metaphor footprint practically in sustainable urban development.

The summary of specific environmental problems below refers, to large extent, to descriptions in current books and reports.

**Climate change**

Extensive use of fossil fuels results in emission of greenhouse gases, thereby elevating the risk of drastic climate change and global warming. Using Antarctic glaciers, scientists have determined that current levels of carbon dioxide are extremely high compared to those over the past 400,000 years. This increase has contributed to a rise in global temperature by an average of +0.6 +/-0.2 degrees Celsius.

11) The concept could, according to Tannerfeldt & Ljung (2006) More urban less poor – an introduction to urban development and management. Sida and Earthscan, be misleading, since it focuses on the spatial dimension. They claim that it is the aspects of production and consumption patterns that are the cause of environmental degradation. However it is in the urban areas where many, and perhaps the most serious, environmental challenges have to be met.


over the last hundred year period. IPPC (the International Panel on Climate Change) forecasts an increase of global temperature to 1.4 – 5.8 degrees Celsius during the next hundred years which may result in sea levels up to 0.9 m higher.

The effects of global warming accelerate the risks and vulnerabilities of urban areas in many ways. Cities situated on floodplains or coast lines run the risk of flooding during extreme weather events. The predicted sea-level rise by the end of this century will cause enormous impact. The increase in global temperature will cause potentially damaging consequences in the form of extreme weather episodes such as heat waves, flooding and extreme storms. Even monsoon patterns may be altered in Asia and precipitation take place out to sea instead over the continent.

As cities are ultimately linked to rural areas, the impact on the latter will bring serious consequences for urban areas. These extreme weather events that are predicted will exert huge impact on potential loss of life and property, as well as on all aspects of infrastructure. In the dry regions of the earth, the shortage of water will be even more severe, while wet regions could expects greater rainfall.

Example
According to a Chinese climate report coal stands for 69 percent of the total energy consumption in China (2005) which means that the economy is “coal driven” while oil stands for 21 percent and natural gas, hydropower, nuclear power, wind power, solar energy stands for 10 percent 80 percent of the electrical energy is generated in coal power plants. This fossil fuel dominated energy mix makes China the world’s largest emitter of carbon dioxide. The per capita emissions are 4 tons which is only one fifth of the US emissions with 20 ton per capita.14

One of the most vulnerable countries in this perspective could be Bangladesh where 17 million people live less than 1 m above sea level. Other countries such as China and Vietnam have already experienced very severe flooding, killing thousands of people. The poor population of the cities, living on marginal land, is placed at the

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14) Ljunggren, B (2008) and Benewick & Donald SH (2009)
highest risk in relation to extreme weather episodes. Hurricane Mitch in Central America could well illustrate such events. However similar storms in India, Vietnam, Philippines and Indonesia have killed many thousands of people and caused immense loss of property.

Natural and artificial hazards
The settlements of the poorest are on the margins of the cities in areas located on steep hillsides, floodplains, railroad sides, waste dumps etc. Squatters are the pioneer settlers of these types of areas but also of swamps, volcanic slopes, chemical dumps and desert fringes – areas that more well-off citizens would not ever imagine living in.

Precisely because these sites are so hazardous and unattractive, they offer protection from rising land values in the city. Such sites are the normal living sites for the poor of the city and they are exposed to risk of disaster. Temporary urbanisation has multiplied – sometimes more than tenfold or even more – the inherent natural hazards of urban environments everywhere. “Slum populations” are growing by 25 million per year, and a part of this population is due to migration into the cities. When people move to cities they lose their rural networks and neighbours that they could previously rely on during and after disasters.

Earthquakes destroyed more than 100 million homes in the 20th century, mostly in slums, tenement districts or poor rural villages. Seismic risk is so unevenly spread in cities that the term “classquake” has been coined to characterise the biased pattern of destruction. However, the chief anxiety of the poor is, according to Davies, fire. Although slum fires are often anything but accidents; rather than save the expense of court procedures or waiting for an official demolition order, landlords and developers frequently prefer arson.

If natural hazards are magnified by urban poverty, artificial hazards are created by poverty’s interaction with toxic industries, anarchic traffic and collapsing infrastructures. Many residents living in areas exposed to regular flooding return to their difficult life out of economic necessity.

All classical principles of urban planning, including the preservation of open spaces and the separation of noxious land uses from residential areas, are stood on their heads in poor cities. A kind of infernal zoning ordinance seems to surround dangerous industrial activities and transport infrastructures with dense thickets of shanty housing.

Traffic congestion, deaths and injuries in traffic
Sprawling urban growth without equivalent social investment in mass transport or grade-separated highways has made traffic a public health disaster. In spite of extreme congestion, motor vehicle use in developing cities is soaring. In 1980 the third world accounted for only 18 percent of global vehicle ownership; by 2020 about half 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 poorer countries.

The overall cost of road deaths and injuries, according to WHO, is estimated at “almost twice the total development assistance re-
Examples

- One quarter of the favelas in Sao Paulo are located on hazardous steep hillsides and riverbanks facing likely risk of rapid erosion.
- In Caracas, two thirds of the slum area population live on unstable hillsides, also running the risk of seismic activity. At least 25 percent live in absolute poverty.
- The August 1988 rainstorms and the Nile flood displaced 800,000 poor residents of Khartoum. Even though the flood high watermark was lower than the 1946 peak, it did ten times as much damage largely due to the increased sprawl of slums without drainage located in the floodplain.

Traffic congestion and air pollution due to old vehicles are increasing problems in many developing countries. Pune, India.

PHOTO: ULF RANHAGEN

Traffic congestion and air pollution received worldwide by developing countries’. WHO considers traffic to be one of the worst health hazards facing the urban poor, and predicts that road accidents, by 2020, will be the third leading cause of death. In New Delhi 10,000 people die each year from air pollution caused by traffic.

Rapid urbanisation in developing countries, in combination with expanding industries and traffic, has led to the situation that individuals will face similar health risks that eastern parts of Europe were facing 30 years ago due to coal combustion. The lack of functioning urban transport systems in many cities in South East Asia and a rapidly growing number of cars are generating severe health problems. Air pollution caused by motorisation is a serious problem due to old buses, superannuated trucks and two-wheelers. Two-stroke engines emit ten times as much fine particulate matter as modern cars and they emit three to five times the level recommended by WHO.

Example

- In China – formerly the home of the bicycle – planners now give irrational priority to automobiles. Simultaneously, bicycle commuters have been penalised by new license fees, and the end of bicycle subsidies formerly paid by work units. The average number of deaths on the road was 68 per million people in 2006. Despite the significant increase in privately owned passenger vehicles (varying between 2-300 percent or more between 2002-07 with China’s average 175 passenger vehicles /10 000 people in 2007) the number of people killed in traffic accidents is decreasing. 15
- China was long a nation of bicycles but now the two-wheelers are in decline dropping by 26 percent between 2001 – 2006 and they are now banned on many city streets. 16 However, a positive sign is an increased number of electrical mopeds in the cities.
- The car market in China exploded 2009, partly due to stimulations from the state, to become the world’s largest car market with 13.6 million vehicles sold 2009. This meant a 50 percent increase compared to sales 2008.

PHOTO: ULF RANHAGEN

15) Benewick, R & Donald S H (2009)
16) Campanella (2008)
Bangkok adds 500 new cars every day and Beijing 1000 cars every day. Cars are a major contributor to global climate change (25 percent). The exhaust gases from cars cause premature death and health problems from particles, sulphur dioxide, nitrogen oxides and the formation of photochemical oxidants where ozone and peroxyacetyl (PAN) are the most important. The particulates formed by combustion and from traffic are a major problem, especially those smaller than 10 microns (PM 10) that are deposited in the lungs causing respiratory problems such as asthma, bronchitis and may lead to respiratory mortality. Children in particular are sensitive to these emissions. Poor people living close to the traffic of the cities are placed at extremely high risk.

**Lack of green areas and biological diversity**
Sustainable urbanism presupposes the preservation of surrounding

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**Example**
- Foul air is most deadly in the sprawling mega cities of Mexico (300 bad ozone days per year), Sao Paulo, New Delhi and Beijing. Breathing Mumbai’s air is said to be the equivalent of smoking two-and-a-half packs of cigarettes per day.
- In China a government study showed outdoor air pollution as causing 400,000 premature deaths each year. The WHO interim target for countries with heavy pollution is 70 micrograms per cubic meter. Only two of China’s major cities met that target in 2006.

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wetlands and agriculture. Environmental efficiency and public affluence require the preservation of green lands, open spaces and natural services; cities need an alliance with nature in order to recycle their waste products (composting) into usable inputs for farming, gardening and energy production. Urban open space is typically buried under uncontrolled waste. Peripheral greenbelts are being converted into ecological wastelands. Even small green areas within the city could maintain high biodiversity, especially if they are wetlands. 850 million people worldwide are undernourished and 75 percent live in urban areas suffering from food shortage. Urban agriculture could be one important factor for improving childhood nutrition. Landfills and marginal lands within the cities could be used. Bangkok, with 10 million inhabitants, obtains one third of its aquaculture products (fish water plants) from the peri-urban areas of the city.

**Waste problems**
Less than 50 percent of the daily amount of waste in large cities in developing countries is collected by municipalities. In most slum areas there is no (organised) collection at all. The chronic discrepancy between the rate of trash generation and properly organised disposal is often staggering. The situation is particularly severe when it comes to different kinds of hazardous or contagious waste, such as waste from industries and hospitals, but also from households. The amount of all kinds of waste is growing.

Sanitary landfills are rare in the developing world, and uncontrolled dumping presents a major, long-term threat to soil, groundwater and surface water. Even a limited rehabilitation of all uncon-

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17) This was first recognised in an urban context by urban theorist Patrick Geddes in Geddes, P (1915) *Cities in evolution*. London: Williams and Norgate.
trolled sites in the world would cost billions of dollars. Uncontrolled use and dumping of hazardous waste leads to bio-accumulation of persistent organic substances along the entire food chain that affects everything in it, including humans – rich and poor.

Waste management in developing countries also presents a direct major health hazard since many poor people trade in waste, work as waste pickers on uncontrolled waste dumps, and also because the unsanitary handling of waste means diseases are free to spread through vectors such as rats, dogs, monkeys and birds.

**Examples**

- The average collection rate is low in many cities: Dar-es-Salaam (25 percent), Karachi (40 percent), Jakarta (60 percent).
- Kabul is turning into one big reservoir of solid waste. If all of the 40 garbage trucks make three trips a day, they can still transport only 200 – 300 cubic metres out of the city which is only 25-40 percent of the total waste produced by 2 million people every day.
- In Colombo, Sri Lanka, where slums sprawl into fields, a unique form of cultivation called keera kotu has emerged, whereby urban waste, including what is hygienically unsuitable, is used to grow vegetables as fast as possible and wherever possible.

**Water scarcity**

On a global scale there is no such thing as water scarcity. However, scarcity in some African, Middle Eastern, American and Asian countries is of the greatest concern, even if the problem does not always have an immediate connection to urbanisation. Groundwater levels drop drastically every year as agriculture, cities and industries compete for water. More than 70 percent of the world’s fresh water is used in agriculture, and major water resources are shared between countries. There is a pressing need for nations to manage water resources better on international, national, regional and local levels.

The need to conserve and manage water worldwide is currently recognised in wider circles, however water management improvements have yet to be made. Water stress in China, India and sub-Saharan Africa increases every year and is expected to affect more than 3 billion people by 2025.

To the individual it does not matter whether water scarcity has quantitative, qualitative or institutional causes, and water scarcity in this broader sense is, of course, more pronounced. During the period 1990-2004 the number of people without access to drinking water actually increased by 25 percent and the portion of people without sanitation increased by as much as 30 percent. These alarming figures could become even higher in the light of a climate change scenario. 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 improvements aimed at increasing access to 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

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in urban areas than in rural as access is approximately three times better in cities than in the countryside.

**Water and sanitation problems**

Service coverage of water supply and sanitation is generally poor in developing countries, and even when coverage is higher, service qual-

**Examples**

- Around 1.2 billion people, or one-fifth of the population on the earth, live in areas of physical water scarcity.
- Food production requires on average 2–3 cubic metres of water per person and day. For household purposes somewhere around 30 to 150 litres are required per person and day.
- Groundwater levels in Inner Mongolia, China, drop every year. In the region’s capital, Hohhot, the decline is reported to be one meter annually.
- China has a low access of water per capita. For the whole country the access is one fourth of the global average and in northern and western China only one tenth. 19

Rapid urbanisation forces poor people to settle in areas where the water supply and sanitary situation is often even worse than in other parts of a city, along river basins that serve as sewage drains or close to uncontrolled waste dumps. The appalling hygienic conditions in the slum areas pose a risk for epidemic diseases, and governments need to take vigorous action. The scarcity of clean water in urban slum areas is a growing concern due to microbial contamination and high levels of hazardous chemicals.

Water supply and sanitation is typically an urban responsibility, but local urban authorities lack financial resources for major, common investments. Poor people tend to pay a high price for the little fresh water they can get, and the poor sanitary situation is a major cause of water-borne diseases. Very often water distribution seems to undergo a wave of privatisation. Not because of political decisions but because public networks deteriorate, and investments cannot keep up with urbanisation. The impact on human health and the environment of this ad-hoc privatisation is uncontrolled and unmeasured at best.

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

The constraining effect on the economy (from poor water and sanitation practices) is being increasingly recognised, and in growing economies such as India and China the demand for improved service and coverage is coming more and more also from the private sector. In many cities where provision of water has improved, it has not been due only to technological improvements, but rather by financial

and management innovations.

**The urban health crisis**

Hand in hand with urbanisation have come epidemics of health issues such as tapeworm, roundworm etc. that previously were usually confined to rural areas. Dominant mega cities find it relatively easy to export some of their environmental and sanitation problems downstream, using other regions as sinks for waste and pollution. A worsening urban sanitation and public health infrastructure has accompanied the compression of national and municipal budgets under the World Bank-sponsored SAPs (Structural Adjustment Programs).

Another part of the problem is that when urban elites move to gated compounds in the suburbs, they worry less about the threat of disease in the slums and more about household security and the construction of high-speed roads.

The growth of the urban population in many cities is strongly interrelated with a deteriorating environment and a wide spectrum of health hazards. People in slum areas are made particularly vulnerable by lack of accessible clean water that causes severe health problems such as diarrhoea and cholera. These problems are worsened by the fact that drinking water sources are polluted by effluent from industries, pesticides etc. Annually it is estimated that 2 million people die from diarrhoeal diseases in urban areas. Health hazards from contamination of ground water by open landfills are also a common problem, especially when household waste is mixed with industrial waste.

**Causes of environmental problems**

Urban environmental problems of the kind described above have many sources and causes: rapid growth in population and area, which is not reflected in investments in services, insufficient technology in industry, increasing and environmentally unsound transport, insufficient sewage systems causing direct emission of waste water from industry and households into rivers and land, unsatisfactory

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20) Source: Davis, M (2006)
21) UN Habitat (2009)
waste management etc.

Also, central to the sub-optimisation of the use of natural resources and care for the environment is the lack of integrated approaches, i.e. the mutual linkage of different subsystems with each other. Inefficient use of energy and energy supply based on fossil fuel are also causes of environmental problems, mainly air pollution and greenhouse gases, as cities have become increasingly reliant on dirty and distant energy resources over the past 150 years. Millions of people who live around the world’s poorest cities do not have access to modern energy services and the demand for energy is often solved in an unsustainable manner. Urban residents in the developed world use less energy than rural residents do. In developing countries, where many rural people lack access to modern energy services, the reverse is often true. The one third’s of India’s population who live in cities consume, for example, 87 percent of the nation’s electricity.22

Behind these concrete causes and sources of environmental problems there is often a combination of lack of access to financial resources and institutional deficiency. These are major elements in the fight against poverty. Authorities dealing with environmental management are often weak, using 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 or efficient enough to stimulate improvement. Municipal budgets are often limited and mostly spent on recurrent costs, while capital investment must be financed and approved from central level.

Corruption is also an obstacle to effective environmental management, for example through uncontrolled processing of permits to extract natural resources or a low rate of enforcement of pollution levels.

Environmental management cannot be treated separately from other development concerns. Integration of environmental considerations into other policy areas and subsystems is essential, subsystems such as energy, transport and industry. Improving environmental management in ways that benefit the poor requires policy and institutional changes that cut across sectors, measures which often lie outside the control of environmental institutions. Changes in governance, economic policies, social policies and international relations are examples of such areas.

As an example, in many developing countries there is little, if any, coordination between actors involved in waste management and those working with central heating. Consequently, the value that could be extracted from incinerating waste in order to use the heat for central heating is not acknowledged. This means a loss to the waste management company or authority which could have sold the heat or waste at a profit, and would need fewer waste dump areas, and to the heating company which cannot take advantage of a comparatively cheap source of energy. Finally, not least, there is an environmental loss since waste will (often) be dumped on sites of inferior quality and other, non-renewable sources of energy will be used for heating instead.

This is just one example of how increased integration of different areas related to the urban environment could generate both financial

22) This discussion is based on texts in Worldwatch Institute, 2007, State of the world. Our urban future
and environmental gains. However, in order to accomplish such integration, the analysis of a specific task or problem – for example waste management – needs to include an analysis of related areas and of the interfaces between them and the task in focus. There is also a need for incentives for actors within these areas to cooperate in order to exploit potential synergies. This conceptual framework presents examples of such interfaces and areas of potential synergies, as well as a discussion of institutional factors that need to be taken into consideration in order to be able to reap such benefits.

Policy framework for sustainable urban development
Sustainable urbanisation must be considered as one of the crucial issues concerning the future of mankind. The central aim for sustainable urban development is well-known: in the often-quoted words from the 1987 Brundtland report:

"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 observed as early as the first Conference on the Environment in Stockholm in 1972. This conference resulted in agreements and discussions between many countries which were of great importance for the next global conference on the environment in Rio in 1992. Agenda 21 with its holistic approach to ecological, economic and social dimensions was an outcome of the conference in Rio. With regard to environmental issues, the Rio Declaration with Agenda 21 was followed up 10 years later in Johannesburg 2002. The outcome was the Johannesburg Declaration and Plan of Implementation, which includes a number of action points on sustainable urban development.

The Commission on Sustainable Development (CSD) is in charge of monitoring progress and formulating advice on action. Some of this advice concerns areas very relevant to this conceptual framework, such as water and sanitation, energy and transportation. Non-negotiated partnerships and initiatives to implement Agenda 21 were important elements of the outcome of the World Summit on Sustainable Development in Johannesburg 2002.

In September 2000 the heads of state at the UN General Assembly adopted the Millennium Declaration. These decisions, which were related to development, poverty eradication, environment, HIV/AIDS, financing, trade and development cooperation, were later condensed into eight Millennium Goals (MDGs). Each goal is specified by the formulation of targets and indicators. Goal 7 is labelled “ensure environmental sustainability”. Target 11 of Goal 7 demands a significant improvement of the lives of at least 100 million slums dwellers by 2020. This goal is also stated in the Millennium Declaration in itself. Target 10 of Goal 7 is to reduce the proportion of people without sustainable access to safe drinking and basic sanitation by half by 2015.

The Cities Alliance is a global coalition of cities and their development partners committed to scaling up successful approaches to
poverty reduction in urban areas. The Alliance brings cities together in direct dialogue with bilateral and multilateral agencies and financial institutions, with the aim of promoting the developmental role of local governments. By promoting the positive impacts of urbanisation, the Alliance helps local authorities plan and prepare for future growth. Sida is a member of the Alliance. For further reading, please refer to Cities Alliance’s own reports.\textsuperscript{24}

The centrepiece of the Sida policy framework on urban development is the policy \textit{Fighting Poverty in an Urban World – Support to Urban Development}\textsuperscript{25}, with the objective of promoting the development of sustainable cities where all citizens enjoy opportunities to improve their living conditions and thus further contribute to the development of their city and country. The policy is supported by the INEC/URBAN Issue Papers on a number of topics, including urban transport, poverty reduction strategies, financing urban infrastructure, public environmental management, urban solid waste management, urban water supply and sanitation and municipal utility reform. These issue papers summarise policies and objectives for these areas of support.\textsuperscript{26}


\textsuperscript{25} Sida, October 2006.

\textsuperscript{26} A more comprehensive presentation of goals, objectives, policy framework etc. regarding sustainable urban development is given in Tannerfeldt, G & Ljung, P (2006), pp 143–160.
2. The conceptual Model
2.1 A conceptual model for analysing and supporting sustainable urban development

This conceptual framework is based on a conceptual model for urban development in developing countries. Important characteristics of the model include a holistic, integrated and multi-disciplinary approach. The model is an attempt to grasp the complexity, and to enable the management, of a number of issues and relationships of relevance to sustainable urban development. This is necessary if potential synergies between different issues are to be utilised and the likely conflicts between different issues are to be avoided or to be managed in a constructive fashion. A sectoral approach should be replaced by a multi-disciplinary approach in order to achieve success in solving combined problems. Incentives should be developed to promote and facilitate such integrated approaches.

One basic objective for all efforts regarding sustainable urban development is to reduce the ecological footprint while simultaneously improving the quality of life, health, comfort and safety for our and future generations and for natural areas within the capacity limits of the city.27 Or, as formulated in Sida’s Urban Policy: 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.28

Even if environmental sustainability is the main theme of the conceptual framework it is important to discuss links to economic, social and spatial sustainability. And, as mentioned earlier, differences in the situation of disadvantaged women, men, elderly people, girls and boys must be taken into account in the analysis. It is also important to discuss the relationship between local, regional and national level as well as the interdependence of urban and rural development. Figure 3 shows sustainable urban development with quality of life,
health, comfort and safety in the centre – surrounded by circles representing economic, social and environmental factors within a spatial context.

As this book has a special focus on the urban physical environment, a more detailed frame of reference has been developed focusing on the environment. In Figure 4 the central part is thus surrounded by three rings representing environmental factors, subsystems and institutional factors. The planning process, including a working procedure (represented by the arrow), also represents an important part of the model.29

Figure 5 shows a more detailed conceptual model with an overview of the sub aspects of each main aspect. The first ring includes environmental factors such as climate change, natural and artificial risks and hazards, traffic congestion, death and injuries in traffic, lack of green areas and biodiversity, waste, water and sanitation problems. An overview of problems regarding these factors is presented in Chapter 1.

The next ring represents a number of subsystems that must be taken into account if improvements to the environmental situation are to be achieved. These subsystems encompass development and management of urban functions such as industry, housing and service as well as traffic and transportation planning and management, energy, waste and water planning and management, landscape planning and building planning and design.

Urban functions – such as housing, industry, services etc – are shown in the same circle as subsystems such as waste, energy and water management. These subsystems can be analysed and developed for an entire town or a town-district with respect to all functions in that town or town-district. It is, of course, also possible and many times desirable to examine a certain function for example an

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29) It is, of course possible to develop guidelines with a focus on social and/or economic factors with the same basic approach and philosophy as is here applied on the environmental field.
FIGURE 5. Conceptual model showing a more detailed picture of environmental factors, subsystems and institutional factors
industry or a service function, analysing the problems or the options regarding energy, waste, water and other subsystems.

The exterior ring represents the **institutional factors** that have to be taken into consideration if long term change is to be possible. A wide definition of institutional factors is applied in this book. These include urban governance, urban planning, land management, legislation and policies, financing, private sector participation, training and technology in a general sense.

A further dimension to be considered is the planning and change process, including a **working procedure** with a number of steps that should be worked through in order to analyse the situation and to find alternatives and solutions appropriate to local conditions.

### 2.2 Structure of this book

The first part of the book presents a **working procedure** which is primarily intended to support the accomplishment of a sustainability review with a focus on the environmental issues of a city/town, city-district/own-district or other kind of urban area. Experience from the applications of the Sustainable City project is that a sustainability review is a constructive way of starting a dialogue that includes the cross-sharing of experience from sustainable urban development between Sweden and other countries. Possible outcomes of this review could be the definition of more specific projects on sustainable urban development in a collaboration between Sweden and a certain developing country.

This working procedure can also be helpful to:

- ensure that all relevant information and activities are considered when a project or an activity related to sustainable urban development is in the planning process (preliminary examination)
- check that all relevant information of importance to environmental sustainability has been considered in an ongoing or completed project (follow-up)

The content of each step of the working procedure is explained in Chapter 3. A number of questions related to each step are raised. Documents which preferably should be included in the working procedure are exemplified. A number of **working charts** are provided in an appendix which could be used to specify problems, links between different aspects as well as strengths, weaknesses, opportunities and threats for a number of issues.

The **second part** consists of a systematic approach or **specific subsystems** related to urban sustainable development. Special focus is placed on interfaces and synergies between different subsystems. Specific policies and tools are covered by more detailed material referred to for further reading.

The **third part** includes an overview of **institutional factors** crucial for achieving lasting improvements and more structural changes that influence both subsystems and environmental problems. Institutional factors can be used to facilitate the creation of integrated concepts, ideas, strategies and practical solutions. An overview of important institutional factors is presented, followed by a checklist. Inspiring examples regarding institutional factors promoting sustainable urban development are also presented.
3. Part 1: Working procedure
This section describes a working procedure with a tool-box based on the conceptual model presented above. The working procedure includes a number of steps in order to prepare a sustainability review of a city/town, a city-district/town-district or other urban area in a systematic fashion. Such a review is meant to include an analysis of the environmental situation in a specific urban area as well as ideas and proposals for the improvement of the environment, with special consideration of the situation and needs of the urban poor.

The steps in the working procedure can also be used for the analysis and evaluation of projects and proposals from Sida partner countries, as well as for dialogue with partners and other stakeholders on sustainable urban development. The working procedure also includes tools for the further development and improvement of approaches, policies, programmes and projects on regional and local level.

The main steps in the working procedure are:

**Step 1** – Define and organise the sustainability review  
**Step 2** – Make a diagnosis of the current situation  
**Step 3** – Specify key issues and objectives  
**Step 4** – Develop alternative proposals  
**Step 5** – Analyse anticipated, potential impacts  
**Step 6** – Choose a strategy for implementation and follow-up

These steps will be described more in detail below. When applying this working procedure it is, in most cases, neither possible nor recommendable to work in a linear fashion through all these steps. There are many advantages to be gained from working in a flexible, iterative or cyclical manner.

The working procedure has many steps in common with the familiar Logical Framework Approach (Logframe or LFA), which includes a number of steps as described in Box 1.

The working procedure presented below is primarily meant to be used for the development and/or assessment of sustainability reviews for urban areas, and can be easily combined with the logframe analy-

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**BOX 1. Steps included in the Logframe Procedure**

- **Logframe Step 1** – Context Analysis – the project’s environment and background information.  
- **Logframe Step 2** – Stakeholder Analysis/Participation Analysis – an analysis of who should be involved when planning and implementing a project.  
- **Logframe Step 3** – Problem Analysis/Situation Analysis – an analysis of the problem to be solved by a project and the reason for its existence.  
- **Logframe Step 4** – Objective Analysis – a picture of the future situation.  
- **Logframe Step 5** – Plan of Activities – means to achieving the objectives and means to eliminating the causes of the focal problem.  
- **Logframe Step 6** – Plan of Resources – inputs necessary in order to implement the activities.  
- **Logframe Step 7** – Indicators – measurement of results.  
- **Logframe Step 8** – Risk Analysis and Risk Management – analysis of the risk affecting the project’s objectives and plans on how to avoid these risks.  
- **Logframe Step 9** – Assumptions – factors important to goal fulfilment but outside the scope of the project.

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30) One source for the description of the working procedure is the overall structure of the proposed working procedure for the integration of environmental aspects in comprehensive planning developed in the so-called SAMS-project (Planning with environmental objectives! 1997–2001, www.environ.se). 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).
sis of a project. The working procedure pays specific attention to the analysis of alternative solutions, of potential synergies between different subsystems and of impacts of proposed solutions and actions. Figure 6 illustrates connection points between the two procedures.

**Figure 6.** Illustration of the relationships between the Logframe Procedure and the Sustainable City working procedure. Each point marks a connection and indicates that is valuable to look into the Logframe steps in more detail when preparing a sustainability review.

<table>
<thead>
<tr>
<th>SUCI</th>
<th>Step 1 Organisation</th>
<th>Step 2 Diagnosis</th>
<th>Step 3 Objectives</th>
<th>Step 4 Proposals</th>
<th>Step 5 Impacts</th>
<th>Step 6 Strategy for Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Context</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Stakeholder</td>
<td></td>
<td>●</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Problems</td>
<td></td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>4. Objectives</td>
<td></td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>5. Activities</td>
<td></td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>6. Resources</td>
<td></td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>7. Indicators</td>
<td></td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>8. Risks</td>
<td></td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>9. Assumptions</td>
<td></td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

In Figure 7 a method of working is shown where a sustainability review or a project is developed in three loops. This idea of a cyclical and iterative way of working can be applied in a number of ways and should not be considered as a fixed pattern. The example in figure 7 illustrates the following application of this idea: In the first loop there is a focus on steps 1–2 above, however, overall objectives and preliminary proposals for improvement of the environment are also developed or reviewed. In the second loop the main focus of the work is placed on steps 3–4. In the third loop most work is concentrated on steps 5–6. Depending on the complexity of the project, further loops may also be considered.

Experience drawn from the development of planning methodology and practical planning has confirmed that this type of approach facilitates the integration of environmental issues into the project development or project review. The intention is to create a basis for discussion of the main features of the project that is produced fairly quickly during the first and second phase of the work. Time-consuming and expensive detailed activities are left until later when the main outlines have been established.

By putting forward alternative proposals for the improvement of the environment as early as in the first project loop, a clearer picture

**Figure 7.** A cyclical, iterative method of working has many advantages. One example: By putting forward alternative proposals for the improvement of the environment as early as the first loop, a clearer picture of the relevant aspects that must be considered in more detail in the second and third loop can be discerned.
of the relevant factors and aspects that need to be considered in more detail can be discerned. The linear working procedure in which the diagnosis is completed before the formulation of objectives and the development of proposals for improvement may result in an overly comprehensive investigation of problems. It is also often difficult to discover the most relevant problems to address as concerns measures for environmental improvement.

In the description of the working procedure steps below, each step is presented in general terms. The activities related to the steps in each loop are not further elaborated as they will vary due to the different specific conditions in every project. The emphasis is instead focused on the overall methodological approach.

3.1 Step 1 – Define and organise the sustainability review

A sustainability review is a holistic analysis of urban areas on different scales: city or town level, city district or town-district level and block level. The review is aimed at obtaining a more comprehensive picture of the environmental situation and also proposing improvement or discerning and delimiting possible and relevant future projects for urban sustainable development. Sometimes the starting point for the process is the need for action within a certain sub-system, such as improvements to the energy service system. Also in this case, there is a need to make a more integrated and holistic review of related urban systems. Thorough planning and organisation of the review is one of the keys to successful review work. In step 1, an organisation plan combined with a time schedule is prepared where all review activities should be described in relationship to each other and with respect to environmental issues.

The review is intended to examine whether environmental issues come out strongly in planned, ongoing or finalised programmes, plans or projects. However it also has the purpose of looking at the environment in an urban area in an unbiased manner.

Representatives for different environmental fields should play a prominent and distinguished role in the organisation of the review. Their role should be to investigate whether environmental expertise has been represented at strategic or operational level in the organisation of plans, programmes and projects. Specific urban environment projects should preferably be related to a wider institutional context as opposed to isolated “project islands”.

The review should be organised in order to assure the best possible opportunities to examine how environmental issues, with special regard to the situation of the poor, have been considered. One important part of the organisation is to, in each phase of the review, facilitate and promote integrated approaches and collaboration between representatives of different fields of action or subsystems. By working in a cyclical manner it is possible to successively integrate environmental 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 environmental issues.
Checklist

- Have the linkages to the institutional framework for the planned intervention been clarified (institutional set-up, regulatory framework)? See Part 3 for more specific questions and remarks.
- How explicitly are environmental issues defined in planning tasks or project goals?
- To what extent have the links between different planning levels been considered with regard to environmental issues? (National level, regional level, city level, town level, town district level etc.)?
- How can the review be organised with respect to the integration of environmental sustainability?
- How can the participation of citizens and other stakeholders be considered in different phases of the review?
- To what extent have relevant stakeholders, including representatives of the poor, been involved in different stages/processes of planned changes? Do not forget non-governmental organisations and the private sector.

**EXAMPLES: SUSTAINABILITY REVIEW STEP 1**

*FIGURE 8* Possible organisation structure for an urban development Sustainability Review in City A.

In City A a section of a semi-peripheral area in the northern part was identified as especially problematic with regard to urban development from a sustainability point of view. Uncontrolled urban settlements had emerged on landslide-prone and marginal areas between railway tracks and major roads. All kinds of small-scale and large industries have located their plants in the area, without any system for waste collection or wastewater treatment etc.

The City has decided to implement an overall sustainability review for this City section in order to obtain a better basis for decision making for future plans, projects and action, especially from an environmental point of view.

A decision was also taken to review the organisational structure of the City as some of their environmental problems may be related to a lack of communication between the planning, traffic/roads and industry departments. Another problem is the weak capacity of public authorities and the intention is also to strengthen their capacity and clarify the mandate of relevant institutions in the municipality.

The organisational structure for the sustainability review is presented in Figure 8. A time schedule in which a cyclical approach is also proposed for the review with the intention of carrying the study thorough in three phases, see Figure 9.
FIGURE 9. Possible time schedule for the urban development Sustainability Review in City A.

The water resources of City B are in a disastrous condition due to long-term poor maintenance of existing sanitation infrastructure, poor reinvestment level, uncontrolled dumping of waste and septic sludge in and near bodies of water, and uncontrolled localisation of industries and workshops.

City B has applied for a loan to invest in new, modernised sanitation facilities and for reinvestment in the water distribution system.

In order to benefit as much as possible from this large-scale loan, a Sustainability Task Force is formed of representatives of the water and sanitation authority, health department, business sector, local farmers’ organisation, environment inspectorate, and from the city districts concerned. Special efforts are made to include representatives of poor settlements in the City.

3.2 Step 2 – Make a diagnosis of the present situation

The environmental situation of the urban area under consideration should always be mapped in order to identify conditions, problems and qualities. The sources of the problems and their basic causes should also be addressed as a basis for efficient, integrated proposals and solutions.

Key issues of a certain project planning area may be identified by a combined analysis of threats and opportunities as well as strengths and weaknesses. One option is to develop key issues based on SWOT analyses in step 2 (diagnosis) of the working procedure. Another method, well known to Sida, is to develop a “problem tree” (see Figure 12.) and based on that, analyse and formulate/plan the project using the Logical Framework Approach (Logframe).31

One major outcome of current urban growth is that poverty tends to be concentrated to urban areas.

Urban environmental problems, in particular, affect the poorest and most disadvantaged who live with maximum exposure to air and water pollution, lack of community services and least access to healthcare.

31) SWOT is a very widely used tool to discern the pros and cons of a phenomenon. (S = Strengths, W = Weaknesses) as well as external factors (O = Opportunities, T= Threats).
An overall picture of the environmental situation in an urban context may be achieved by a SWOT-analysis. The environmental problems can also be described more in detail with regard to different kinds of emissions, disturbances and frequency. It is an advantage if the problems can be systematized on different urban scale: regional level, city level or city district level.

Sometimes, for example when Sida receives a project proposal for consideration, the review may be more limited in order to focus on the specific aspect/subsystem of interest to that particular project. However, even in this case it is crucial to analyse interfaces and linkage to other areas and subsystems in order to avoid sub-optimisation and to identify potential synergies or conflicts with other aspects.

If the situation is described using a scale of 3, 4 or 5 grades as in the example below, a rough overview of the situation can easily be obtained and communicated.

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

The definition of each grade must be made with regard to each environmental factor. There are advantages to using the same scale for all relevant factors in a specific case. Figure 10 below shows how a rough diagnosis may be presented.

<table>
<thead>
<tr>
<th>City District</th>
<th>Traffic noise</th>
<th>Industrial air pollution</th>
<th>River water pollution</th>
<th>Ground water pollution</th>
<th>Radiation</th>
</tr>
</thead>
<tbody>
<tr>
<td>West</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>South</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Central</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>East</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>North</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
</tbody>
</table>

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. Often enough it is difficult to relate a certain health situation directly to specific environmental problems. Many diseases are caused by the compound effects of a number of environmental problems which can also be difficult to measure.

32) In this book, consequences in this context 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 entitled impact analysis.
When seeking to address these problems and consequences it is important to identify the sources and causes of environmental problems and establish why these sources have arisen. Figure 11. below shows one way of illustrating the linkages between the causes of the problems, the sources of problems and their consequences.

The **sources of the problems** may be multiform and complex. As an example, air pollution problems may be related to a number of subsystems such as emissions from industry, traffic or fossil fuelled energy power stations. Lack of green areas, unfavourable topography (for example heavily urbanised valleys) often exacerbate the problems when pollution forms an inversion layer and cannot be absorbed by vegetation.

As is described in other sections of this document, a central aspect of the “Sustainable City Approach” is to avoid examining one environmental problem and/or one source of environmental problems in isolation, instead there should be a strong focus on the interfaces between different areas of action, for example how waste handling and heating can be linked in order to reduce resource use and loss of energy. This integrated approach can also be applied to the diagnosis of the present situation by looking at how problems are interrelated and linked to different kinds of sources and causes.

When examining the environmental situation in a specific town or town district, it is also of importance to picture the environmental situation in a wider global, national and regional perspective. It is, for example, valuable to gather climate change data related to population and GNP per capita.

It is important to study the **causes** of the problems, for example if industry does not invest in environmental technology due to weak environmental legislation and lack of efficient urban governance. In order to find solutions it is often crucial to find the institutional causes to the problems such as weak regulations regarding air pollution in industry, or weak inspectorates. The institutional setting of a certain country, region, city/town has a considerable influence on the opportunities to undertake measures for solving problems and to fulfil specific objectives regarding the environment. The most important institutional factors include:

- Legislation and policy
- Law implementation systems (courts, inspectorates, permits, etc)
- Urban governance
- Spatial or urban planning systems
- Land management systems
- Financial resources and incentives
- Private sector participation
- Institutions for education and training
- Technological level

These institutional factors are discussed in more detail in Part 3. Each of these factors may be analysed with regard to what extent it offers opportunities for, or threats to, environmental improvement in relationship to a certain project or proposal.

Environmental problems may also have external sources/causes, which a specific intervention itself cannot directly influence. These factors should be identified and analysed to assess their effects on
project implementation and outcome, and their impact on the environment.

The border between internal and external factors is often not easily distinguishable – but it should be defined as far as possible during the process of identifying the central problem to be addressed by the intervention and the formulation of a certain project. The project preparation phase, being an iterative process, often includes redefinitions of the intervention and hence of which factors are internal and which external.

For example, for an investment project aiming at reducing air pollution by introducing clean technology, legislation as well as urban plans and government incentives are usually external factors. However, for an intervention with national legislation and policy framework as its focus, these factors are obviously internal.

As also highlighted in the Logframe procedure, it is very important to discern the fundamental causes of a focal problem in order to identify sustainable solutions. Often a large number of causes and effects are identified when a real problem analysis is made during a workshop with all important stakeholders participating. Keep on asking questions as to why a problem exists until there are no more answers.

A problem tree is a tool for illustrating the consequences/effects, the sources and the causes of a problem, see Figure 12. In order to arrive at sustainable solutions, the problems need to be tackled at the bottom of the tree. It is crucial to find out what the real obstacles to the realisation of change are. The problem tree should be elaborated further with local stakeholders in respect of both causes and effects.

**FIGURE 12.** Tool for analysing sources and causes of a specific problem

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>SOURCES</th>
<th>CAUSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air pollution</td>
<td>Car traffic, Industry</td>
<td>Legislation regarding transportation, Lack of integration between land use and transportation, Old process technology, Industry adjacent to housing</td>
</tr>
</tbody>
</table>
Checklist

**General**

- What are the crucial environmental problems and issues relevant to the project?

Or, if the project is yet to be identified:

- What are the key issues for environmentally sustainable urban development or planning in the area under consideration?
- What are the sources of the problem?
- What are the institutional causes of the problem?
- What are the consequences of the environmental problems with regard to health, safety, comfort and life quality?

For a planning project with a specific physical location and delimitation, the following questions may be relevant:

**Internal factors**

- What are the internal conditions regarding the environment, and have they been analysed and systematised?
- What are the main qualities (strengths) and weaknesses of the review area? Have they been analysed by the authorities?
- What are the formal judicial planning conditions pertaining to the site? What is the tenure situation for the inhabitants?
- What is the landscape pattern including vegetation, topography and hydrological features?
- What are the geotechnical conditions of the site? How has risk of landslide, earthquake, flooding, explosion etc. been considered in the planning?
- Has the cultural and historical heritage of the site been analysed and how has these been taken into account in planning?
- What are the microclimatic conditions? Has a climate analysis been implemented and what was the outcome?
- What is the current standard of the built environment, the traffic and transportation system and the infrastructure system for water, sewage, waste and energy?

**External factors**

- What are the external conditions, for example national, regional and local policies and plans regarding economic, social and environmental factors and have they been analysed in a systematic manner?
- What are the potential threats to, and opportunities for, the future of the region?
- Has the situation for the poor in general in the country, and specifically in the region/city/town been analysed? What issues were brought up by this analysis?
- Has the environmental situation in the areas surrounding the planning area been examined? Which aspects should be paid specific attention in the process?
- What information is available regarding different environmental factors in a regional and historical perspective?
- What is the situation regarding environmental awareness, education and research in the country and the region?
EXAMPLES: SUSTAINABILITY REVIEW STEP 2

CITY A

In City A, a preliminary diagnosis of the City Section in question was carried out by compiling existing studies for different parts of the area. This compilation showed that there was information about emissions to air and ground for some industries but such information was lacking for others.

The same situation was found in other aspects. For some parts of the major roads there was information about traffic deaths and injuries; however this information was missing for the peripheral part of the system. Knowledge concerning risk of natural and artificial hazards to the peripheral urban settlements was also fragmentary.

The group of experts from different fields systematised existing information on the problems, on both physical maps and in tables. This showed the areas in which supplementary studies were necessary. Some data were insufficient and of poor quality. Among the most apparent problems identified with an especially negative impact on the poor in the urban settlements were risk of landslide, air pollution from metal working industries, dangerous traffic situation and insufficient options for public transportation, lack of open spaces and green areas, frequent flooding due to lack of storm water management and poor aquatic environment in the lake next to the area.

In a second phase, supplementary studies of the problems were implemented in the areas where information was missing. These confirmed the problems initially identified but also added problems regarding the shortage of potable water, especially during summertime as well as poorly organised waste collection and landfills.

In a third phase the sources of the problems were analysed. As an example, it was found that 80 percent of the air pollution was caused by the company Ferro Ltd. The companies in a working area consisting of ten metal working firms and stores also caused major risks for traffic deaths and injuries due to deliveries crossing the main roads for two-wheelers and cars.

The risk of landslides in the urban settlements was, to a large extent, caused by poor land management as the private owner of the area had neglected to formalise the ownership of the land, which made it difficult for the City to place restrictions on land use.

As for the causes of the problems, deficiencies in institutional settings in the form of barriers between different departments and lack of capacity with regard to air pollution and landslides were also verified. The environment department had only limited means of sanctions as concerns industry, and had also been pressured by the city government not to press charges when industry ignored national emission standards.

One main reason the Municipality did not exercise sufficiently organised control, was that the area was an uncontrolled informal settlement. Previous city governments had tried to evict people from the area, but had met strong resistance and had failed.

As an initial activity, pollution was mapped by characteristic and effects were roughly graded in terms of level of hazard to people and nature. The relative shares of pollution of the most important substances were estimated, using data from industries, literature and from the environment inspectorate and health departments. It turned out that neither the environment inspectorate, nor the head of the municipality had an overview of how serious the problem was, and the aggregated information was highly appreciated. It was decided to go public with the findings and with the action plan that must follow.

The task of identifying the causes of pollution of different types was difficult due to lack of data; however estimates were made and displayed a picture that was clear enough to continue with Step 3. While there were surely many sources for the poor quality of water resources, toilet waste was stated as one of the most serious pollutants.

Institutional weaknesses and information and collaboration gaps between different municipal and non-municipal organisations were mapped and discussed. It was decided that an action plan for improvement should be included as one element of the project.

Costs to inhabitants for the existing, malfunctioning system were estimated. The task force had some trouble in defining the scope of such a study, but eventually agreed on the limits to be applied.
3.3 Step 3 – Specify objectives

Overall objectives should reflect the basic ambition of improving the environment in a long term perspective. Key objectives regarding the environment should be formulated as a basic starting-point for the development of alternative proposals for the improvement of urban areas.

Objective, goals and targets represent a more specific method of formulating ambitions for future urban areas. The objectives of a certain urban area should be related to overall goals on global/international, national, regional levels. It is recommended that specific objectives for an urban area be formulated on three levels. The following example refers to the energy sector:

- Level 1. Main objectives (main goals), for example minimised environmental impact caused by use of energy resources.
- Level 2. Sub objectives (sub goals), for example minimised energy supply for heating, cooling, household electricity, estate electricity and gas.
- Level 3. Targets, for example 110 kWh/m² per year

Objectives and goals on all levels should preferably be formulated as ratios or principles independent of technical solutions in order to promote and facilitate the development of alternative, innovative solutions. It may be practical to use indicators for at least three different purposes:

1. As a tool for formulating objectives, goals and targets on different levels.
2. For the evaluation of impact of proposals.
3. For follow-up of the performance of urban areas or solutions in operation.

An indicator must not be mistaken for an objective, goal or target. It is a technical term or way of expressing a certain phenomenon in an extremely compressed fashion. Examples of environmental indicators include:

- Proportion of the population that suffers from stress symptoms due to noise pollution.
- The modal split i.e. the proportion of people moving by bicycle, bus, car, two-wheelers and other transportation modes in an urban area.

An indicator may be the basis for formulation of what is desirable in quantitative terms, for example an increase of the proportion of people moving by bicycle from 10 to 30 percent. Establishing a suitable indicator for an objective or target is a way of ensuring that an objective or target becomes specific, realistic and tangible.

The term planning indicator is introduced in order to facilitate the use of indicators related to spatial planning. A planning indicator is an indicator that facilitates the formulation of objectives and targets for spatial planning and also the assessment of environmental impact in physical/spatial plans. A planning indicator elucidates concisely the important properties of a plan aimed at achieving environmental goals. Planning indicators should preferably describe future conditions in the plan as – possible, proposed, desirable or expected – in the same terms as the current situation. Two examples of planning indicators which could be used for formulation of objec-

tives/targets, for impact analysis and follow-up of implemented plans are:

- Proportion of the urban area that is served by a bus stop or train station within a radius of 400 metres, currently and in future plans
- Proportion of protected green areas for recreational use within an existing or planned urban area.

Most indicators can be labelled as field indicators which means that it is necessary to measure them in reality and that it is difficult to use them as a planning tool. One example of a field indicator is “the number of pearl mussels in local watercourses”. An equivalent planning indicator may be formulated as “the size of coherent, protected areas surrounding water courses in the urban area in order to allow the preservation of the mussel population”.

The term indicator is presented in this step as it can be used both for the formulation of objectives/targets, as a basis for the development of alternative proposals, for impact analysis and for the follow-up of implemented solutions. Indicators are also discussed in Log-frame step 7.

In step 2 (working chart 6), five grades for describing environmental problems are presented. It is, in a corresponding manner, possible to define target levels as a basis for the development of alternative proposals. In general terms, these target grades can be defined as follows:

- High comfort standard – excellent
- Comfort standard – very good
- General standard – good
- Minimum standard – less favourable
- Absolute minimum standard – not acceptable other than as an exception

The baseline for targets should normally be minimum or general standard in the short term perspective. In all medium or long term perspectives, comfort or high comfort standard should be aimed at.

Checklist

- What are the environmental objectives for the project or the proposal?
- How are the locally formulated objectives related to overall objectives on the national and regional level?
- How have targets and indicators been formulated for environmental aspects, and in that case, which are they?
On the basis of the problems, sources and causes identified in step 2, the review group formulated site-specific objectives and targets. The objectives, targets and corresponding indicators were discussed both with the group of local stakeholders and with representatives from the national and the regional level.

Objectives were set for each of the eight problem areas identified during step 2 as well as for institutional capacity strengthening and performance. Table X below shows an example of how objectives, sub objectives and targets were formulated in the fields of water and use of land resources.

Table Y shows another example of how target levels were set in some problem areas. The level “very good” was chosen as target for storm water and landfill. The level “good” was decided on for accessibility to a neighborhood park and “public transportation”. These levels were decided after intense discussions with the stakeholders in phase 2 of the review. The realism of the targets were tested in a preliminary development of alternative proposals (step 4) before the review group proposed targets in a medium term perspective (10 years in this specific case) to be presented in the review report.

It was apparent already from the preliminary phase of the diagnosis that the area included a number of interlinked problems. Two main approaches as to how the problem should be addressed were discussed:

- Approach 1: Should a few problems be chosen for detailed study and choice of specific solution? or
- Approach 2: Should most of the problems discovered be considered and alternative solutions searched for that solved many problems simultaneously?

It was agreed that the process would follow Approach 2.

<table>
<thead>
<tr>
<th>Main objective</th>
<th>Sub objective</th>
<th>Targets formulated by using indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved aquatic environment</td>
<td>Favourable treatment of storm water by separating pure rain water from polluted traffic stormwater</td>
<td>100% of storm water an treated grey water is used for irrigation or infiltrated on the site</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Storm water from streets with traffic intensity &gt; 8000 vehicles a day is treated</td>
</tr>
<tr>
<td></td>
<td>Water saving</td>
<td>Total potable water consumption 100 liters/person,day</td>
</tr>
<tr>
<td>Environmental planning and use of land resources</td>
<td>Access to public green areas and parks</td>
<td>Access to local public green areas: 80% of population &lt;150m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Access to neighbourhood park 1-5 ha size: 80% of population &lt;400m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Access to town district park 5-10ha 80% of population &lt;800m</td>
</tr>
<tr>
<td></td>
<td>Preservation/compensation of green areas</td>
<td>Preservation of nature areas of considerable value (qualitative indicator)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Construction on virgin green areas are compensated with biotopes that promote biodiversity in the area (qualitative indicator)</td>
</tr>
</tbody>
</table>
TABLE Y: Illustration of formulation of target levels

<table>
<thead>
<tr>
<th>Environmental objective</th>
<th>Target levels</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Excellent</td>
</tr>
<tr>
<td>Wastewater treatment-recycling of nutrients</td>
<td>&gt;95% of the phosphorous</td>
</tr>
<tr>
<td>Maximize the application of dual storm water</td>
<td>100% dual storm water</td>
</tr>
<tr>
<td>Accessibility to neighbourhood park (5-10ha, 80% of pop less than x metres)</td>
<td>&lt;200m</td>
</tr>
<tr>
<td>Minimize land fills</td>
<td>&lt;5%</td>
</tr>
</tbody>
</table>

After having defined the problems and the limitations of scope, the task force started working on defining long and short term objectives for investments. Public consultations were held and hearings were broadcasted live by local television. City B University objected strongly to the proposed objectives and was invited to join the task force as expertise for the final drafting.

The task force eventually agreed to propose a set of objectives to the City Council. Goals were formulated regarding:
- maximum amount of coliform bacteria in the City B lake
- treatment standards for wastewater discharge (after investments) with reference to BOD, Phosphorus and Nitrogen

- the time it would take the water utility company to reach the national standard for drinking water quality at the tap
- the time it would take the water utility company to reach 90 percent coverage for distribution of water to inhabitants
- the time it would take the sanitation authority to formulate an action plan for the treatment and management of dry toilet waste and septic sludge
- institutionalised cooperation between sanitation authority and waste utility
- action plan for industries to reach national standards for discharge into the public wastewater network
- action plan for industries not connected to the public wastewater network etc.
From the Sustainability guidelines for Caofeidian International Eco-city, Tangshan, China

The overall vision of the 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 (30sqkm), the city district level (12 sqkm) and the block level. Except from environmental sustainability the indicator system encompass 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 on the sub systems of the city. The complete indicator list encompass 140 indicators and 30 indicators have been selected for management level and information. In the table these 30 indicators are presented briefly as well as the conceptual models forming the base for the indicator system.

**LEGEND**
- Chinese standard
- Higher standard by improvement factor (Factor 2 = Target level two times better than reference)
- Environmental goals
- Socio-economic goals
- Spatial goals

**INDICATOR** | **TARGET LEVEL** | **FACTOR** | **GOALS**
--- | --- | --- | ---
**Urban functions**
1. Density | X person/sqm | |  
2. Living Space | X sqm/person | |  
3. Local accessibility to service | 100 % of housing areas | |  
4. Functional mix | 100 % of urban nodes | |  
5. Affordable housing | > 5 % | |  
6. Houses in risk areas | 0 % | |  
**Urban space**
7. Urban environmental qualities | 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 transports | > 50 % | |  
11. Regional travel by public transportation | > 70 % | |  
12. Location strategies and parking restrictions | 100 % of city districts | |  
13. Time difference ratio bike/car and public transp/car | < 1,5 time | |  
14. Excess speed | 0 % | |  
**Energy**
15. Energy demand | 10 000 kWh/capita.year | 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. Reservoir water for drinking water | > 90 % | |  
22. Sanitation coverage | 100 % | |  
23. Separated wet sanitation | > 90 % of buildings | |  
24. Water quality | 100 % | |  
25. Storm water 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 % | |
3.4 Step 4 – Develop alternative proposals

The diagnosis of the current situation, as well as the formulation of objectives, serves as a basis for the search for alternative proposals for the solution of environmental problems. As the problems are often very complex, it is likely that there will be a number of alternative solutions. The possible set of alternatives, with their focus on the synergies between different subsystems, should be examined in order to be able to grasp the proper measures. Since the situation often changes rapidly, and any solution or investment should be relevant for several years, it is particularly important to choose flexible solutions in developing countries.

Objectives can be satisfied in many different ways, which means that alternative proposals and solutions should be developed and evaluated. The first choice should be to develop alternative proposals aimed at prevention and intervention using such measures as urban redevelopment of housing areas, workplaces and service, investment in clean technology within heavy industry or the elaboration of new or improved legislation for the upgrading of air quality and traffic safety. One way of working in a future-oriented manner with both the renewal of existing urban areas and the planning and development of new urban areas is backcasting, further described in Box 2.

Only if it is not possible to prevent problems, the secondary choice should be to mitigate the existing situation by measures for improving it. Existing technology in industry can be supplemented by solutions for the reduction of air pollution and noise. Urban areas which suffer from traffic congestion can be improved by moving heavy traffic to peripheral roads or by traffic separation aimed at separate lanes for pedestrians, bicyclists and cars. A polluted river can be cleaned by reducing the emission outlets into the river from industrial areas. Examples are manifold.

Mitigation means, in many cases, low cost solutions which can be implemented in the short term perspective. One dilemma related to mitigation is that choosing mitigation as an overall strategy for improvement may mean that an unfavourable overall situation in the urban pattern, the technology within industry etc. is made permanent. Certainly, small improvements can be achieved in smaller areas or of specific objects or activities, but there is a risk that an unfavourable urban pattern prevents more radical changes and successive improvement of the environment towards an overall objective. In a practical situation it is often necessary and recommendable to combine prevention/intervention and mitigation.

The backcasting approach can be favourably combined with the development of different or alternative proposals for sustainable urban development. By developing visionary alternatives or scenarios (possible futures) it becomes possible to obtain a good picture of what could be achievable as well as a good basis for further impact assessment. Two different principles for a sustainable urban development of a town or city could, for example, be the following, representing alternatives at each end of the spectrum:
BOX 2. The ideas behind backcasting and some incentives for applying this method

Backcasting is proposed especially for the creative process of developing new innovative systems and solutions focusing on synergies between different subsystems and institutional factors. Thus backcasting involves imagining a future situation with a sustainable urban structure, based on the objectives and key issues formulated in step 3.

This is first done without any preconditions or restrictions imposed by the contemporary obstacles and problems covered in step 2. Future images of an urban area with regard to urban development or different subsystems can be used to outline future patterns which are desirable for a combination of different environmental objectives. This approach has, for example, been applied to create a more tangible concept of how a durable transportation system might look.\textsuperscript{34}

After having found future images of an urban area or a combination of subsystems, it is very important that the next step relates this future image to the present situation as defined in step 2 and then attempt to find paths from the present situation to the future situation thus defined. By applying this approach, solutions can be found in the short term, medium term and long term perspectives. Awareness of the future image will also ensure that the short term and medium term solutions will be coherent with the long term solutions.

However, backcasting should not be misinterpreted as a strategy for drastic change only. It can also be very useful for the small-scale and stepwise improvement of poor areas in developing countries. Solutions developed through this approach can, after having evaluated their impact in step 5, thus become a constructive input for a more detailed implementation strategy in step 6.

The advantages of the backcasting method can be described as follows: “Many people have considerable difficulty in making their visions tangible when imagining the future. If however, they turn things around and start by guessing how it might be to look back from the future, it feels much easier. One of the many advantages of backcasting is that the problems one sees looking back using this method are not at all of such overwhelming importance as they can appear to be when looking forward into the future. A combination of the vision’s problem dominance and the problem reduction effect of backcasting could possibly provide us with both a sound and realistic relationship with the future”.\textsuperscript{35}

BACK-CASTING

A simplified picture of the backcasting process is shown in the figure. A future image of the urban environment is developed from objectives where level 3 represents long term goal for example 2050, level 2 medium term objectives for example 2030 and level 1 short term objectives, for example improvements within 5 years. By relating the future image to the present situation strategies two alternative strategies for the improvement may be defined: Fast-slow with focus on short-term and medium-term measures respectively slow-fast with focus on medium-term and long-term measures.

• Large-scale solutions for sustainable development, such as large supply areas for energy, waste water and waste management, concentration of building areas and large-scale specialised technology.

• Decentralised solutions for energy, waste water and waste, dispersion of building areas to separate, independent neighbourhoods and small-scale, differentiated technology.36

These principles can be realised by application to a certain urban area or site. An evaluation of these scenarios may result in a combination of solutions from both scenarios.

As has been emphasised as a recurring theme in this book it is very important to examine synergies between different subsystems when developing alternative proposals. The advantages doing this instead of solving each problem separately include:

• Sub-optimisation is avoided when the opportunities to solve two or more problems by the same proposal or solution are discovered. This will also result in a range of economic benefits.

• In order to identify relevant synergies it is necessary to enhance a multi-disciplinary approach and collaboration across formal sectors. This will promote mutual sharing of knowledge and facilitate collaboration which is vital in order to achieve a cost-efficient and smooth planning process.

In Section 4.8 some possible synergies where these benefits can be achieved are exemplified.

Identifying essential synergies between different subsystems

The conceptual model presented above, including the subsystems presented in more detail in the following chapter, may be used to discuss and develop different kinds of synergies between subsystems when alternative proposals for solving environmental problems are developed. An integrated approach where different subsystems or fields of action are coordinated in order to obtain positive synergetic environmental effects, but also positive economic and social effects, should be a crucial part of the development of proposals. Chapter 4 below focuses on synergies between different subsystems.

Checklist

■ What are the alternative strategies for prevention/intervention in order to improve the environment?

■ In which fields is mitigation the only possibility – or a complementary strategy? Has the risk of making an unfavourable overall environmental situation permanent been observed or discussed?

■ Have alternative solutions been developed presenting principles and ideas for integrated land-use and green areas, traffic/transportation and infrastructure planning? Which are they and why was the chosen alternative considered the best?

■ Have cross sector, multi-disciplinary approaches been applied or studied when developing alternatives for the improvement of the environment? What was the result of this approach and analysis?

36) 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.
After having set objectives and chosen the approach to consider most of the discovered problems and search for alternative solutions that could solve many problems simultaneously, two main alternatives were developed by the review group after frequent consultations with both the local stakeholder group and regional representatives. The alternatives were based on the assumption that the solution to the air pollution problem had highest priority, and that it was likely that the solution to that problem would have to influence the solution to the other environmental (and institutional) problems:

**Alt 1. Elimination of the problem by dismantling the polluting industry and relocation of urban settlements, small-scale ecological sanitation etc.**

Prohibition on continued operations of the most polluting industry, which should also solve the problem of heavy traffic conflicting with the heavy flow of people towards the city centre from the urban settlement. This measure could also open up for the development of new green areas since the industry covered a large area. This in turn would offer opportunities to attenuate storm water and offer sporting grounds and other areas for recreation.

A new bus rapid transit corridor could also be run through the area and become the shortest way to adjacent commercial areas and the city centre. It was also proposed that the parts of the urban settlement in the riskiest locations should be moved to a less risky area on the opposite part of the hill which had firm, solid earth-layers. The landfill area would be covered properly and planted with vegetation in order to be used as a public green area. Sustainable and affordable sanitation methods using urine separation and local composting and hygienisation of solids were also proposed.

**Alt 2. Elimination of air pollution by measures within industry and urban intensification, local waste water treatment plant etc.**

It was proposed that the industry should thoroughly reconstruct its processes in order to drastically reduce emission of pollutants to air. A prerequisite that would allow the industry to stay was also that they must invest in a common industrial wastewater treatment facility. At the same time, a new road for heavy traffic was proposed that would not interfere with the major road from the urban settlement towards the city. When the physical structure of the urban settlement was studied more in detail, options for urban intensification were identified on non-productive, residual areas within the settlements.

This should make it possible to leave the risky, land-slide areas and to build affordable, low-cost housing in 2-4 floor buildings for the people living in the risky areas. This urban intensification would raise the basis for public transportation through the area and to enlarge the green areas with storm water attenuation options around the settlements.

A local waste water treatment plant was proposed where organic waste could be treated with sludge to produce biogas for vehicles. The treatment plant should be designed with expansion opportunities in order to treat waste water from the whole northern part of the city at some point in the future.

The institutional problems that were identified were not related to any of the alternatives or even to the City section, but rather to the entire city and applied irrespective of chosen approaches and alternatives. It was decided that new regulations should be drafted for the environment department, and that they should move in to the same premises as the state inspectorate in order to be able to share information and knowledge more easily.

It was further decided that both waste, water and public transport utilities should form a joint financing and procurement unit to act as help-desk for the utilities in the investments and contracting work that was to follow.

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**CITY B**

The City B water and sanitation authority formulated sanitation alternatives together with the waste utility, representatives of the peri-urban districts that were worst hit by health problems related to water and sanitation and representatives of local industry. A representative from an old settlement with a relatively functioning sanitation system also joined.

Alternatives (i) community water closets with connection to the mains system, (ii) community dry toilets and (iii) a fully decentralised system with dry toilets were discussed. Local representatives showed a genuine mistrust
towards the municipality as to whether the municipality would actually provide services as promised in a centralised system and opted for an alternative that allowed for local organisations to service the chosen system on a concession basis. Alternative (iii) was discarded due to serious lack of space. The waste utility was reluctant to accept a dry toilet alternative due to workers health and sanitary aspects, but agreed to be part of further study of such a model. Alternatives for treatment of industrial waste water were discussed in a separate sub-group. Also here, mistrust towards the municipality was an obstacle to serious discussion. Industry representatives called for assistance in knowledge about clean technologies, and urged the university to “get down off their high horses” and assist industry with practical solutions. It was finally proposed that common treatment plants for aggregation of industries would be the best solution, but doubt was raised as to whether the loan that the city would take could be used for the purpose. It was also evident to the group that some industry and workshops may have to be closed down or moved. Contacts were made with urban planning department to discuss alternatives.

3.5 Step 5 – Analyse impact

The economic, social and environmental impact of alternative proposals and solutions should be studied inorder to obtain a basis for choice, either of one alternative or a combination of several alternatives.

The analysis of impact is an important part of the development of holistic and innovative proposals with the aim of promoting sustainable development. It is therefore recommended to include an impact analysis in a sustainability review. The focus of this conceptual framework is on the assessment of environmental impact of alternative solutions with special regard to the situation the urban poor. Social and economic impact is no less important to analyse – but tools for this type of analysis is provided in other governing documents.

Environmental assessment on both strategic and project levels is a generic term for a number of methods and tools used to examine proposals as to the extent that environmental objectives have been provided for in a policy, programme, plan or project for sustainable urban development.

An environmental assessment must be part of the basis of decision making for all activities supported by Sida. It is the collaboration partner’s responsibility to carry out an environmental assessment. The scope of the assessment should be adapted with respect to the needs of the actual situation, or what type of document or process is the subject of assessment.

Programmes, plans or projects with extensive environmental consequences demand a comprehensive and detailed environmental assessment. In projects with insignificant environmental impact, the assessment may be very brief. The environmental assessment of proposals and solutions for the improvement of the environment (developed in step 4) should be based on the objectives and targets defined in step 3. The diagnosis of the actual environmental situation (step 2) is also an important input into the assessment.

Environmental Impact Assessments (EIA) have been a proven tool over many years and enjoy a good track record in evaluating environmental risks and opportunities of project proposals. Yet the need for a similar assessment process at the strategic level of decision making has not been recognised. Leaving environmental assessment
at the project stage severely limits opportunities of identifying strategic choices that might lead to more sustainable outcomes and reduce risks to the environmental resource base.

Project assessment invariably takes place in a predetermined policy environment. For example, the EIA of a new fossil fuel energy generation plant will be unlikely to consider other energy generating possibilities. Consequently alternatives for energy generation will be limited to location and technology choices within the framework of fossil fuel power generation.37

Strategic Environmental Assessment (SEA), is the collective term for methods and tools concentrating on the analysis of the environmental impact of policies, programmes and plants on a strategic level and for larger urban areas often in a long term perspective. Its strate-

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gic direction is especially valuable in a review process where overall alternatives for the improvement of the environment are discussed.

A strategic environmental assessment should illustrate how the choices and key issues related to proposals in, for example comprehensive planning, affect the environment and provide potential for the establishment of environmental objectives. In order to be most meaningful, the assessment should be made as early in the process as possible so that the direction of the planning can be modified on the basis of its results.

The work with SEA should not be regarded as a purely technical procedure but rather as a dynamic process of communication with the stakeholders involved contributing to the development of a creative, active and interesting dialogue about environmental issues in an urban area and their connection to social, cultural and socio-economic perspective. It should also contribute to increasing involvement in environmental concerns and providing new insights into problems and solutions as well as highlighting undesirable effects, providing warning signals and questioning traditional views where environmental issues are considered to be a sector concern.

As illustrated in Figure 14, SEA is currently mainly focused in the questions why, if and where, while the more well-established tool EIA is focused in the question “how”. Sida has published a comprehensive manual for the examination of environmental impact assessments which can be used for large and small-scale projects.

An “ideal” model for SEA work in an urban region can be described with regard to time perspective, scope and degree of detail as shown in Figure 21. In this model SEA work is integrated with regional and comprehensive planning on city/town level in order to cover environmental effects in a long-term perspective but in less depth. The SEA procedure creates a comprehensive basis for a decision on EIAs at the detailed planning and project level.

Checklist

- How have environmental (Strategic Environmental Assessment, SEA) and social impact assessments on the strategic level been applied in order to compare alternative interventions? Have their recommendations been taken into account in the planning?
- Has Environmental (and Social) Impact Assessment (ESIA or EIA + SIA) been carried out on the project level? What were the main recommendations?
- Can other, more advanced tools such as multi-criteria analysis (MCA) and life cycle analysis be applied in order to handle a larger number of aspects and indicators?
- Have qualitative tools such as assessment graphs been applied in order to evaluate alternatives?
- How has the involvement of different stakeholders as experts, NGOs and citizens including representatives of the urban poor been organised in assessment activities?
- Which main conflicts have been identified in the impact analyses between different environmental objectives or between environmental and/or other objectives (mainly economic and social)?
The two alternatives, reflecting two different ways of addressing the cumulative and manifold problem situation, were compared with regard to both environmental objectives and targets formulated in step 3 but also economic (financial) and social objectives. The alternatives were compared in the table shown in Table Z. As a first step in the assessment, the alternatives were ranked.

Alternative 2 was finally proposed as the main alternative but it was decided to find more economical solutions than were proposed in the preliminary phase and to further study if more efficient methods for the reduction of air pollution could be found.

### Table Z: Simplified, preliminary assessment of the two main alternatives for the improvement of the environment in City A (1 = better solution)

<table>
<thead>
<tr>
<th></th>
<th>Alt 1</th>
<th>Alt 2</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risks for landslides</td>
<td>2</td>
<td>1</td>
<td>The urban intensification in alt 2 combined with stabilization of the ground will result in less riskier environment in both a short term and a long term perspective</td>
</tr>
<tr>
<td>Air pollution from industry</td>
<td>1</td>
<td>2</td>
<td>The measures within the industry in alt 2 cannot achieve the same reduction as the dismantling of the industry in alt 2</td>
</tr>
<tr>
<td>Traffic safety</td>
<td>1</td>
<td>1</td>
<td>Both alternatives would solve the hazardous traffic situation problem</td>
</tr>
<tr>
<td>Sanitation</td>
<td>2</td>
<td>1</td>
<td>The waste water treatment plant imply solutions with better hygiene and less health risks in alt 2</td>
</tr>
<tr>
<td>Storm water treatment</td>
<td>2</td>
<td>1</td>
<td>To reuse the industrial area for green area and storm attenuation may be risky due to land contamination in alt 1</td>
</tr>
<tr>
<td>Accessibility to green areas for recreation</td>
<td>2</td>
<td>1</td>
<td>The urban intensification implies that a fine-meshed network of green corridors and nice public spaces can be developed within the area in alt 2</td>
</tr>
<tr>
<td>Accessibility to public transportation</td>
<td>1</td>
<td>1</td>
<td>The alternatives will become equivalent with regard to accessibility to public transportation</td>
</tr>
<tr>
<td>Access to potable water</td>
<td>2</td>
<td>2</td>
<td>Neither of the alternatives provides an adequate solution. The problem needs to be solved on a regional basis</td>
</tr>
<tr>
<td>Waste management</td>
<td>2</td>
<td>1</td>
<td>Both alternatives would solve the problem of dumping, but Alt 2 also utilises organic waste</td>
</tr>
<tr>
<td>Social objectives</td>
<td>2</td>
<td>1</td>
<td>Alt 1 may cause social problems as the working opportunities diminishes in the area and unemployment among poor people in the urban settlement will raise</td>
</tr>
<tr>
<td>Economic objectives</td>
<td>1</td>
<td>2</td>
<td>Alt 2 is more expensive than alt 1</td>
</tr>
</tbody>
</table>

The alternatives for sanitation and industrial discharge in City B were analysed in terms of environmental and health impact of different alternatives in relationship to the zero alternative of no action. A local consultant was used for the impact assessments. The results were discussed in public hearings. Assessment and hearings resulted in a proposal for choice of alternatives.
3.6  Step 6 – Choose a strategy for implementation and follow-up

The analysis of impact, including environmental and social assessment such as SEAs and EIAs, and the application of tools for the evaluation of alternative proposals, results in the recommendation of a preferred proposal and a further strategy for implementation of this proposal in a long term and short term perspective. The proposal and strategy developed during a sustainability review may be a combination of elements from several alternatives or a main alternative with some additions from the other alternatives assessed in step 5.

Sustainability issues in terms of social, economic and ecological aspects, brought up during the review process must be integrated into all phases of the transformation process: urban planning and design, detailed design of buildings, roads and landscape, development of areas, tendering and construction – as illustrated in Figure 15.

An important part of this step is also to define in more detail a number of projects focused on potential synergies between different subsystems for further development and implementation.

It is also important to continuously assess the final result of the planning process i.e. the built environment. The operation and maintenance phase is the longest period in the life of a city and its components, which makes it necessary to systematically measure, evaluate and take steps for successive improvement of buildings, roads and green areas. An overall sustainability framework should be developed during the urban planning phase and successively translated into more specific programmes within an environmental management system.

For the follow-up of the impact of an intervention proposed in the review, the logical framework (or similar structure with a hierarchy of objectives, outputs, activities and indicators) designed during the planning phase is a very useful tool. Especially steps 6 – 9 provide useful advice regarding resource planning of projects (step 6), the fol-
low-up of implemented solutions with 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).

**Checklist**
- What action plans have been developed, including measures in the short term, medium term and long term perspectives?
- What systems or routines exist for follow-up of implemented plans?
- What indicators are used in follow-up procedures? Which stakeholders have been involved in the setting up of indicators and how has the process of defining and choosing indicators been organised?
- What financing mechanisms are important to further planning and implementation with respect to the environment? What needs to be studied further?

**EXAMPLES: SUSTAINABILITY REVIEW STEP 6**

**CITY A**

After the proposed choice of Alternative 2 as the main alternative for further study, a strategy for implementation and phasing of this alternative was developed. The following possible phases of the implementation of this long term alternative (>15 years) were discerned:

**Phase 1** Measures to reduce air pollution from the metal working industry, urban intensification of parts of the urban settlement combined with the development of a central public square and future bus stop. It was proposed to replace the settlements on the riskiest parts of the land by new affordable, high-density dwellings adjacent to the public square. Reinforcement of the department of the environment with specialists on landslides and air pollution, and joint premises for City and state environmental departments. Establishment of the utilities’ support facility followed by the application for loans to the regional development bank.

**Phase 2** Establishment of a public transportation corridor from the settlements to adjacent areas and the city centre. Further urban intensification combined with further replacement of housing on the less risky sites by affordable, high-density dwellings. Construction of a new sanitary landfill outside town. Establishment of a first phase of new infrastructure for water and sanitation to the high density areas.

**Phase 3** Development of green areas for recreation combined with storm water treatment. Closure of existing waste dumps. Extension of water and sanitation infrastructure. Establishment of a formal organisation for different City districts based on a multi-disciplinary approach where planners, traffic engineers, environmental and energy specialists collaborate on a daily basis. After presentation of this strategy in a public meeting for residents, workers, NGOs and others (a so called open house) in the second phase of the review lots of supplementary ideas on both the detailed and the strategic level were expressed. Some of the people present were very doubtful about the high-density affordable housing idea while others were enthusiastic. A discussion followed as to whether there was an option to develop high-density, low-cost housing of only one floor.

After revision, the review was compiled in a report that was sent to the mayor and other politicians in City A for decision about further steps in urban development, for example strategic and detailed plans based on the review. In this report a number of specific projects within the framework for the main alternative were also proposed.
On the basis of the review, the City Council of City B decided to divide investments into three phases in relationship to the seriousness of the health-related problems.

**Phase 1** was to reinvest in the water distribution system which would be composed of a combination of a centralised and decentralised system, with special solutions for the disadvantaged areas of the City.

**Phase 2** was to invest in a new sanitation system. It was proposed to keep both the dry and water closet alternatives for the poor areas, and to continue with economic and organisational analysis of the two alternatives for sanitation before taking a final decision. It was anticipated that an international consultant would be needed for this study.

**Phase 3** was to invest in three treatment plants for aggregations of industry in three different parts of the City. Certain industry would be allowed to discharge their water into the existing network.
4. Part 2: Specific subsystems and their potential synergies
A number of specific subsystems have been identified as being especially important to the substantial improvement of urban environment. Institutional factors are also of crucial importance for the mitigation of environmental problems. These are described in the next section. If progress is to be made, a city needs to address both its institutional settings and the performance and infrastructure of one or more subsystems. Figure 16 illustrates the overall holistic approach.

The sustainability concept itself, and Swedish development cooperation goals, require that urban functions, municipal services and infrastructure are available to all at affordable costs. It is vital that urban planning, sector planning and interventions in these fields are implemented with poor people’s conditions and needs in focus, and that all inhabitants are invited into the decision-making and planning processes.

Financing needs for urban environment interventions are high and require special attention. Local authorities must be involved and strengthened in order to be able to handle both investments and long-term operation of environmental investments. Also in this respect it is vital from a sustainability viewpoint that all inhabitants’ ability to pay is taken into consideration when formulating tariffs, fees, connection charges, organisation of operations etc.

Each subsystem is described in the following with a special focus on its interfaces with other subsystems i.e. how they are linked and interdependent, how synergies can be achieved and sub-optimisation avoided. A traditional project or intervention often considers one system at a time. When looking at this special system it is always important to try to find links to other systems in order to develop optimal solutions.

Important potential synergies between a number of subsystems are described in Section 4.8. These synergies can be achieved if the
stakeholders involved intend to apply a broad, holistic approach from early in the planning process. The economic, environmental and social benefits, especially for poor people, of this type of approach should be stressed. The approach facilitates an optimal utilisation of limited resources.

However, there are not only synergies between different subsystems, there are also conflicts of interest or conflicting objectives. Sometimes hard facts show that what is good for one area of planning contradicts the needs of another. At other times it is rather a matter of conflicting strategies, vested interest and poorly defined division of responsibilities. One example of where objectives may contradict each other could be when there is a strategy to reduce heavy transport in a neighbourhood, and at the same time an urgent need to improve waste collection using trucks. Another may be when goals regarding reinvestment in the sanitation sector collide with cultural heritage interests.

A general remark regarding the technology for subsystems is the option for successive development of small-scale, low-tech solutions to medium-large and large-scale respectively medium-tech and hightech. Opportunities for future improvement and extension should always be considered, see Figure 17.

Readers who would like assistance with more in-depth analysis of each individual subsystem is recommended to take part of suggested further reading provided in Chapter 6.

4.1 Sustainable Urban Functions
– housing, industry, services etc.

Urban functions are defined as a subsystem in order to facilitate a discussion of environmental issues related to specific activities within
industry, housing and service functions. These issues are closely related to urban planning which, in this book, is considered as an institutional factor.

The planning of cities and towns with regard to urban functions strongly relates to the economic and social aspects of sustainability including demographic issues as well as the inclusion of unregulated settlements and poor people in the planning process. The increasing number of people moving into urban areas, as well as the structure of the population, must be considered in combination with the dimensioning, location, planning and design of housing and residential areas. Urban functions are normally defined as residential, commercial, educational, industrial production and other vital urban functions. The challenge of bringing housing and other urban functions for poor migrants into the overall planning procedure must not be underestimated and calls for multi-stakeholder involvement including representatives of poor women and men.

The business activities, markets and production systems of a large spectrum of industries, from heavy processing factories to medium heavy and light 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 the country in question.

Environmentally friendly product policies as well as action programmes regarding sustainable patterns of production and consumption must be fulfilled in the long term. Even in the developing world there is increasing awareness of the large market potential of small-scale, cheap but environmentally friendly, products in cities and towns.

As for service functions it is important to relate the study of the needs of commercial, cultural and social service to expected population development and industrial activities.

**URBAN FUNCTIONS – POTENTIAL SYNERGIES AND INTERFACES**

- (Space for) Water and sanitation facilities, waste collection and possible source separation must be considered for residential and commercial areas.
- Catering for public transportation facilities between poor settlements and city centres, commercial and industrial areas.
- If possible, placing new residential areas (also for poor migrants) where it is favourable from a transportation and public infrastructure viewpoint, so as to minimise costs for transport and connections to energy and water supply systems.
- Energy demands for cooling of industries and offices are increasing. Can this demand be diminished and financial resources be utilised for poor areas instead?
- Opportunities for rainwater collection can be considerably increased if there is awareness of these possibilities during the planning and construction process.
- The orientation of industries may, to a great extent, affect the


The making of dumplings is an important Chinese tradition. PHOTO: CHRISTER VALLSTRAND
impact they have on city inhabitants’ health and well-being.

- Locate industry correctly with regard to prevailing wind direction, consider planning for common industrial wastewater treatment plants and waste separation and collection facilities.
- Develop alternative solutions presenting principles and ideas for integrated land-use and green areas, traffic/transportation and infrastructural planning.

**CHECKLIST – SUSTAINABLE URBAN FUNCTIONS**

- To what extent has a historical and future-oriented demographical analysis of the region and the town been carried out and used as a basis for urban planning?
- Is there an analysis of housing land needs for the future based on ideas regarding high-density affordable housing concepts and other ideas promoting the improvement of urban settlement areas? What is the outcome of the analysis, and has it been taken into consideration in planning? Are poor people and migrants considered to an appropriate extent?
- What assumptions are made regarding industrial development with regard to space and location in relationship to housing and service areas?
- In what manner have spaces adjacent to urban settlements for small-scale industries and activities of special importance to poor people been considered?
- Which measures have been discussed in order to reduce and minimise air and water pollution, noise and other environmental problems caused by industrial production?
- What strategies are in place to encourage the development of increased environmental protection, workers’ health and safety, and the introduction of clean technologies in industry?
- Which concepts and ideas are there for preserving and developing social, commercial and cultural functions close to housing areas, respectively in central locations in the town?
- Do urban settlements and poor people have access to green areas and water areas for recreation?
- Is there a strategy for relocating housing and industrial areas located on apparently risky landslide sites, garbage dumps, railway or highway embankments?
- Are there ideas for urban development based on mixed-use patterns in order to counteract mono-functional development of the town into separate enclaves?
- How are the systems for water, sanitation, waste and energy for different urban functions considered and integrated into the urban plans for the town on different levels with regard to:
  - collection and connection points,
  - location of areas for dry sanitation respectively waterborne systems,
  - location of recycling areas and landfills with regard to protection distances, and
  - the availability of housing, industrial and service areas?
4.2 Sustainable energy

The energy sector could, on one hand, be described with regard to the energy supply (energy production – energy distribution) and on the other hand with respect to energy efficiency in the use of energy for different purposes. In a sustainable city, environmentally safe supply of energy from renewable energy sources should be given special priority as well as energy efficiency in all steps of energy flows.

The first step in the process of achieving sustainable energy solutions should be to minimise energy demand by a combination of energy efficient buildings, production processes, household equipment, lifestyles etc. By minimising energy demand, optimal energy solutions for distribution of renewable energy can be promoted. District solutions for both heating (in regions with cold climates) and cooling are an option in densely populated areas.

Close to 300 million poor people living in cities lack access to electricity and other modern energy services. The majority is dependent on winning energy from dung, wood charcoal or other biomass. The indoor air pollution created by burning this biomass results in millions of deaths annually.

It is important that both health implications and environmental impact from the use of injurious fuels and inefficient equipment for cooking and heating is considered, since this is a field in which poor people, and especially children and women, are badly off. A prerequisite for sustainable urban development is also that energy be supplied to all inhabitants at all times. Energy efficient, small-scale solutions can often be combined with environmental-friendly answers.

- Deforestation around the city and the use of firewood and charcoal for cooking are closely linked. Forestry authorities, nature conservation authorities and energy planners/utilities must cooperate in order to stop deforestation and turn the situation around towards sustainable and efficient use of biomass.
- Energy demands for cooling industries and offices are increasing. This demand can be diminished through a combination
of urban planning, building design, production processes and equipment, introduced in early decision-making phases.

• The city’s own energy demand may be high. Municipal utility departments must cooperate in identifying energy savings opportunities.

• Digestion of biodegradable waste, septic sludge, wastewater sludge or other such materials may be a feasible option for small-scale energy production. Gas may be utilised for heating purposes or to produce electricity or even vehicle fuel.

• The energy sector can contribute in the dissemination of knowledge on the potential hazards of cooking or heating with dangerous fuels. They may be able to contribute alternative, affordable, energy-efficient and environmentally-friendly solutions.

• In some medium-income countries, incineration of waste may be a possible option for large-scale CHP systems (Combined Heat and Power). Environmental considerations must be rigorous and the best available technology for reduction of dioxin emissions applied.

• Energy utilities and industry may cooperate to cut peak loads in order to make energy supply more reliable.

CHECKLIST – SUSTAINABLE ENERGY

■ What kind of energy plan and strategy for future supply of energy to all inhabitants, 24 hours a day, is available in the city?

■ If so, are energy efficiency action, and substitution of non-renewable energy sources part of the plan? Does the plan include affordable energy supply for the poor and a stepwise strategy for implementation of energy-efficiency in all sectors?

■ Have central or district solutions been considered for (heating and) cooling for existing areas where it is difficult to obtain high energy-efficiency in a short term perspective?

■ Does the city have a plan for reduction of emissions from household and utility energy generation and use?

■ How has urban planning considered options to reduce the need for energy for heating and cooling by means of foresighted location, re-location, design and re-design of blocks and buildings within urban settlements?

■ Have renewable energy sources that could replace non-renewable sources in the city been identified?

■ What options for renewable energy are being considered for heating/cooling, production of hot tap water and electricity – windpower, solar panels or PV cells, geothermal energy, bio-energy – also in poor areas and in urban settlements? Have low-cost, smallscale applications for renewable energy systems been considered?
4.3 Sustainable waste management

Waste management can be divided into the following phases: (1) minimisation of waste amounts and waste hazardousness, (2) collection and transportation of waste, (3) reuse and recycling, and (4) treatment and disposal of residues. Ideally household waste, hazardous, contagious and industrial wastes should not be mixed in an uncontrolled manner. Neither should it be dumped in open areas with no environmental protection however, environmentally safe collection and landfills are rare in the developing world.

Waste separation, collection and control should be gradually improved, as should also the standard of landfill areas. Old dumpsites need to be stabilised and closed and new landfills with higher environmental and safety standards need to be constructed. These new landfills are based on a considerably lower amount of residual waste and should be combined with a resources management centre with material recycling faculties. Cooperation with water and sanitation utilities in the field of toilet waste or sludge treatment may be a way to minimise sludge management problems, and gas from landfills may be recovered and utilised if the waste has the right composition.

It is important to identify, collect separately and treat the most hazardous waste from industry, workshops and households. A phased hazardous waste treatment plan can be a help in this respect. The same goes for waste from hospitals.

Private sector, both in the formal and informal economy, is often heavily involved in all steps of waste management. They need to be part of the solution in a sustainable waste management system. Their involvement in the planning phase is important.
toilet waste, septic sludge and other types of waste is clearly allocated.

- Minimisation of industrial waste and changing hazardous substances for less hazardous may be carried out in 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 collectors for storm water and/or wastewater.
- Digestion of biodegradable waste, septic sludge, wastewater sludge or other such materials may be a feasible option for small-scale energy production. Gas may be utilised for heating purposes or to produce electricity or even vehicle fuel.
- In some medium-income countries incineration of waste may be a possible option. Environmental controls must be rigorous.
- New landfills need to be carefully located in order to protect water sources and land from pollution. It is also important that they are not placed too close to existing or future residential areas. Citywide collaboration is therefore needed when a new landfill site is chosen.
- Old waste dumps may be redeveloped for ecological and recreational purposes, or integrated into strategic and detailed plans.

CHECKLIST – SUSTAINABLE WASTE MANAGEMENT

- What information is available regarding the environmental and health effects of unsustainable waste management in the city?
- Does the city have a waste management plan? Does it include 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 the elaboration of the plan?
- Have the needs of the poor been considered?
- Which solutions are anticipated for the management of hazardous waste from households and industry, and of hospital waste? Is the institutional setup optimised?
- How is the competent body responsible for waste issues involved in urban planning issues? Can the involvement be improved qualitatively?
- Is there enough knowledge about the amounts, types and treatment of waste in the city, or how can such information be gathered and compiled?
- Which goals, if any, have been set up regarding waste management and waste minimisation?
- Is there a sanitary landfill in the region, or is there a landfill in the region that has been identified as possible to turn into a sanitary landfill?
- Is there any ongoing collaboration with neighbouring municipalities/cities that must be taken in account? Which? How are they involved?
4.4 Sustainable water supply and sanitation

Water supply and sanitation is a fundamental dimension of sustainability. One of the Millennium Development Goals states that the proportion of people lacking access to safe water and basic sanitation will be reduced by half by 2015. In densely populated areas and in medium income countries, water-based sewage systems and treatment plants may provide feasible solutions. In poor countries and in arid and semi-arid areas, dry sanitation systems are often more relevant.

System solutions tend to be long-term and of a more or less irreversible nature. Consequently, choices need to be carefully considered with sustainability aspects applied in a broader sense, including issues such as water conservation, water and groundwater pollution, health and hygiene, social and cultural aspects and affordability. In many cities the poor residents pay more than the wealthy for water of poor quality. Weak management of water resources lead to water shortages.
WATER SUPPLY – POTENTIAL SYNERGIES AND INTERFACES

- Water supply authorities and authorities responsible for toilet waste and/or wastewater management must cooperate. Far too often drinking water sources are polluted by sludge and toilet waste.
- Dumpsites, landfills and industries must not be located in areas of importance for existing or future drinking water purposes.
- Water supply and wastewater treatment plants, if any, may be managed in a manner that decreases energy demand peaks i.e. can energy demand (in kWh) and power (W) be cut down?
- Water and drainage utilities and waste collectors need to cooperate to prevent dumping of waste and septic sludge in storm water collectors and/or wastewater.
- Digestion of biodegradable waste, septic sludge, wastewater sludge or other such materials may be a feasible option for small-scale energy production. Gas may be utilised for heating purposes or to produce electricity or even vehicle fuel.
- Improvement of incoming water quality to wastewater treatment plants through collaboration with industry. Combat environmental problems “upstream”.
- Road department and water utility cooperate in storm water-management issues.
- Water supply and sanitation authorities need to include health education and hygienic practices in their operations in order to mitigate water-borne diseases.

CHECKLIST – SUSTAINABLE WATER SUPPLY AND SANITATION

- Have goals regarding drinking water quality, sanitation service levels, water conservation etc. been discussed and established? Are they harmonised with national goals and requirements?
- Is there a plan for sanitary and environmentally sound management of toilet waste and septic sludge?
- Are there plans or activities aimed at reducing loss of water from the water supply system?
- To what extent and how are water sources protected?
- Do the city authorities have sufficient resources for implementation of strategies to meet goals, and for reinforcement of legislation regarding protection of groundwater and surface water? If not, what is the solution to this?
- Is water available to everyone 24 hours a day? If not, have the reasons been analysed? How, and within which timeframe, continuous distribution to all customers 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 (if any) been considered?
- What are the organisational, financial, operational, (lack of) investment reasons for potentially poor performance in the water distribution and/or wastewater treatment fields?

A checklist developed for specific interventions in the water and sanitation sector can be found in “Checklist to Sida Strategy for Water Supply and Sanitation” (2004).
4.5 Sustainable traffic and transportation

As for the traffic and transportation field, an integrated land-use and transportation approach is essential in order to achieve long-term sustainable solutions. Institutional arrangements which must be considered when developing a sustainable traffic and transportation system include regulations, legislation and its enforcement, learning and training, evaluation and monitoring.

Future vehicle technology and renewable fuels will become an important part of the solution in the long term. Currently, there is considerable demand for improvements in the cities for the developing world that are connected with organisation of public transport, traffic management to reduce congestion, promotion of non-motorised traffic and regulation and monitoring of ordinary non-renewable fuels. New fuels, such as ethanol or biogas, may be a feasible solution in certain countries.

Road safety issues are closely connected with environmental and health-related transport issues, and should be considered jointly. It is of special importance to consider unprotected pedestrians and bicyclists.

The greening of transportation systems is essential to overcome the major environmental impact of cars. Poor people living close to traffic are put at risk from toxic air emissions. Special bus-lines, light trains, cycle lanes are methods of helping the city to become more resilient. Green streets where all traffic is banned have been introduced into poor areas with narrow streets.
TRANSPORTATION – POTENTIAL SYNERGIES AND INTERFACES

- Minimise the need for transportation by private car and motorcycle through collaboration between stakeholders representing urban planning, public transportation, industry, housing and service functions in order to minimise travel distances between these functions in the city.
- Utilise synergies between land-use (location of urban functions and urban density), traffic and transportation to achieve good prerequisites for public transportation and to minimise energy consumption for transportation as well as air pollution and noise.
- Gas from digestion of biomass may be used as fuel for vehicles. Technology may be competitive where fuel costs are high.
- Waste utilities, private actors and traffic planners need to develop plans for how to make waste transportation efficient.
- Minimise the need for transportation of drinking water by car and truck by implementing a sound drinking water supply system for formal and informal residential areas.

CHECKLIST – SUSTAINABLE TRAFFIC AND TRANSPORTATION

- Current public transportation system?
- Have transportation needs been measured or assessed? Are poor people’s and women’s needs considered?
- Is there a current transport and road safety policy that includes environmental considerations? Is it realistic and is it implemented?
- Any planning procedure for improving or expanding the public transport system or even for introducing bio-fuels in buses (ethanol, bio-gas)? Have Bus-Rapid Transit systems been considered?
- Have bus lanes been planned with regard to accessibility for poor people to major industrial areas and other workplaces as well as service centres?
- What plans are there for a network of continuous, comfortable and safe routes for bicycling and walking connecting housing, industry and service functions, even at night?
- How can traffic and mobility management be improved?
- To what extent has an integrated approach to planning been applied to the location and design of transportation systems for all sustainable modes of traffic in connection with land-use? Considering different urban densities?
- What strategies can be used to counteract, replace and reduce unsustainable modes of traffic based on vehicles with poor emission control and poor quality fuel (for example two-wheelers)?
- Is the authority properly organised to govern and monitor planning and running an integrated multi-modal transport system?
4.6 Sustainable landscape planning

Landscape planning regarding both the core urban areas (parks, green corridors, courtyards, plantation along streets etc) and surrounding green areas deals with at least three issues;

- landscape for human use for recreation including culturally-valuable areas
- landscape that offers areas for recycling of waste products
- landscape that contains bio-diversity

In some cases these aspects can be resolved and needs provided for in the same area or in adjacent areas. Regarding the nature of the ground, there is also a design approach in the field of landscape planning. The demands of the “green structure”, its theoretical size and the consequences if it is not taken into consideration are well known. For example there is a very strong relationship between the use of areas for recreation and accessibility of housing areas, and of course consideration must be given to the presence of barriers of different kinds. Easy access gives a high degree of utilisation. The continuity of green areas is of great value to flora and fauna.

It is therefore a great advantage if a hierarchy of green areas is developed with links between green courtyards, urban parks and larger recreational areas. A network of green corridors or wedges should be considered when considering the green structure in a regional or city perspective. Urban settlements, where many poor people live, should be linked to such green corridors including comfortable and continuous bicycle and walking paths, recreational areas, sports grounds etc. Such networks can be implemented more easily if they are included in overall plans. However, it is also possible to successively develop such facilities in existing urban areas.

LANDSCAPE PLANNING – POTENTIAL SYNERGIES AND INTERFACES

- Purification of water bodies connected to recreation and biodiversity.
- Integrated planning of green areas and the attenuation of storm water by developing attractive open ponds and ditches where the water level can vary.
- Restoration of waste-land “brownfield management” turned into green areas and parks for recreation.
- Redevelopment of closed land-fills for green areas and recreational purposes.
- Using green areas to help school children understand ecology and the environment.
- Green areas are the lungs of the city which make them important for the reduction of air pollution. (However, it should be emphasised, that green area planning can never replace solutions at source for the reduction of air pollution.)
- Green wedges and green corridors should be planned in coordination with paths for bicycling and walking.
- The topography, vegetation and other factors concerning the green structure are important to the micro-climate which should be taken into consideration when planning or re-planning areas for housing and industry as it influences energy

Traditional physical exercises in a Beijing park, 2008.
PHOTO: ULF RANHAGEN
demand, the diffusion of air pollution, comfort level due to sun exposure, sun shading or wind exposure for cooling winds in summertime or wind protection in wintertime etc.

CHECKLIST – SUSTAINABLE LANDSCAPE PLANNING

- To what extent has the strategic view that green areas are an asset to human health, comfort and well-being been considered in the city?
- How have the green areas as a resource for recreation been considered on these, interlinked levels: the courtyards of building blocks, city and city district parks and sports grounds, green corridors and green wedges, links to other parts of the city, the surrounding landscape and agricultural areas etc?
- Restoration of small bodies of water, canals, ponds etc. is vital to the maintenance of biodiversity (plants, insects, fish, amphibians, birds etc). To what extent has this been taken into account in the city?
- How has the importance of the ecosystems such as green corridors and water streams been considered in the existing town and in strategic and detailed plans?
- How are green areas, and the relationship between rural and urban areas, taken into consideration in the existing town and in strategic and detailed plans?
4.7 Sustainable building design

Sustainable architecture includes all the relevant aspects to be considered when planning and designing all types of buildings within the Sustainable City. The adaptation of buildings to the microclimate, ground conditions and surrounding buildings, traffic systems and green areas is of major importance for the indoor environment and also for the environment in the immediate surroundings. It has a considerable influence on building and architectural design and the choice of building materials. Much of the energy that people pipe, wire and truck into cities is used by and in buildings – constructing them as well as operating them as well as making their occupants comfortable. Globally buildings, throughout their total life cycle, account for more than 40 percent of total energy use. 39

A comfortable and healthy indoor climate is obtained through both the design of building envelopes and their installation systems. The development of an energy, waste and water strategy at building level will promote opportunities of achieving sustainability at the urban level. An environmental assessment of buildings should include both internal and external environmental effects on people and on the natural environment.

One of the challenges of urban settlements is to find ways of constructing simple, but functional and healthy, buildings from local, environmentally friendly materials that protect from a climate that is either too hot or too cold. As the buildings must be affordable for poor people, it is often an advantage to promote self building processes based on traditional experience and know-how. The physical environment must possess dignity and poor people must be able to feel proud of their own buildings.

BUILDING DESIGN – POTENTIAL SYNERGIES AND INTERFACES

- The building design of walls, roofs and floors (insulation, space and design of windows etc.) is one of the most important factors for the reduction of energy demand and minimising energy supply needs and operating costs.
- Considerable advantages with regard to microclimate (sun shading, sun exposure, wind exposure, wind protection) and energy demand can be achieved by careful building design in relationship to the surrounding landscape.
- Green roofs are an option for the attenuation of storm water flow and contribute to cooling in summer.

• The buildings and their immediate surroundings should be designed with regard to the source separation and collection of waste, for example by facilitating waste management centres on the ground floors of multi-family housing.
• The entrances of buildings should be easily accessible from bicycle and walking paths and parking lots for bicycles.
• The option to design multi-purpose buildings should be considered in urban areas in order to facilitate mixed use of both housing and small-scale business activities within the service sector. Environmental problems can be solved at building level while social and economic advantages can be achieved at the same time.

**CHECKLIST – SUSTAINABLE BUILDING DESIGN**

- Is the use of environmentally friendly construction materials encouraged when planning design or re-building of buildings?
- Have the most favourable materials for the minimisation of energy demand been considered as insulation material in the walls, roofs and floors and windows of municipal, public, residential and industrial buildings?
- Has the heat exchange option (reuse of heat) been considered in building design?
- Has the solar panel and solar cell option been prepared in the design of buildings?
- Is the building designed for an efficient shading and self-ventilation (when relevant)?
- Are the buildings oriented towards the sun in order to obtain the best possible energy efficiency from solar panels or solar cells?
- Has space for systems for sorting and collecting waste been included in the building design?
- Has a system for collection, minimisation and reuse of storm water been considered in the building design?
- How have options for reducing negative wind effects and sun exposure been considered in connection with renewal or extension of areas for housing, industry and serviced functions?
4.8 Essential synergies between different Subsystems

In this section selected examples of synergies between a number of subsystems will be presented. Many other examples of essential synergies may be developed. In all planning and design situations related to the Sustainable City and town planning, one important task will be to take potential synergies between all these subsystems into consideration.

Conflicts of interest may also exist between different institutional factors, between subsystems and between institutional factors and subsystems. Potential conflicts of interest must always be identified and addressed at the early stages of the review process. The following examples focus on synergies.

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

There is great potential to obtain environmental, economic and social benefits by combining systems for water supply and sanitation, waste and energy. Organic waste from restaurants and grocery shops as well as from households, toilet waste, sludge from septic tanks or wastewater treatment plants and manure from agriculture adjacent to a town, can be utilised for the production of biogas in a biogas reactor. The digested biogas contains methane, which can be used for heating, cooking and electricity production or, after refinement, as fuel for vehicles. Depending on the quality, the residue can be used as fertilizer in agriculture. An alternative technology is the composting of the same waste material. However, this technology requires, rather than generates, energy.

Another interesting possible synergy is the use of compost, treated
wastewater or wastewater sludge for the fertilisation of energy crops which can then be used as fuel for power plants on large, medium or small scale.

Green areas are needed to deal with residual products. Combining conscious landscape planning including water resources with both wastewater treatment and waste management has provided successful ecological solutions. Dumping of waste can be planned and designed into recreational areas. The cleaned water can be used in cultivated areas, allotment gardens or as a stream through the green structure.

In order to identify optimal solutions in a planning situation of this kind it is crucial to create a project organisation based on cooperation with both the public and the private sector – including formal and voluntary/informal organisations. Deep commitment and participation of all parties is required. In order to facilitate operations, and even the further development of the future system, education and training of both experts and residents is important. It is also necessary to guarantee environmental and quality standards.

**Example: Integrated resources management in Pune, India**

In order to prevent the pollution of the Mula-Mutha River, PMC (Pune Municipal Corporation) has constructed four sewage treatment plants alongside the existing Naidu treatment plant. The segregation of dry and wet waste at source and the adoption of a decentralised system of solid waste disposal at ward level have been very successful in Pune.

Solid waste generation has been reduced by up to 750-800 metric tons a day i.e. 60-80 percent of the total waste generated in Pune City. There are 10 decentralised biogas plants within Pune City where bio-degradable waste is digested and processed as a source of small-scale production of electricity and gas for cooking. The role of rag pickers in solid waste management is very important. Daily, 200-250 metric tonnes of dry waste are collected by rag pickers.
Synergies – Planning of public traffic and transportation systems with regard to the location of urban functions such as industry, offices, service functions and housing

Planning for integrated land use for different urban functions should be closely coordinated with the planning of the transportation system in order to reduce the need for, and needs of transportation. It is also a prerequisite for the introduction and development of efficient public transport systems in a town or city. Urban density for different functions has a significant effect on overall transport patterns and in density. By comparing areas with the same level of car ownership per capita, but with different urban densities, transportation intensity decreased in direct proportion to urban density.40

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” meaning the trend of choosing peripheral locations where land is cheap for commerce, offices and housing.41

Advanced IT-models may be used to calculate and present these consequences and to facilitate the discussion on how spatial alternatives should be revised and refined.

**Bus Rapid Transit systems (BRT systems) in Brazil, Colombia and South Africa**

Successful BRT systems developed as part of an integrated land-use and transportation approach have been implemented in Curitiba and Bogota and are the subject of planning in Nelson Mandela Bay Municipality, South Africa.

During the 60s and 70s – a period of rapid urbanisation in Brazil

Curitiba started to implement an urban development process based on integrated land-use and transportation planning. Under the dynamic and visionary mayor Jaime Lerner, a plan was adopted under which future expansion was to take place along linear axes with public transport lines in the centre. A fully integrated route network was designed and is constantly upgraded in which buses of different types fulfill different tasks. The entire system is colour coded: red for express buses, yellow for suburban feeder buses, and green for inter-district buses linking the concentric suburbs. For major trunk lines, bi-articulated buses have been introduced with a capacity of 270 passengers each.

Bus terminals are well developed and serve as community and commercial centres. The “Citizen Streets” project aims at rebuilding the areas round large terminals and providing more services there which further promotes the 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 a day and attracts nearly 2/3 of the population. Curitiba’s buses carry 50 times more passengers than they did 20 years ago. Despite the second highest per capita car ownership rate in Brazil (one car for every three people), Curitiba’s petrol use per capita is 30 percent lower than that of eight comparable Brazilian cities. The public transport system has contributed to the city enjoying the lowest rates of air pollution in Brazil, little congestion and a pleasant and attractive urban environment.42

The Transmilenio Bus Rapid Transit (BRT) system in Bogota is a cost-effective transport solution that serves as a model for other cities. The system features dedicated lanes, large doors to permit speedy passenger boarding and bus stops similar to subway stations. Of 100 people who travel in Bogota 3 go on foot, 4 by bike, 4 by taxi, 14 by Transmilenio, 15 by private vehicle and 60 by other means of public transport. The Transmilenio system connects poor areas with other areas of the city and the BRT system now covers 82 of planned 355 kilometres. Between 1997 and 2005, private car use has dropped from 17 to 12 percent. Bogota also boasts one of the world’s largest dedicated city cycle networks covering 330 kilometres, which is used by 400,000 people.43

A new Integrated Public Transport System in Nelson Mandela Bay Municipality will replace current sprawling competing systems of subsidised buses and non subsidised mini-bus taxies. The system will consist of trunk lines along defined development corridors supported by local feeder buses in suburbs. Buses will be given clear passage by providing dedicated bus lanes and signal priorities.

Also a uniform ticketing system will be introduced for the city to allow multi-transfer journeys on one ticket. Eventually a transport authority will be established with the mandate to govern and monitor operating contracts.

The new public transport organisation is aimed at a system that will provide the citizens with safe, comfortable and affordable services. Full access to workplaces, public and commercial services and social visits will support economic growth and contribute to a sustainable integrated transport system.

Six small buses equal one big bus
Of 100 people who travel today in the city of Nelson Mandela Bay, 33 are pedestrians, 41 go by private vehicle and 26 go by public transport. However, this is the average situation. Travel patterns vary significantly in the city which reflects different socioeconomic situations in the various districts. In a typical township only 10 people go by private car while the majority of 90 people choose either public transport or walking.

In order to support economic growth, it is essential that people are accorded good access to various activities in the city, no matter what their economic situation. It is also of vital importance to the development of a sustainable transport system that people, when their economy improves, still remain faithful to public transport as their primary choice. The system must also be designed to persuade people in economically more wealthy areas to use public transport.
Synergies – Layout of buildings with regard to the microclimate and the surrounding landscape

The well thought-out layout of buildings is an efficient method of optimising opportunities of using solar energy for heating and electricity and minimising the negative impact on energy demand caused by wind exposure. Prerequisites for optimal adaptation of buildings to different sites will benefit from farsighted urban planning, but also from urban governance promoting the development of good relationships between public authorities and private developers, (see Figure 23. South Africa, pilot project).

Integrated planning of buildings, landscape and energy (eco-housing) in Pune, India and Sol Plaatje, South Africa

During the last three decades the population of the city of Pune in India has grown from approximately 900,000 inhabitants to over 3 million. The housing needs of the city have grown proportionately. The rapid increase of urban population (+62 percent in the last decade) has resulted in a rapid growth of slum population in Pune City. Almost 40 percent of the population of the city lives in over 500 slum pockets. In Pune City, 90 percent of the slums are on private land and only 10 percent are on government land.

Pune Municipal Corporation (PMC) has been encouraging the participation of private developers in Slum Redevelopment Schemes (SRSs) and has evolved a win-win formula where slum dwellers are able to get a free house of 225 square feet each. PMC has approved over 31 such schemes and four of them have already been completed.

PMC has also developed new policies to promote eco-housing. The present PMC Commissioner recently launched a voluntary eco-housing certification process for new constructions. The corporation has proposed an eco-housing certification process which comprises a number of steps.

FIGURE 22. Illustration of synergies between building (architecture), landscape and energy.
The developer applies for an eco-housing certificate to the PMC eco-housing cell. The developer can obtain an eco-housing award if the application is verified and if it fulfils the requirements of the eco-housing cell. The corporation has worked out 88 criteria within eight main focus areas; site selection, environmentally-friendly architecture, building materials, energy efficient lighting, solar water heaters, water conservation, segregation of water and others.

Hull Street in Sol Plaatje, South Africa aims at creating a socially and environmentally rich cosmopolitan area, with a real community environment. Add Agenda 21-based ecotech innovations and you have what amounts, in South Africa, to an urban design revolution. Among the key planning objectives were densification to enhance opportunities and lower costs, a green healthy environment with shared spaces for social interaction and urban agriculture, cost-saving and environmentally sound service provision, multi-faceted transport and movement planning.

The entire Hull Street Integrated Housing Project (HSIHP) consists of four phases, with Phase 1 completed early in 2003 and consisting of 331 housing units. The development of the site is of the same standing and importance as the rest of the central area of Sol Plaatje and not to be treated as a peripheral dormitory residential area. A central feature of the HSIHP is the arrangement of higher density houses (compared to urban patterns developed during the last decades) in eco-blocks each of 40-60 semi-detached houses. Each block has a large central garden designed for shared recreation and
urban agriculture, using recycled grey water. Eco-blocks will be man- 
gerated by residents’ committees who will decide on rules, rights and responsibilities.

In old Galeshewe Township, next to Galeshewe Housing Support Centre, a colourful new eco-village has been built as a pilot for the future development of Hull Street. The eco-block concept includes dry sanitation system involving urine diversion and composting of faeces in two containers requiring rotation twice a year. Household grey water passes through sand filter sumps before being collected in a common pond, for irrigating vegetable and other garden plants and fruit trees. Clean energy features such as solar heating panels, PV cells and tower wind chargers have been applied in the buildings as an energy pilot project.44

Integrated master planning of Cities and City Districts

Integrated master planning offers great opportunities of working systematically with the synergies of many subsystems in order to take advantage of environmental, but also social and economic, benefits. Two examples from China, one example from South Africa (municipal level) and two examples from Sweden are presented.

Example 1: Conceptual physical planning for Caofeidian International Eco-City, Tangshan, China

Caofeidian Eco-City project is a focus point of the cooperation between China and Sweden concerning sustainable urban development and environmental technology which builds on agreements between the Ministry of Housing and urban–rural Development of PRC and the Swedish Ministry of Environment and Sustainable Urban Development. The planning also builds on the Agreement of Cooperation signed between the Swedish ministry of Enterprise, energy and Communications and the Tangshan Municipal government. The new eco-city is strategically located in the centre of a potentially strong development band stretching west from Tianjin in the south to Tangshan and east towards Qinhuangdao. The development of southern Tangshan is based on the development of a new international deep harbour and a large industrial area that will demonstrate Close Loop Economy.

Nine major planning features are the basis for planning and design of the Eco-city reflecting the SymbioCity holistic and interdisciplinary approach to sustainable urban development, see Figure 24a and b. The EcoCity has a compact and varied mixed-use structure. Different city structures are interwoven to create an inspiring whole. The urban nodes serve as centres for the city-districts and should be given distinct urban 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 with priority for walking, bicycling and public transportation. The green and blue structure is an integral part of the public space.

There is a shift in character from the north to south, depending on the salinity of the soil. The climate-neutral energy systems are based on achieving the lowest possible energy demand through construc-

44) Sida, 2003, It’s about creating sustainable communities. Ecological Community Housing
tion of energy-efficient buildings and systems. Local renewable power production is based mainly on windmills and waste incineration, with the option of increasing other renewable energy sources such as solar cells and tidal energy.

The ecocycle model includes a proposal for integrated handling of energy, waste and water. One key advantage of this model is the option of using upgraded biogas from wastewater sludge and organic waste as a vehicle fuel. Public awareness and information are combined with user-friendly systems. The city has a general structure that allows rapid or slow expansion but also different ways of varying the subdivision and urban design of individual blocks. The overall orthogonal structure of the EcoCity offers a basis for an infinite variety of urban design and architectural achievements. This integrated urban structure contributes to quality of life, liveability, social security, inclusion and health.

Figure 24a. Bird’s-eye view of the Caofeidian EcoCity – the starting area of 12sqkm – and the Nine Major Themes of Planning. SWECO 2009

Figure 24b. Mixed-use structure of the Caofeidian EcoCity – The Science Node. SWECO 2009
Example 2: Conceptual master plans for a green housing district in Wuhai, China

Applying the Swedish Sustainable City Concept launched by the Swedish government, the proposed conceptual master plan for Wuhai green housing district constitutes a starting point for discussion on how Swedish knowledge, services and products can be utilised within the Sino-Swedish Initiative, see Figure 25. The working procedure elaborated in this manual has been partially applied in the planning process. Sustainability is regarded in a holistic fashion, thus including ecological, economic and social dimensions. In the analysis of external conditions the planning area has been related to its surrounding areas for residential, commercial and governmental purposes.

A SWOT analysis (see p. 30) has been used in order to analyse the internal (site) conditions and to summarise strengths, weaknesses, opportunities and threats for a green River City Binhe District with regard to environmental issues. One important finding is that the prevailing wind is from the Northwest (winter) and South-Southeast (summer) and consequently:

• clean air during winter with low impact caused by emissions from industries and the city
• high content of polluted air during summer, with high impact caused by emissions from industry and the city

Among the key planning issues were adaptation and showing consideration to the preconditions of the sitelaying out the town district efficiently as concerns resources, developing high quality, economic public transportation, integrating greenscape and waterscape and developing an eco-cycle strategy including an energy strategy and an eco-cycle model.

Alternative land-use patterns were developed and evaluated as a basis for a proposal in which urban typology and design, a circulation

FIGURE 25. The Master Plan for Wuhai green housing district including an ecocycle model which will take into consideration the synergies between urban functions, land-use, landscape, energy, waste and water
The advent of integrated development planning has constituted a major watershed for local authorities in South Africa, being regarded by the national legislature as a key to the reorientation and refocusing of the vision and mission of local authorities as they prepare to manage a new development role.

During the 1990s, the concept of integrated planning was adapted in South Africa from strengthening international trends towards holistic and more sustainable development, and was regarded locally as an appropriate method of beginning to address the deficiencies and injustices of apartheid planning. Taking the situation of the poor into consideration is one of the highest priorities in planning.

The Integrated Development Planning process in Buffalo City (the IDP process) was conducted in a unique situation of historical transition and a new, emerging identity for the municipality. The boundaries of the newly established municipality now include a large area characterised by very different features. Two former municipalities (TLCs) have merged into one and other areas which were previously not included in either of them are now part of Buffalo City. The administrative structure is being gradually defined and new functions and roles identified and allocated.

Within an overall sustainability framework, environmental issues have been subject to an environmental analysis including community needs assessment, an overview of environmental factors and key findings. As environmental priority issues, objectives and strategies of overall environmental management, solid waste management and water, soil and air pollution were identified. As part of the integrated development plan proposal, an environmental development framework was developed including short term and long term objectives, strategies, programmes and projects.

Example 3: Integrated Development Plan – Buffalo City Municipality

The Buffalo City IDP – a spatial development framework which is of overall importance to most environmental measures discussed in the plan.
Hammarby Sjöstad is the first city district labelled as an environmental profile area in Stockholm. The experiences from Hammarby will be utilised and refined in the development of the Royal Seaport Area and Liljeholmen which are the other two city district with a specific environmental profile. The area’s location as a natural continuation of the Stockholm inner city has shaped the infrastructure, urban planning and design of the buildings. An old, heavily polluted industrial and harbour neighbourhood has been regenerated into a sustainable city district. Once fully built in year 2017 Hammarby Sjöstad will have about 11,000 residential units for just over 25,000 people and about 10,000 work places.

An environmental programme was drawn up for the city district with the aim of halving the total environmental impact in comparison with a district built in the early 1990s. The strict environmental requirements demanded completely new urban and environmental solutions. The work has been conducted on an interdisciplinary basis, thereby substantially accelerating the decision-making process and enabling the project to run smoothly. The integrated approach on planning permeates all planning phases from comprehensive to detailed planning. The city district is characterised by a unique combination of a modern, semi-open, block-based structure and a closed, traditional inner city character.

Traffic and services including both light-rail (Tvärbanan) and BRT-buses are concentrated along a 3km avenue linking Hammarby sjöstad together. Public transport covers 75-80 percent of the residents and workers’ journeys on peak hours. Parks, quays and walkways in different styles have been laid out within and around Hammarby Sjö.

Hammarby sjöstad has its own Eco-Cycle, the Hammarby model, which outlines integrated environmental solutions for waste, energy, water & sewage with strong linkage to urban space, landscape and transportation. Hammarby sjöstad has been an important source of inspiration for the development of the SymbioCity concept.
FIGURES 27. Hammarby Sjöstad in Stockholm
SOURCE: THE CITY OF STOCKHOLM AND SWECO
The Western Harbour has in a couple of decades transformed itself from being an industrial park into an area for knowledge and sustainable living and working. The aim is for the district to be an internationally leading example of a densely built urban environment. It will also be a driving force in Malmö’s development towards economic, social and environmental sustainability. The vision for the western harbour is to create a national and international example of sustainable urban development and complete urban quarter comprising work and study facilities, services and housing- an urban area which stimulates the transition into the knowledge city.

The western part of the western harbour was developed in connection with the Bo 01 European Housing Exhibition organised in the summer of 2001. In many ways, Bo 01, has set the the standard for the whole of the western harbour area with its quality programme, high quality standards for public areas and large variety of developers. The eco-cycle systems in Bo 01 is characterised by minimization of waste, recycling and reuse as well as utilization of energy from waste and waste water sludge. In the area two parallel systems for utilization of food waste, vacuum transportation of waste and waste grinders are tested and evaluated.

A unique concept based on 100 percent locally produced renewable energy has been developed based on wind power, solar energy and heat pumps extracting heat from the sea and an aquifer. These energy production units are linked to the district heating and cooling system of the city. During some periods of the year energy is delivered from the large system and during other periods energy may be delivered to the large system resulting in 100 percent renewable energy on a yearly basis.

The Bo 01 area is a carfree area, bicyclists and pedestrians have priority, and the residents are encouraged to choose environmental friendly transportation modes. The bus line serving the area links it to the most important urban nodes of Malmö.
FIGURES 28. Western Harbour, Bo 01 exhibition area in Malmö
SOURCE: THE CITY OF STOCKHOLM AND SWECO
5. Part 3: Institutional Factors
5.1 Overview of institutional factors
Well-functioning institutions are crucial to the improvement of the urban environment and include a wide range of aspects: legislation and its implementation, knowledge, capacity and decision-making power in relevant authorities, organisational structures, communication and coordination between different actors, transparency, participation of a wide range of stakeholders in assessing priorities and ensuring accountability and many others.

In order to achieve sustainable solutions it is important to combine different institutional factors with action within several subsystems. Institutional arrangements often have crucial importance to achieving synergies between different technical subsystems. One tangible example is the difficulty in requiring industry to decrease emissions if there is no legislation that demands emission reduction or if the risk of fines is minimal and an emission permit can easily be “acquired”.

5.2 Urban governance and capacity building
Good urban governance is extremely important as it embraces the management and administration of financial, economic, technical, organisational, human and other resources which are necessary for the improvement of the urban environment by urban planning in combination with several subsystems. Good governance according to the World Bank means: “Predictable, open and enlightened policy making, a bureaucracy imbued with professional ethos acting for the public good, the rule of law, transparent processes, and a strong civil society participating in public affairs”.

One critical issue is the capacity and responsibility of local authorities to take decisions on sustainable urban development. Management of resources should be located as close as possible to the people for whom they are intended. The empowerment of local authorities must be adapted according to their size, capacity, the situation in the country and the situation of the poor within the country.

Capacity building for the development of well-functioning, strong institutions should be promoted and considered a continuous process on all levels. It is an important prerequisite for good governance. The institutional structure should preferably be developed in order to encourage multi-disciplinary collaboration instead of sector organisations with strong barriers between them. There should be incentives to encourage working with an integrated approach on both small and large-scale urban development activities and projects. In order for this to happen, a strong political will and leadership from the top management of the municipality is essential. Consensus among stakeholders should also be aimed at, both between municipalities (intermunicipal) and within them (intramunicipal), as well as between the public and private sectors.

Self-governance means that the administration, management and decision-making on urban development and urban environmental issues are, to a certain extent, decentralised to local areas, for example to a town-district. In some cases and for certain issues it may also be favourable to decentralize decisions from national or regional level to the municipal level.

Increased local self-governance requires the strengthening of
institutional capacity and technical support, as well as improved information for citizens, professional audits and a national system for monitoring municipal performance. The necessary financial resources, within the control of the municipality, are also essential, as discussed further below.

The development and the enhancement of democratic institutions is a prerequisite for the opportunities of involving local society and the groups concerned in urban planning and environmental improvement.

Checklist:

- How is the local authority organised with respect to urban planning and urban environmental issues?
- How is the work regarding urban planning and urban environment executed? In a multi-disciplinary manner or does the sector approach dominate?
- What responsibility for activities regarding planning and environmental issues does the local authority bear?
- How decentralised/centralised is decision-making regarding urban planning and urban environmental issues?
- What capacity does local administration possess as concerns developing standards and programmes for environmental improvement in a short term, medium term and long term perspective?
- What institutions are there for self-governance for the poor in urban settlements? Do these also embrace environmental activities?
- What systems are there for monitoring of municipal performance regarding the environment – including in 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 risk constituting a killer factor for an integrated approach?
- Are there built-in obstacles that can constrain action? 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?

45) Tannerfeldt and Ljung (2006)
5.3 Legislation and policies
Legislation and policies regarding the urban environment are powerful tools for enforcing improvements for the urban poor and other inhabitants. Overall objectives integrated into legislation and policies regarding the urban environment on national and regional level should be the starting-point for the formulation of planning and building codes and regulations on the local level.

Checklist
- What policies and objectives regarding environmental improvement are in place on the national and regional level that offer support to local activities for the improvement of the environment?
- What local regulations exist for urban planning and urban environment, including local objectives, indicators and targets? How are these local regulations (ordinances and decrees) established? Are they consistent with national legislation? Are they implemented? Can national and regional objectives easily be translated to the local context or do different kinds of obstacles exist?
- Has the local level identified situations where the national legislative framework etc. creates obstacles for the efficient management of the urban environment?
- Are the policies, regulatory and legal frameworks sufficient to safeguard long-term sustainability even for poor people? What evidence is there that policies and regulations are actually implemented?
- Does the municipality have a local environmental plan? Is it implemented?

5.4 Financial resources and incentives
Financing of public infrastructure
Arranging proper financing is an essential requirement for planning and implementation of urban environmental measures. Expert advice should be contracted from the beginning of the process in order to provide a comprehensive and objective overview of the financial requirements, as well as funding and risk capacity available, and to mobilise the best possible combinations of different financing resources and develop a financing plan. In doing so, it is important to bear in mind several limiting factors for municipalities and other actors involved, as is further described below.

Financing plans should, for example, include:
- long term availability of water and electricity
- the development of functioning housing finance services, including savings and micro-finance institutions for the poor
- more efficient land and housing markets and a supply of land for future urban growth, as well as a more efficient ways of utilising already exploited urban areas
- major and minor infrastructure investments

In most developing countries, municipalities account for only a small
share of public expenditure. Furthermore, borrowing may be restricted and municipal budgets often need to be approved by central government. The limited resources available are often used for recurrent 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 underinvestment. Modern, sustainable approaches to financing aim to leverage capital based on municipal utility balance sheets.

Tariff construction is an inherently difficult area since distributional and efficiency goals tend to pull in different directions. From a distributional, at least from a pro-poor viewpoint, a progressive tariff would be preferable; however this happens to be the tariff that is the farthest away from an efficient tariff construction. The most efficient tariff would follow the structure of marginal costs which implies that major consumers – who cost less – should pay less.

The progressive tariff tends to 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. This further weakens the finances of the supply company.

One argument against the progressive tariff is that it is better “to subsidise the poor, e.g. by subsidising connections, instead of subsidising services”. Whichever way the city chooses to go, it is important that decisions, in this field too, are transparent, that consequences are known, and that the effects on disadvantaged groups are recognised and mitigated. Traditional urban infrastructure financing comes from central budgets, where towns receive subsidies and/or credits from governments or financial institutions based on sovereign guarantees. Projects are often implemented by parastatal organisations or separate units, leaving towns without clear duties to service debts or maintain assets.

Consequently it is necessary to clarify roles and responsibilities. Local authorities must be able to develop and maintain infrastructure and to ensure that the needs of the urban poor are taken into account in budgets and investment plans. Having access to affordable long-term debt, working capital and equity finance is critical to the enabling of municipal investments. This requires sound public investment planning, policies and regulatory framework, as well as local management and project implementation capacity. As financial and economic resources are scarce and unevenly distributed in developing countries, it is extraordinarily important to optimise the use of resources by strengthening links between local and central instruments of control. There is a further category of service that needs to be organised and priced, not only to cover local costs but to avoid regional or global externalities. Striking examples are from the energy sector where buildings, roads and cities need to be planned to minimise transports and other forms of energy use. This policy needs to go hand in hand with (high level) taxation of household electricity and transportation fuels.
Housing finance for the poor

Microfinance has, in many countries, gained considerable recognition and has increasingly developed into a mature and sustainable industry, although the regulatory framework is often unsatisfactory. However, housing microfinance – including housing improvements and investments in communal goods, e.g. for the environment – has not reached the same status. In some countries regulations state that microfinance by definition may only be used for income generating purposes and micro, small and medium enterprises, while housing microfinance is granted under exceptional circumstances or, implicitly, by the clients using their income generating or consumer loan for their housing needs.

Some other challenges to housing microfinance are general weak property rights enforcement and/or lack of such rights for the individual, 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) which all reduce incentive to repay.

While some of these are specific to housing microfinance, many are also present in normal microfinance. Another aspect of housing microfinance is its relationship to subsidy schemes by governments or others. Many governments, understandably, wish to subsidise housing for the poorer strata of the population.

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

As for microfinance 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.

Likewise, the role of donors in housing microfinance is, in many ways, similar to their role in relationship to microfinance in general, and can be guided by good business practice. Consequently, donors should focus on backing up governments in their macro role, supporting promising financial institutions with institutional strengthening and moving towards financial sustainability, contributing to the establishment of refinancing mechanisms that can provide medium-term funds for financial institutions (e.g. by providing loan guarantee funds).

Checklist

- 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

46) Or the wider concept “housing finance for the poor”. 
(including debt service, 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 affordability been considered when setting tariffs, e.g. by consultations with the public?
- Is the city eligible for international trading? If not, how are investments made?
- What financing possibilities are available for the poor with regard to housing, environmental improvements and small-scale integrated environmental solutions? Are these schemes sustainable?

5.5 Spatial planning and land management

Spatial planning is closely interconnected with systems for governance. Spatial planning can be defined as the spatial coordination of all types of land use for both urban and rural areas. When dealing with the urban areas, planning activities can be labelled as urban planning. However, in sustainable urban development, the interplay between urban and rural areas is so important that spatial planning has been chosen as the main term to be utilised in this document.

The implementation of spatial planning should be organised as part of local authority management. This is a way to strengthen planning as a tool for coordination of land-use, traffic, infrastructure, green areas and urban functions. Urban planning should be executed closely related to rural planning in order to promote interplay between urban and rural areas. Planning should thus promote the reception and conversion of residual products from industry, housing and service functions in a city or town. These resources should be converted into valuable resources for fertilisation of agricultural production, extraction of biogas etc.

Planning can also be used as a framework for developing synergies between different subsystems and activities. Planning also possesses the potential to act as a platform for an integrated systems approach, focusing on both the physical and social environments. Planning
should not only be considered as a technique for coordination; one prerequisite for good results is that different stakeholders in the local authority are involved and encouraged to work in a multidisciplinary manner. Another prerequisite for success is the involvement of the citizens in all phases of the planning process. A participatory approach should be intertwined with planning activities. Municipal environmental activities should be conducted with Local Agenda 21 as a point of departure. Furthermore, spatial/urban planning can be a tool for coordinating different stakeholders, interests and factors in the development process, in combination with a public consultation process and transparent decision making and governance. Good examples of this are the IDP processes in South Africa or the comprehensive planning processes in Swedish municipalities.

Systems for land management should be developed in direct relationship with urban planning. As stated by Tannerfeldt and Ljung, “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”.

The increase in land value thanks to urban expansion could cover at least part of subsidies to the poor, including integrated environmental measures linked to an urban pattern which is favourable for the environment in both a short term and a long term perspective.

Checklist

- What systems exist for planning on different levels or geographical areas of the community – for example the municipal level (comprehensive plans), town district level (profound comprehensive plans) and area/block level (detailed development plans)?
- How are environmental issues considered in strategic or detailed planning for example in studies, formulation of objectives, planning proposals or in environmental assessments of plans?
- To what extent are synergies or conflicts between different environmental issues discussed in planning activities or documents?
- Which methods and tools are applied for presentation and documentation of plans in a graphical, 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?
- Which systems are there on local level for land management related to urban plans?
- To what extent is affordable land for housing, industry and service functions available to the poor?
- What opportunities do poor women and men have in influencing decisions on the localisation of urban functions of relevance to them?

47) Tannerfeldt & Ljung page 97-98.
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 are the main features of such strategies?

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

What opportunities do poor women and men have to influence decisions on the localisation of urban functions of relevance to them?

5.6 Private sector participation

In order to achieve sustainability in connection with both new and existing cities and towns it is important to develop continuous cooperation between planning authorities and private enterprises. There should be incentives for small business units within different kinds of town district to become involved in the small-scale transformation of urban areas. At the same time, top competence in different fields of
consultancy as well as manufacturing companies with innovative, sustainable products should be involved in large-scale projects, for example regarding new infrastructure.

It is important to develop forms of cooperation that absolutely guarantee democratic regulation. A multi-stakeholder dialogue includes meaningful discussions and cooperation between the public and private sectors as well as NGOs. Private sector involvement in service provision ranges from multinational water companies managing water and sanitation facilities in the developing world to city dwellers earning a living from recycling waste in different ways.48

Checklist

- Is there a formalised or informal collaboration or coordination between the local authority and private stakeholders in connection with urban and environmental issues? What is the nature of such collaboration or coordination?
- Do the country and city allow private-public partnerships in the field of public infrastructure (energy, water, distribution etc)?
- What are the options for the development of purchasing systems focused on urban environmental issues and business? 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 private companies, cooperatives or community-based organisations?

5.7 Public participation

Achieving public involvement and participation in efforts to improve the environment is crucial for both short term and long term success. It is important to inform the residents in an area in the early phases of the planning process, and to establish mechanisms for taking their needs and preferences into account in the planning, implementation and follow-up of measures. While it is often not practically feasible to expect involvement from everybody in every step of the activities, there are usually representative bodies in informal settlements which can be consulted.

Strengthening civil society’s role in environmental management requires improved governance not only in terms of participatory decision-making processes and methods of judicial appeal as well as methods of judicial public appeal, but also in terms of access to good quality environmental information and statistics, as described in Section 5.9. Mass media are especially important for awareness creation, public debate and dissemination of information.

One way of achieving broad involvement is to establish an information space, centrally located in the area concerned. In this space problem diagnosis, requirements, alternative proposals and impact assessments can be exhibited in all their stages and discussed with residents and other stakeholders continuously during the process.

48) Experience from public-private partnerships within this field is discussed in Tannerfeldt & Ljung, page 115 – 122.
Open houses can be arranged as well as workshops on specific topics.

Checklist

- How have the options for public participation been included in environmental management plans and governance strategies for the city?
- To what extent have the possibilities of arranging spaces for information, presentation, discussion and workshops been considered in the areas where environmental improvements are planned?
- Have tangible and well-thought-out plans for public involvement been presented and discussed among politicians, civil servants and NGOs?
- What opportunities are provided for the public to express opinions and/or influence investments that have positive or negative impact on the environment?

5.8 Transparency and accountability

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

Transparency is also a crucial factor for the reduction of fraudulent use of public finances. Poorly functioning public systems and environment infrastructure is not always the result of lack of natural resources, such as water, lack of finances or lack of human resources. Patronage, nepotism, petty and grand corruption are contributing factors to environmental and health problems in poor countries. The World Bank estimates, for example, that between 20 and 40 percent of water sector finances are lost through corrupt or fraudulent practices. Corruption in relationship to public procurement leads to increased transaction costs. The OECD reports that bribery occurs in every other public procurement process.49

Corruption will typically generate problems such as increased investments cost and choice of second-best technologies, cover-up of emissions from industries and other sources, excessive abstraction of water for industry and agriculture, illegal dumping and use of hazardous and other waste. Where corruption exists it will also, in itself, create problems for transparency of procurement and decisions. Powerful individuals have a vested interest in avoiding publicity and openness.

Checklist

- What formal systems are there for auditing and control of management 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?
- Can the project/review connect to ongoing national initiatives on the fight against corruption?
- Are functions and systems in place for transparent public pro-

49) Stockholm International Water Institute, SIWI, Corruption in the Water Sector
Are there institutional or social structures or traditions that impede transparency, such as patronage and “buying” of votes in exchange for certain investments?

5.9 Public awareness

Dissemination of information is of basic importance to the increase in public awareness regarding urban and environmental issues. The development of learning programmes is especially important for the future, programmes that include not only technical knowledge on specific aspects, but also on the holistic and integrated system approach.

Checklist

- What vision, strategies and methods do the local authorities employ for public awareness raising?
- What local institutions are there for information dissemination and training in basic knowledge on environmental and urban issues?
- Which options are there for involving experts with higher education in programmes for the improvement of the urban environmental situation?
- Which options are there to develop training and education regarding different subsystems and capacity building, respectively, with an integrated systems approach?
6. References
and suggestions
for further reading


Perspectives on urban governance. Government Offices of Sweden Sida and the National Board of housing and Planning.


Larsson, S & Tyrstrup, O (2007) Sustainable Community Planning GUIDE.

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Ranhagen, U. (2002) *Sustainable City – A Swedish Partnership Initiative.* Stockholm 2002 (This presentation from WSSD in Johannesburg and other presentations are available on www.sweco.se/suci)


Sida (2003) *It's about creating sustainable communities. Ecological Community Housing*


Sida (2006) *Sustainable Energy Services for Poverty Reduction (Policy)*


Sida (2003) *It's about creating sustainable communities. Ecological Community Housing*


**Internet**
Hammarby sjöstad: www.hammarbysjostad.se

Swedish Environmental Protection Agency: www.environ.se

Sida: www.sida.se

United Nations Human Settlements Programme publications can be obtained from UN-Habitat Regional and Information Offices or directly from website: www.unhabitat.org
7. Appendices
Appendix 1. Working charts

Working chart 1.

<table>
<thead>
<tr>
<th>Environmental problems</th>
<th>Scale for classification of magnitude of problems</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Hazardous on brief exposure</td>
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<tr>
<td>CLIMATE IMPACT</td>
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<tr>
<td>NATURAL RISKS</td>
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<td>ARTIFICIAL RISKS</td>
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<td>TRAFFIC CONGESTION</td>
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<td>AIR POLLUTION</td>
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<td>NOISE</td>
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<td>WATER ENVIRONMENT</td>
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<tr>
<td>LAND CONTAMINATION</td>
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<tr>
<td>HAZARDOUS MATERIAL AND WASTE</td>
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<tr>
<td>DESTRUCTION OF NATURAL and CULTURAL ENVIRONMENT</td>
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</table>
# Working chart 2.

<table>
<thead>
<tr>
<th>Environmental problems</th>
<th>Scale for classification of magnitude of problems</th>
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<tbody>
<tr>
<td></td>
<td>Consequences of problems (especially health effects)</td>
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<tr>
<td>CLIMATE IMPACT</td>
<td></td>
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<tr>
<td>NATURAL RISKS</td>
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<td>ARTIFICIAL RISKS</td>
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<td>TRAFFIC CONGESTION</td>
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<td>HAZARDOUS MATERIAL AND WASTE</td>
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<td>DESTRUCTION OF NATURAL and CULTURAL ENVIRONMENT</td>
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</tbody>
</table>
Working chart 3.

<table>
<thead>
<tr>
<th></th>
<th>Urban functions, planning and management</th>
<th>Traffic and transportation planning and management</th>
<th>Energy planning and management</th>
<th>Waste planning and management</th>
<th>Water planning and management</th>
<th>Landscape planning and management</th>
<th>Building planning and management</th>
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</thead>
<tbody>
<tr>
<td>Climate change</td>
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<tr>
<td>Natural risks</td>
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<tr>
<td>Artificial risks</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Traffic congestion</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Air pollution from industry and traffic</td>
<td>interme-</td>
<td>strong</td>
<td>strong</td>
<td>low</td>
<td>interme-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of green areas and biodiversity</td>
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<tr>
<td>Contamination of land and water</td>
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</tbody>
</table>

Working chart for analysis of the sources of environmental problems by relating specific environmental problems to different subsystems. The relationship may be expressed on a scale of 5 or 3 steps for example strong, intermediate or low. Text and notations can be written in the boxes. A SWOT analysis may also be applied to each relationship.
Working chart 4.

<table>
<thead>
<tr>
<th></th>
<th>Urban governance</th>
<th>Urban planning</th>
<th>Land management</th>
<th>Legislation and policies</th>
<th>Financial resources</th>
<th>Education and training</th>
<th>Private sector participation</th>
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</thead>
<tbody>
<tr>
<td>Climate change</td>
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<tr>
<td>Artificial risks</td>
<td>T2</td>
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<tr>
<td>Natural risks</td>
<td>T1</td>
<td>T3</td>
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<tr>
<td>Mobility</td>
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<td></td>
<td></td>
<td>T5</td>
</tr>
<tr>
<td>Outdoor environment (air pollution, noise, etc)</td>
<td>O1</td>
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<tr>
<td>Aquatic environment</td>
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<td></td>
<td></td>
<td>T4</td>
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<tr>
<td>Land contamination</td>
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<td></td>
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<tr>
<td>Natural and cultural environment</td>
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<tr>
<td>Hazardous material</td>
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</tbody>
</table>

Working chart for analysis of the institutional causes of environmental problems by relating specific environmental problems to different institutional arrangements. The relationship may be expressed on a scale of 5 or 3 steps for example strong, intermediate or low. Text and notations can be written in the boxes. A SWOT analysis may also be applied to each relationship. T1, T2 etc. = potential threats, O1 etc. = potential opportunities.

Examples:

T1 Natural risks have not been given priority in the administration of a city.
T2 An urban area is divided into a large number of plots owned by different people. The overall land management of the entire area is very poor. Some of these owners run industrial activities with risk of explosion and fire which can easily spread to adjacent housing areas.
Working chart 5.

<table>
<thead>
<tr>
<th>Urban functions</th>
<th>Urban governance</th>
<th>Urban planning</th>
<th>Land management</th>
<th>Legislation and policies</th>
<th>Financial resources</th>
<th>Education and training</th>
<th>Private sector participation</th>
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<tbody>
<tr>
<td>Traffic and transportation</td>
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<tr>
<td>Energy</td>
<td>T1</td>
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<td>T3</td>
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<tr>
<td>Waste</td>
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<td>T5</td>
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<tr>
<td>Water</td>
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<td>O1</td>
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<tr>
<td>Landscape</td>
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<td>T4</td>
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<tr>
<td>Buildings</td>
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</tbody>
</table>

Working chart for the analysis of relationships between sources of environmental problems and institutional causes of environmental problems. The relationship may be expressed on a scale of 5 or 3 steps for example strong, intermediate or low. Text and notations can be written in the boxes. A SWOT analysis may also be applied to each relationship. T1, T2 etc. = potential threats, O1 etc = potential opportunities.

Example:
T1) Energy production based on coal is the source of immense air pollution in an urban area. In spite of considerable knowledge of the air pollution caused by this energy system, the local administration has not initiated any solutions for reducing pollution from coal-fired plants.
Working chart 6.

<table>
<thead>
<tr>
<th>Main objectives</th>
<th>Sub-objectives</th>
<th>Targets/indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced CLIMATE IMPACT</td>
<td></td>
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<tr>
<td>Reduced consequences of NATURAL RISKS</td>
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<tr>
<td>Reduced consequences of ARTIFICIAL RISKS</td>
<td></td>
<td></td>
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<tr>
<td>Resource-conserving and environmentally-friendly MOBILITY</td>
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<tr>
<td>Improved AIR QUALITY</td>
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<tr>
<td>Reduced NOISE LEVELS</td>
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</tr>
<tr>
<td>Improved WATER ENVIRONMENT</td>
<td></td>
<td></td>
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<tr>
<td>Reduction and prevention of LAND CONTAMINATION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmentally friendly and resource-conserving manner of using MATERIALS and other RESOURCES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection of the NATURAL and CULTURAL environment in an urban context</td>
<td></td>
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</tr>
</tbody>
</table>

This is one possible way of formulation of main objectives – there is, however, a number of ways of expressing objectives, sub-objectives, targets and criteria. The important thing is to encourage that this type of overall formulation of objectives be included in every project and proposal.
Analysis of relationships and synergies between different subsystems. A SWOT analysis may be applied to each relationship. For each linkage between two fields of action, synergies may be characterised as strong, intermediate or low.
### Working chart 8.

<table>
<thead>
<tr>
<th>Alternatives</th>
<th>Objectives</th>
<th>Impact analysis with regard to main objectives/sub-objectives and targets respectively other objectives/sub-objectives and targets</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Main objectives</td>
<td>Other objectives</td>
</tr>
<tr>
<td></td>
<td>Sub-objectives</td>
<td>Sub-objectives</td>
</tr>
<tr>
<td></td>
<td>Targets</td>
<td>Targets</td>
</tr>
<tr>
<td>ALT 1</td>
<td>Reduced CLIMATE IMPACT</td>
<td></td>
</tr>
<tr>
<td>ALT 2</td>
<td>Reduced consequences of NATURAL RISKS</td>
<td></td>
</tr>
<tr>
<td>ALT 3</td>
<td>Reduced consequences of ARTIFICIAL RISKS</td>
<td></td>
</tr>
<tr>
<td>ALT 4</td>
<td>Resource-conserving and environmentally-friendly MOBILITY</td>
<td></td>
</tr>
<tr>
<td>ALT 5</td>
<td>Improved AIR QUALITY</td>
<td></td>
</tr>
<tr>
<td>ALT 6</td>
<td>Reduced NOISE LEVELS</td>
<td></td>
</tr>
<tr>
<td>ALT 7</td>
<td>Improved WATER ENVIRONMENT</td>
<td></td>
</tr>
<tr>
<td>ALT 8</td>
<td>Reduction and prevention of LAND CONTAMINATION</td>
<td></td>
</tr>
<tr>
<td>ALT 9</td>
<td>Environmentally friendly and resource-conserving manner of using MATERIALS and other RESOURCES</td>
<td></td>
</tr>
<tr>
<td>ALT 10</td>
<td>Protection of the NATURAL and CULTURAL environment in an urban context</td>
<td></td>
</tr>
<tr>
<td>ALT 11</td>
<td>A SOCIALLY cohesive community</td>
<td></td>
</tr>
<tr>
<td>ALT 12</td>
<td>ECONOMICALLY favourable solutions</td>
<td></td>
</tr>
</tbody>
</table>

**Good** = completely fulfils the objectives  
**Acceptable** = partially fulfils the objectives  
**Bad** = does not fulfil the objectives
Working charts for discussion of the implementation of solutions in the short term, medium term and long term perspective (working charts 9 and 10)

### Working chart 9.

<table>
<thead>
<tr>
<th>Urban functions</th>
<th>Traffic and transport-ation</th>
<th>Energy</th>
<th>Waste</th>
<th>Water</th>
<th>Landscape</th>
<th>Building</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Short term</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Medium term</strong></td>
<td></td>
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<td></td>
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<tr>
<td><strong>Long term</strong></td>
<td></td>
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</tr>
</tbody>
</table>

Working Chart 9. for analysis of institutional arrangements with regard to opportunities to implement improvements in the short term, medium term and long term perspective.

### Working chart 10.

<table>
<thead>
<tr>
<th>Urban governance</th>
<th>Urban planning</th>
<th>Land Management</th>
<th>Legislation and policies</th>
<th>Financial resources</th>
<th>Education and training</th>
<th>Private sector participation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Short term</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Medium term</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Long term</strong></td>
<td></td>
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</tbody>
</table>
Appendix 2. Multi Criteria Analysis

Multi-criteria Analysis (MCA) is the tool chosen for the evaluation process. MCA is a tool which is convenient for the assessment of the quality of a certain aspect or indicator. MCA may also be used in order to compare several alternatives based on an assessment of their qualities. It is proposed that the evaluation be carried out in three phases:

In the **first phase** the evaluator obtains an overview of the current alternatives making her/himself acquainted with the proposals, focusing on the overall features and specific characteristics of each proposal.

In the **second phase** the qualities of each alternative with respect to sub-aspects and related indicators within each main aspect are assessed. The following assessment scale is proposed:

- **4 = Excellent**
- **3 = Very good**
- **2 = Good**
- **1 = Acceptable**
- **0 = Not acceptable**

If a sub-aspect is found to be irrelevant to the choice between alternatives, it will be removed from the list.

In the **third phase** the sub-aspects within each main aspect are ranked according to their relative importance. 100 marks are distributed between the sub-aspects in order to reflect the relative weight of each. It is allowed to use extreme values (for example 0 or 100 for a sub-aspect).

In the **fourth phase** the main aspects are considered and ranked according to their relative importance. In the same manner as for the sub-aspects, 100 marks will be distributed between the main aspects in order to reflect the relative weight of each. Also in this process it is allowed to use extreme values for example 0 or 100 marks for an aspect.

In the **fifth phase** calculations will be carried out in which the sum of the assessed qualities for each alternative without weights respectively with the proposed weights is calculated. Diagrams showing the relative difference between the alternatives with weights respectively without weights will be produced.

In the **sixth phase** the result is discussed and critical observations may be made with regard to certain aspects. As many qualitative aspects are assessed using numbers, it is very important to carry out a robustness analysis which means analysing the importance of the proposed weights. The extent to which a certain weight must be changed in order to change the resulting order of precedence among the alternatives is studied.
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