The SymbioCity Approach

SUMMARY

Conceptual framework for support to sustainable urban development in low and middle income countries
The urban crisis and its solutions

Since the beginning of this century the majority of the world’s six billion people have lived in cities. World population may rise from the current 6 to 9 billion people by 2050 and some scenarios predict that 60% of this population will live in cities by 2030. This urbanisation trend is especially apparent in developing countries or countries in rapid transition.

Urbanisation is inherent in economic and cultural development and the trends are universal. Life chances and economic opportunities are often better in cities, even for many of the poor and disadvantaged. In spite of all real and potential opportunities that urbanisation offers, the common impression has been that the problems related to urbanisation dominate. Perceived opportunities are seldom realised and this is especially evident in cities in the developing world.

How urban growth is managed has enormous implications for whether the potentially disastrous impact of climate change can be avoided. A number of environmental problems – most of them related to climate change – must be dealt with in cities, problems such as natural and man-made hazards, traffic congestion, traffic deaths and injuries, air pollution from industry and traffic, lack of green areas and biological diversity, waste problems, water and sanitation problems. Energy supply based on fossil fuels and low energy efficiency in buildings is often a major cause of environmental problems as CO2 emissions and other kinds of air pollution contribute to climate change.

All these problems contribute to the urban health crisis. Hand in hand with urbanisation have come parasites such as tapeworm, roundworm etc. that previously were usually confined to rural areas. The growth of the population in many cities is strongly interrelated with a deteriorating environment and a wide spectrum of health hazards.

Urban problems have many sources and causes: rapid growth in population and area which is not met by corresponding investments in services, insufficient technology in industry, transport increasing in volume and not environmentally adapted, insufficient sewage systems causing direct emissions of waste water from industry and households into rivers and onto land, unsatisfactory waste management etc.

This large-scale urban growth – especially in some areas of Asia and Africa – brings a pressing need for more holistic planning and governance of city development, including environmental system solutions. There is also an urgent need for improved management and operations of municipal technical infrastructure. These problems formed the background of the Swedish initiative and presentation of the Sustainable City concept by the representatives of the Swedish Government and the Swedish Trade Council at the WSSD in Johannesburg in 2002.

Sida believes that the Sustainable City concept may form a starting point for further development of methods and tools concerning sustainable urban development in developing and transition countries, paying special attention to the conditions and needs of poor women, men, girls and boys.
One important factor behind this Sida initiative is the option to mobilise the Swedish resource base to contribute to integrated solutions in close collaboration with the local resource base. A number of stakeholders should be involved in the processes such as municipalities, other public authorities at national, regional and local level, institutes, universities, companies and the extensive networks concerning all these stakeholders.

Purpose of the conceptual framework
This publication on sustainable urban development has its main focus on the urban physical environment. Social, economic and institutional issues are included to an extent but need to be subject to further studies. The primary purpose of the manual is to serve as a basis for dialogue with cooperation partners regarding sustainable urban development aimed at practical and integrated solutions as well as at environmental system solutions with links to social and economic aspects.

The manual is intended to be useful as a tool for reviewing cities' environmental situation in a systematic and multidisciplinary manner. By applying this proposed holistic approach to environmentally sustainable development, a number of benefits for cities and their residents can be achieved such as:

- An overview of the city's environmental situation including key issues and objectives for future improvement.
- Win-win situations created by working with integrated planning of different subsystems such as energy, water and waste.
- A strategy for short term, medium term and long term improvement of the environment related to both the economic and social dimensions.

How to use the conceptual framework
There are three entry points to the conceptual framework:
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 and 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 concrete solution or project proposal on the table. A successive widening 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 approach is often necessary as it is usually extremely difficult to remove institutional barriers for a multidisciplinary approach in a short term perspective. By working this way, the mindset of decision-makers may successively shift in order to embrace the multi-disciplinary approach.

In both types of approaches the sustainability review may be supported by systematic working procedure, combined with information from Part 2 (sub systems) and Part 3 (institutional factors).
This manual is based on a conceptual model for urban development in developing countries.

One important characteristic of the model is a holistic, integrated and multi-disciplinary approach. The model is an attempt to grasp the complexity of the process and to make it possible to handle a number of issues and relationships of relevance to sustainable urban development (Figure 3). This is necessary if potential synergies between different subsystems are to be utilised and the likely conflicts between different issues are to be avoided or managed in a constructive fashion. A sectoral approach should be replaced by a multi-disciplinary approach in order to succeed in solving combined problems. Incentives should be developed to promote and facilitate such integrated approaches.

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 (Figure 5) also forms an important part of the model.\footnote{It is, of course, possible to develop guidelines focusing on social and/or economic factors with the same basic approach and philosophy as is applied here to the environmental field.}

As this manual has a special focus on the urban physical environment, a more detailed conceptual model has been developed focusing on the environment.
FIGURE 5. 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.

Part 1. Working procedure

The working procedure includes a number of steps for preparing a sustainability review of a city/town, a city district/town district or other urban area, in a systematic manner.

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 described in the working procedure can also be used for the analysis and evaluation of projects and proposals from Sida cooperation partners, as well as for dialogue with partners and other stakeholders concerning 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 levels. 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, possible impacts
Step 6 Choose a strategy for implementation and follow-up

The sustainability review, or the project, is intended to be developed and/or scrutinised in three loops. In the first loop there is a focus on steps 1–2 above, but overall objectives and preliminary proposals for the 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 be considered.

By putting forward alternative proposals for the improvement of the environment as early as during the first project loop, a clearer picture of the relevant factors and aspects that need to be considered in more detail can be discerned.

A linear working procedure, where the diagnosis is completed before the formulation of objectives and the development of proposals for improvement, could instead result in an investigation of problems that is too comprehensive. The linear working procedure may result in a problem analysis that is too comprehensive as it is difficult to discover the most relevant problems to address before having examined possible alternative solutions, at least in a general manner, in the first loop.
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 of the manual is placed on the overall methodological approach.

**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 meant to achieve a more comprehensive view of the environmental situation and also to propose improvement or to discern and delimit possible and relevant future projects for sustainable urban development. Well-thought out planning and organisation of the review is one of the keys to its success. In step 1 an organisation plan combined with a time schedule is prepared in which all review activities should be described in relationship to each other and with respect to environmental issues. A list of relevant stakeholders should be drawn up as part of the organisation plan.

The importance of involving the population – including the poor – in the process in general, and in the steps of the review in particular, must be underlined. The competence and creative resources of the residents of poor urban settlements are often underestimated, for example with regard to knowledge of the population structure, the status of infrastructure, risk situation etc. There are also potential opportunities for the residents to contribute their own efforts to improve the situation in order to reduce investment and operating costs.

**STEP 2**

**Make a diagnosis of the current situation**

The environmental situation of the urban area in question should always be mapped in order to identify conditions, problems and qualities. Urban environmental problems in particular affect the poorest and most disadvantaged sections of the population who experience maximum exposure to air and water pollution, lack of community services and poor access to healthcare. An overall picture of the environmental situation in an urban context may be achieved by the application of a SWOT-analysis. Environmental problems can also be described in more detail with regard to different kinds of emissions, disturbances and frequency.

The consequences of problems should be observed and noted separately e.g. respiratory diseases due to air pollution, high death rates amongst children due to waterborne diseases or high cost of water treatment due to polluted water sources. When seeking to address these problems and consequences it is important to look for the sources and causes of environmental problems. A “problem tree” is a useful method for this analysis.

**STEP 3**

**Specify Objectives**

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

It is proposed that objectives should be formulated on the following three levels as concerns the project situation: main objectives (environmental quality objectives) for example improved aquatic environment. One sub-objective related to this main objective is water saving and an example of a target is “total potable water consumption 100 litres/person and day. Other examples of formulation of objectives are presented in the manual.

Key issues regarding the environment for a certain area may be defined based on the analyses in Step 2 (SWOT, problem tree etc.).

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2) SWOT = Strengths, Weaknesses, Opportunities, Threats
The diagnosis of the current situation, as well as the formulation of objectives, serves as a basis for the search for alternative proposals to solve the environmental problems. As the problems are often complex there will probably be a number of alternative solutions. A possible set of alternatives, focusing on synergies between different subsystems, should be identified in order to grasp the proper measures.

Since the situation often changes quickly, and any solution or investment should be relevant for several years, it is particularly important to choose flexible solutions in developing countries.

The first choice should be to develop alternative proposals aimed at prevention and intervention using such measures as redevelopment of housing areas, workplaces and services or investment in clean technology within heavy industry. The secondary choice should be to mitigate the existing situation by measures for improving existing urban areas or existing technology. One dilemma related to mitigation is that this type of strategy may cause an unfavourable overall environmental situation to be made permanent. One way of working in a future oriented manner with both the renewal of existing urban areas and the planning of new areas is backcasting.

This methodology, which is described in the manual, may be very useful for small-scale stepwise improvement of poor areas with a sustainable urban structure, where each step is coherent with a long-term sustainable government structure.

The economic, social and environmental impacts of alternative proposals and solutions should be investigated in order to obtain a basis for choice of one alternative or a combination of several alternatives. The analysis of impacts by applying SEAs and EIAs is an important part of the development of holistic and innovative proposals.

Consequently, the inclusion of an impact analysis in the sustainability review is recommended. The focus of these guidelines is on the assessment of the environmental impacts of alternative solutions with special regard to the situation of the urban poor. Social and economic impacts are no less important to analyse – however tools for this analysis are provided in other governing documents.

The analysis of impacts in Step 5 results in the recommendation of a preferred proposal and a further strategy for the implementation in a long term, medium term and short term perspective. The proposals and strategies developed in a sustainability review may consist of a combination of elements from several alternatives, or one main alternative with some additions from other alternatives assessed in Step 5.

An essential part of this step is also to define a number of projects focused on 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 qualities and problems related the built environment. For follow-up of the impact of an intervention proposed in a review, the logical framework approach (LFA) is an useful tool.

3) SEA = Strategic Environmental Assessment
4) EIA = Environmental Impact Assessment
Part 2. Specific subsystems and...

A number of specific subsystems have been identified as being especially important with regard to substantial improvements of the urban environment.

Examples of such subsystems are Urban Functions\(^5\), Energy, Waste Management, Water Supply and Sanitation, Traffic and Transport, Landscape Planning, Sustainable Architecture. Institutional factors are also of crucial importance for the mitigation of environmental problems. These are described in the next section. For progress to be made, a city needs to address both its institutional settings and the performance and infrastructure of one or more subsystems. Figure 6 illustrates the overall holistic approach applied in this part of the manual.

The sustainability concept itself, as well as Swedish development cooperation goals, requires that urban functions, municipal services and infrastructure are available to all, at affordable cost. It is vital that urban planning, sector planning and interventions in these fields are made with poor people's conditions and needs in focus, and that all inhabitants are invited to participate in the design 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 the long term operation of environmental investments. Also in this respect it is vital from a sustainability viewpoint that the inhabitants' ability to pay is taken into consideration when formulating designs, fees, connection charges, organisation of operations etc.

Each subsystem has interfaces with other subsystems. Below follows a description of some examples of this, i.e. how different subsystems are linked and interdependent, how synergies can be achieved and sub-optimisation avoided. Traditionally, a project or intervention has considered one system at a time, leading to sub-optimisation. When examining one specific system it is always important to try to find links to other systems in order to develop optimal solutions.

One general remark regarding the technology of subsystems is the option for successive development of small-scale, low-tech solutions to medium large and large scale respectively medium-tech and high-tech. The opportunities for future improvement and extension should always be considered, see Figure 7.

**Essential synergies between different subsystems**

In all planning and design situations related to sustainable urban planning it is essential to take potential synergies between subsystems into consideration. The main focus is placed on synergies between different subsystems, examples of which are given below.

Synergies between different institutional factors and between institutional factors and subsystems should also be identified.

Often there are not only synergies but also, or instead, conflicts of interest between different subsystems. Sometimes hard facts prove that what is good for one area of planning works against the needs of another area.

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\(^5\) Examples of urban functions include housing, industry, service functions, recreational and cultural functions etc. This can be considered as a subsystem as it is very important to examine the spatial, environmental, social and economic requirements of such functions as a basis for the development of both technical solutions and integrated city planning.
their potential synergies

FIGURE 17. Technological solutions may be systematised in three dimensions: technological level, urban scale and time dimension.

can be used as fertilizer in agriculture. An alternative technology is the composting of the same waste material.

Synergies
Planning of public transport and traffic systems with regard to the location of urban functions such as industry, offices, service functions and housing
Planning of public transport and traffic 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 intensity.

Developing an urban pattern with higher urban density 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.

Synergies
Layout of buildings with regard to microclimates and surrounding landscape
Layout of buildings with regard to microclimates and surrounding landscape. The well thought-out layout of buildings is an efficient method of optimising opportunities of using solar energy for heating, cooling 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.

Examples: Integrated master planning of cities and 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 on City District level from South Africa and China are presented.

Integrated Development Plan – Buffalo City Municipality
Example 1
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. Within an overall sustainability framework environmental issues were subject to an environmental analysis including a community needs assessment, an overview of environmental factors and key findings. As environmental priority issues, solid waste management as well as water, soil and air pollution were identified. An environmental development framework was developed including short and long term objectives, strategies, programmes and prioritised projects.

Conceptual Master Plan for a green housing district in Wuhai, Inner Mongolia, China
Example 2
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. The Master Plan proposes resource efficient land-use patterns including a high quality, economic public transportation system, a network of green corridors and careful design of the waterscape. An energy strategy is integrated into the proposal including measures for combining energy efficiency on the block and building level with renewable energy supply. An eco-cycle model, which takes into consideration synergies between energy, waste, wastewater and storm water, is also an integral part of the proposal.
Part 3: Institutional factors for sustainable solutions

Well-functioning institutions are crucial to the improvement of the urban environment and include a wide range of aspects.

Important aspects are, for example, 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. Institutional deficiencies may often delay evident solutions to environmental problems and consequently cause new, attendant problems.

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 for achieving synergies between different technical subsystems.

Clear objectives for the environment – expressed in legislation and policies – combined with good urban governance, visionary spatial planning and well-thought out land management are, for example, of considerable importance in order to promote integrated land use and transport planning as well as integrated planning of water, waste and energy.

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".

Spatial planning can be defined as the spatial coordination of all types of land use for both urban and rural areas. 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.

Spatial/urban planning may be used as 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. Key issues for the poor are transparency of land information systems and taxation for propoor land management. In order to improve the situation of the poor, small plots, mixed land use, affordable infrastructure and affordable land for housing should be observed in land legislation and policies. Land and housing markets should also be made more effective, which also contributes to economic development.

"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." 6

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.

6) Tannerfeldt & Ljung pp 97-98.
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.

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 enterprise. 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 as regards new infrastructure.

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 preparation, 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.

Education, training and dissemination of information are of basic importance for the increase of 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.

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