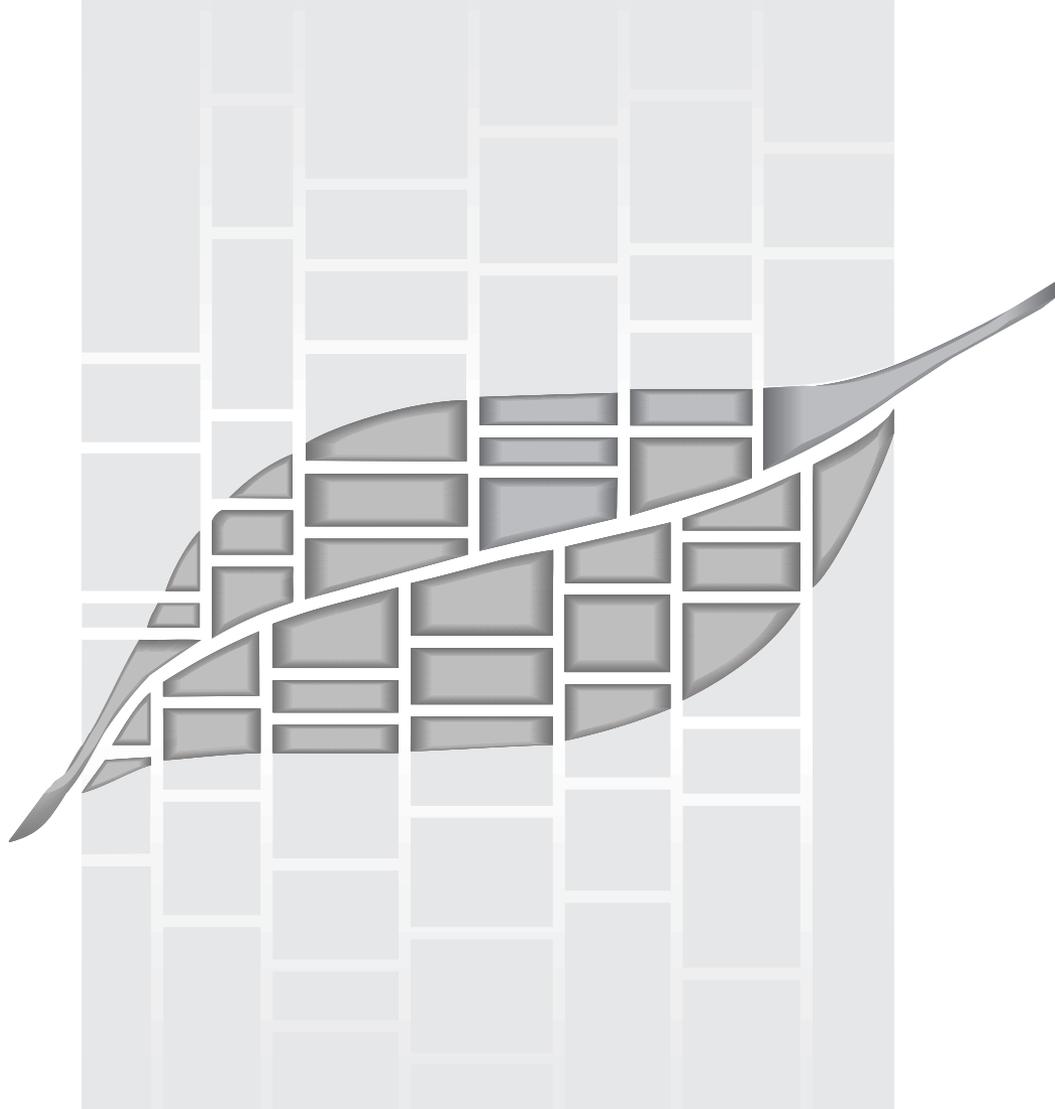


Planning Sustainable Settlements



edited by
Jaroslav Coplák
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PLANNING SUSTAINABLE SETTLEMENTS

HANDBOOK BASED ON THE PARTIAL RESULTS OF THE EC RESEARCH
PROJECT "ECOCITY - URBAN DEVELOPMENT TOWARDS APPROPRIATE
STRUCTURES FOR SUSTAINABLE TRANSPORT"



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(editors)

Slovak University of Technology Bratislava

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Planning Sustainable Settlements

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Editorial

The strategy of the Slovak University of Technology in Bratislava is oriented towards the vision of a research university of European importance. Since more than 10 years, this ambitious goal has been purposefully fulfilled by joining many international research projects and education programmes. As successful examples of these efforts might be mentioned the results of the Faculty of Architecture and the Faculty of Civil Engineering achieved in joint projects supported by the European Commission (Tempus, Leonardo, Copernicus) and, in particular, within the RTD projects of the 4th and 5th framework programme (Ecocity, Leda, Portal, Transplus, Luda, Perseus). In addition to the theoretic knowledge and experiences gained and turned into practice through training cycles (Tempus-Spectra, Tempus-Tiger), the outcomes of the projects were collected in various publications, study materials, papers and internal reports.

Sustainable development and the questions of environmental quality in all areas of the society are quite new topics of the research and education activities of our faculties. These problems have to be dealt in a holistic approach, which has been the reason for putting together an interdisciplinary and comprehensive team out of experts coming from both faculties and other involved bodies, as realised during the work on several research projects, such as Ecocity, Quality of Sustainable Transport, Atlas of the Landscape of the Slovak Republic.

The intended purpose of this book is to provide study material for graduate and postgraduate courses taught at the Faculty of Architecture (spatial planning and urban design, environmental planning, city marketing, social aspects of planning), at the Faculty of Civil Engineering (urban engineering, transport engineering, energy and water management, transport logistics).

The text is the outcome of the phase 1 of the project Ecocity, which is the international research project supported by the European Commission within the 5th framework programme. The project is a component of a cluster of synergetic projects (LUTR) aimed at strategic approaches and methodologies in urban planning towards sustainable urban transport.

As indicated by the full title of the project – *Ecocity: Urban development towards appropriate structures for sustainable transport*, the overall goal of the project is to develop settlement patterns for sustainable cities (Ecocities), emphasising the implications for an environmentally compatible transport system. Strategies to design a space- and energy saving settlement structure will thus give priority to the requirements of sustainable transport (convenience for pedestrians, efficient public transport and goods' distribution logistics) as well as energy efficiency, environmental quality and the utilisation of alternative sources of energy.

The approach of Ecocity is to develop a common concept, design model settlements in seven participating countries with different socio-cultural, legislative, economic and climatic conditions. The outcomes to be developed within the Ecocity project, properly disseminated, should have a substantial impact on the growing community of urban planners interested in an improvement of current planning practices. It is intended that the model settlements should be the best practice examples of

sustainable ‘cities of tomorrow’, with regard to both the planning of new and the regeneration of existing settlements.

The publication was prepared in cooperation with foreign universities and research institutions involved in the project Ecocity - Novem Utrecht, University of Tampere, University of Applied Sciences Győr, University of Economics Vienna and many others.

The structure and content of the book follow the methodological approach of the project Ecocity, defined through the following three cornerstones:

- Overall Concept
- Criteria Catalogue
- Guidelines

Overall concept is based on the vision of Ecocity that includes the basic principles and objectives which are to be fulfilled in order to transform the vision into real Ecocity (Part 2 of this book).

Criteria catalogue consists of a set of qualitative and quantitative criteria, which create a basis for evaluation, i.e. how the concepts met the ideas of sustainable urban development (Part 3 of this book).

Guidelines represent a set of recommended rules for actions and procedures that enable to implement the Ecocity concept by acquiring the defined standards of Ecocity (Part 4 of this book).

Within the project Ecocity, this material serves as a common framework for coordination of the works in all selected sites involved and in all subsequent phases of the Ecocity project, starting with the analyses and designing the local Ecocity concepts (phase 2), until the stage of evaluation and implementation (phase 3).

The structure of the book is further enhanced by the introductory part, containing some general thoughts on the concepts of sustainable urban development, definition of the basic terms, and a brief overview of the history and current trends, also indicating the diversity of views to the problem of sustainability and ecological restoration of cities. For better illustration, some of the concepts, political objectives, and professional manifestos are collected in the Appendix.

Preface

Prof. Ing. Dušan Petráš, PhD,

dean of Faculty of Civil Engineering STU

The Faculty of Civil Engineering (FCE) was founded in 1938 as the first faculty of the Slovak University of Technology (SUT). It was originally located in both Košice and Martin. The establishing of its first departments laid the foundations not only for the present faculty, but also for technical education as a whole in Slovakia. Instruction was provided by three departments: the Department of Building Construction and Transportation, the Department of Water and Cultural Engineering, and the Department of Surveying.

In 1939, the Faculty moved to Bratislava. There, two branches, which later became faculties of SUT, the Branch of construction Engineering and the Branch of Specialised Sciences, were formed. Another organisational change was adopted during the academic year 1946-47, when the Departments of architecture and Civil Engineering were established.

In the last sixty years, the Faculty has produced almost 27,000 graduates and 850 Philosophiae Doctors (PhD). The Faculty of Civil Engineering is now one of the largest engineering faculties at the University and in Slovakia as a whole. Shaped by a number of outstanding personalities in science and technology, the Faculty has become a leader in research and education in the fields of civil engineering and geodesy in Slovakia.

The Accreditation Committee of the Government of the Slovak Republic confirmed the ability of the Faculty to award the Bc. degree in 5 branches and the MSc. degree in 11 branches in graduate-study courses as well as the PhD. degree in 11 branches. Simultaneously, the Faculty has also obtained the right to appoint associate professors and professors. This results in a periodical evaluation of the Faculty's scientific research and education, which represent the very high level of all the Faculty's activities.

Prof. Ing.arch. Peter Gál, PhD.,

Dean of Faculty of Architecture STU

The urban structure in the context of Ecocity follows a vision of an ideal "sustainable" urban design. There is a strong linkage between the urban form and sustainable development of the city with appropriate transport structures. Sustainable city is based on the form and scale which supports walking, cycling and efficient public transport, and on maximising opportunities to create more socially and culturally sustainable urban forms within the city, to create more compact city with accessible public services that offer possibilities for communication and social interactions generating the process of identification with the sense of place. It is about developing an appropriate mix of uses in the city and contributing to reducing urban sprawl with its associated social inequity problems. An important objective is to provide environmentally friendly local economies, affordable housing, access to public services in the sense of the equity of chances for all social groups. Holding local events to help develop plans and to communicate with the citizens the planned functions and designs fulfils the process of participation, which is a very important part of the Ecocity planning.

To fulfil the above-mentioned objectives was the task in the city of Trnava, as the model site in Slovakia. Trnava is developing in the frame of historical continuity and for this reason it was necessary to work out several scenarios where the balance between the historical preservation and the modern development has been conceptualised. The concepts of scenarios have been widely discussed with the public, NGO's and the planners of the city in order to find out the most sensitive points to be taken out and implemented in the master plan of the Ecocity settlement in Trnava.

This project was a challenge for the research teams of the Slovak University of Technology: Faculty of Architecture, Department of Town Planning and the Faculty of Civil Engineering, Department of Transport Structures which are systematically dealing with the sustainability principles at various levels of settlement structures. In this project they found the opportunity not only to develop an integrated knowledge about sustainable urban development in the integration of its main dimensions: economic, environmental and social at the level of the city but also to develop the efficient interface between the planning theory and practice via elaborating the spatial development strategy for the city of Trnava. This project initiated, opened and proved the opportunities for interdisciplinary cooperation and confrontation not only between various departments of the University but also in the international context which generated new dynamics of the University research work.

1. General Information and Thoughts on Sustainable Development

1.1 Backgrounds to Sustainability

If we try to sum up a short history of the idea of sustainability, we have to mention that sustainable development is not entirely a new idea. Many cultures over the course of human history have recognised the need for harmony between the environment, society and economy. What is new is an articulation of these ideas in the context of a global industrial and information society.

The birth of the sustainability concept in the 1970s can be seen as the logical outgrowth of a new consciousness about global problems related to environment and development, fuelled in part by 1960s environmentalism. In this period first writings on sustainability emerged.

Progress on developing the concepts of sustainable development has been rapid since the 1980s. In 1992 leaders at the Earth Summit built upon the framework of Brundtland's Report to create agreements and conventions on critical issues such as climate change, desertification and deforestation. They also drafted a broad action strategy—Agenda 21—as the workplan for environment and development issues for the coming decades. Throughout the rest of the 1990s, regional and sectoral sustainability plans have been developed.

A wide variety of groups, ranging from businesses, municipal governments to international organisations such as the U.N., WTO, OECD have adopted the concept and given it their own particular interpretations. These initiatives have increased our understanding of what sustainable development means within many different contexts.

1.2 Definition of Sustainability

The term sustainability is a difficult concept to define as it refers more to a process than to an endpoint. There are variations in definitions and classification depending on the sector or issue being researched, the function being observed as well as the legislative or administration system being referred.

The most frequently quoted definition comes from the report Our Common Future (also known as Brundtland's Report): "Sustainable development is development which meets the needs of the present without compromising the ability of future generation to meet their own needs."

Other definitions of sustainability - overview

Sustainability means different things to different people. Some authors criticise the Brundtland's definition for being anthropocentric and for raising the confusing concept of needs. Wheeler (1998) suggests to move rather towards a relatively simple, process-oriented definition emphasising long-termed welfare: "Sustainable

development is development that improves the long-term health of human and ecological systems." In his opinion, this strategy avoids debates over the notion of "needs" while emphasising the process of continually moving towards healthier human and natural communities.

There are many other definitions of sustainability and sustainable development, some general and some more precise. The following definitions illustrate the variety of the issue evident in discussions on sustainable development:

"Sustainability is the emerging doctrine that economic growth and development must take place, and be maintained over time, within the limits set by ecology in the broadest sense-by the interrelations of human beings and their works, and the biosphere... It follows that environmental protection and economic development are complementary rather than antagonistic processes." (William D. Ruckelshaus - Scientific American, September 1989).

"Sustainable development seeks to respond to five broad requirements:

- (1) Integration of conservation and development,
- (2) Satisfaction of basic human needs,
- (3) Achievement of equity and social justice,
- (4) Provision of social self-determination and cultural diversity, and
- (5) Maintenance of ecological integrity." (Conference on Conservation and Development, International Union for the Conservation of Nature, Ottawa 1986).

"Sustainable development means improving the quality of human life while living within the carrying capacity of supporting ecosystems" (World Conservation Union 1991).

"Sustainability is the search and the carrying out of rational strategies that allow society to manage, in equilibrium and perpetuity, its interaction with the natural system (biotic/abiotic) such that society, as a whole, benefits and the natural system keeps a level that permits its recuperation" (E. Gutierrez-Espeleta, Costa Rica 1993).

Sustainable city

Sustainable urban development is a sub-part of sustainable development: "Sustainable urban development must aim to produce a city that is user-friendly and resourceful, in terms not only of its form and energy efficiency, but also its function, as a place for living" (Elkin 1991).

Similarly to the previous case, there are also many definitions for a sustainable city. The essential in these is the relationship with the concept of sustainable development, as we can see in the following example: "sustainable city is one in which its people and businesses continuously endeavour to improve their natural, built and cultural environments at neighbourhood and regional levels, whilst working in ways which always support the goal of global sustainable development" (Haughton & Hunter 1994).

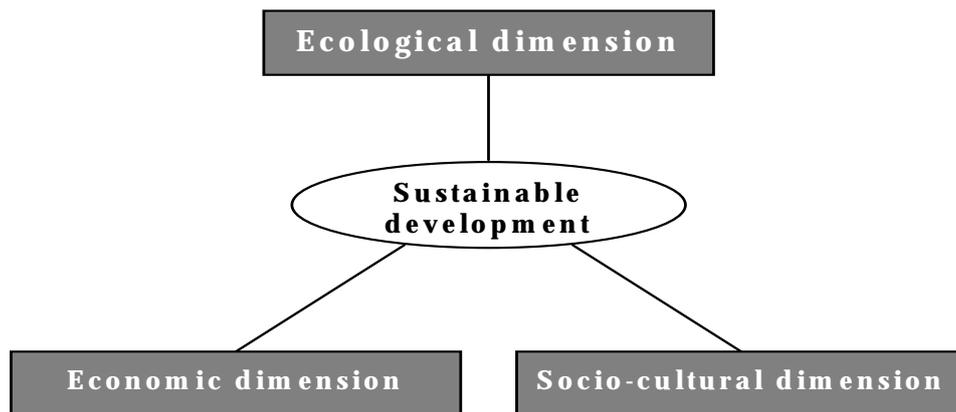
Direct relation to the Bruntland's definition of sustainability proves the definition of sustainable urban development developed at the Urban21 Conference (Berlin, July 2000): „Improving the quality of life in a city, including ecological, cultural, political, institutional, social and economic components without leaving a burden on the future generations. A burden which is the result of a reduced natural capital

and an excessive local debt. Our aim is that the flow principle that is based on an equilibrium of material and energy and also financial input/output, plays a crucial role in all future decisions upon the development of urban areas.“

1.2.1 The Three Dimensions of Sustainability

„Economy, ecology and social cohesion are the pillars of a sustainable city. These must be in balance and therefore require an integrated approach.“ (Conference Strategies for Sustainable Cities, The Hague, 1999).

Figure 1 Dimensions of sustainable urban development - integration of ecological, economic and socio-cultural dimension



Already the Brundtland's definition implies a very important shift from an idea of sustainability, as primarily ecological, to a framework that also emphasises the economic and social context of development.

Interactions between environment, economy and society is used as a starting point by Castells (2000) who integrates these components into sustainability. For him the complex phenomenon of sustainability has following three dimensions:

1. environmental (ecological) sustainability,
2. economic sustainability,
3. social (socio-cultural) sustainability.

The three dimensions of sustainability, sometimes also called pillars, or considered as subsystems of the general term sustainability, reflect the presence of three types of the so-called community capital:

1. natural capital (natural resources, services provided for human activity)
2. financial/built capital (manufactured goods, buildings, infrastructure, information resources, credit)
3. human/social capital (cultural heritage, education, skills and health of population)

A comprehensive survey of the integration of internal subsystems is given by Camagni et al (1998) where the triangle consists of three subsystems: the economic one, the environmental one and the social one.

The main argument is, that all these systems dispose with main ruling principles, as profitability/economic-growth, ecology/aesthetics and pure-equity/welfare respectively, but neither of these principles are able to assure sustainability in their pure form, only their integration able to do that. The overlapping field between the environmental and the social sets gives the environmental equity subset (intra- and intergenerational equity). Similarly, between the environment and the economy there is a subset called the long-term allocative efficiency, as „pure short-term profitability principles should evolve into a long-term allocative efficiency through the internalisation of negative externalities” (Camagni et al 1998, p. 108, Fleischer 2002); while between the economic and the social spheres the distributive efficiency principle was formulated unifying the profitability and the pure equity earlier principles.

Many authors underline that the interaction between the dimensions may bring not only positive externalities – they might be contradictory in several issues. Thus, sustainability is about finding the balance point between a community's economy, environment, and society (Fleischer 2002).

1.3 Related Concepts

The maturation of the concept of sustainability embedded into Urban Planning and Architecture has brought on the scene some other approaches and ideologies. Although they may have different emphases, they substantially agree with the principles and goals of sustainable urban development.

Some of the concepts have been endorsed by documents such as Agenda 21 and Habitat Agenda, Aalborg Charter, professional manifestos such as the Charter of the Congress for the New Urbanism and the Local Government Commission's Ahwahnee Principles (see Appendix).

Beside the ideas represented by the concept of sustainability, there is also the concept of livability. If compared, the concept of livability is somewhat simpler, since it focuses less on abstract themes and more on specific human need. It is also an important pillar of the new urbanism. Among the basic elements that make cities and towns livable we could mention healthy environment, decent housing, safe public places, uncongested roads, parks and recreation opportunities etc. Such elements obviously contribute to sustainability as well. Wheeler (1998) points out that the livability themes are becoming more important to modern societies in which the basic problems of food shelter, public health have long since been solved. Instead, in the post-industrial world the emphasis is increasingly on "quality of life". Both the Ecocity movement and the movement of the New Urbanism, described in more detail in the following sub-chapters, have adopted this concept as one of their core ideas.

1.3.1 The New Urbanism

New Urbanism is an architectural movement that designs with priority to the pedestrian. It introduces itself to be an alternative to suburban sprawl. Its appeal results partly from widespread dissatisfaction with suburban development and nostalgia for traditional forms.

New urbanists have received considerable attention in the United States and, to a lesser extent, in Great Britain. They further call for an urban design that includes a variety of building types, mixed uses, intermingling of housing for different income groups, and a strong privileging of the "public realm". The basic unit of planning is the neighbourhood, which is limited in physical size, has a well-defined edge, and a focused centre: "The daily needs of life are accessible within the five minute-walk" (Kunstler 1996).

The movement owes its formal roots to the City Beautiful and the Garden City movements of the late 19th century. From the City Beautiful, a urban beautification movement borne from the Ecole des Beaux-Arts in Paris, the New Urbanism adopts an emphasis on monuments, civic architecture, plazas, landscaped parks and public spaces, and the physical ordering of these elements through the use of axes, grids, and urban walls.

At the regional scale, New Urbanism pays homage to the Garden City movement, a planning philosophy initiated by Ebenezer Howard in England, by concentrating development in compact communities in an open space framework that sets land aside for conservation, resource or recreational use. New Urbanists reinterpret these 19th century forms in an effort to balance contemporary environmental, social and fiscal challenges facing communities today.

The origins of the movement dates back to the 1991, when the Local Government Commission brought together a group of architects who have been leaders in developing new notions of land use planning: Andreas Duany and Elizabeth Plater-Zyberk, Stefanos Polyzoides and Elizabeth Moule, Peter Calthorpe, and Michael Corbett. These innovators were asked to come to agreement about what it is that the new planning ideas - from neotraditional planning to sustainable design - have in common and from there, to develop a set of community principles. They were then asked how each community should relate to the region, and to develop a set of regional principles. Finally, they were charged with defining how these ideas might be implemented by cities and counties. Their ideas are outlined in the "Ahwahnee Principles," a document named after the Ahwahnee Hotel in Yosemite National Park where they presented their findings (see Appendix 6.4).

In 1993 the Ahwahnee group and others identify their shared interests and convene in Alexandria, Virginia to form the Congress for the New Urbanism (CNU). In 1996 the CNU holds its fourth congress in Charleston, South Carolina, and adopts the "Charter of the New Urbanism," a document that lists what the CNU believes are appropriate solutions to the challenges facing America's built environment, asserts the CNU's basic design principles (see Appendix 6.5).

New Urbanism is not only about theory. Many cities worldwide have built New Urbanist developments. In 2000, there were approximately 410,000 housing units (built or planned) in 380 New Urban developments in 38 states.

New Urbanism and sustainability

New Urbanism claims to offer a real, sustainable method of town and city planning that will repair cities and make them the livable, vital things they once were. Core to New Urbanism is the concept of livability and variety. A city should be walkable, diverse, with sound design and good 'place-making' present in public areas. It should offer mixed housing, and its population density should be great enough to support local business in a traditional neighbourhood structure. Public transport is integrated and the whole caboodle must be sustainable.

Sustainable development often focuses on reduced environmental impact of buildings by cutting energy and water use. New Urbanism is more concerned with restoring human-scale and "place" to developments by creating genuine neighbourhoods, towns and villages.

1.3.2 The Ecocity Movement

The application of the concept of sustainability in urban settings principally represents the term sustainable city. Recently we are witnessing a rising popularity of other terms or catchwords – one of them is Ecocity (and generics such as Ecopolis, Ecovillage). Unlike "sustainable city", Ecocity sounds much more striking and understandable for broad audience. Increasing number of towns and cities all over the world decide to present their visions under the brand Ecocity. Except of those engaged in the Ecocity research project, well-known examples provide Cleveland, Johannesburg, Whyalla, Bolzano, Halifax and many others.

In the last few years a worldwide movement has developed which seeks to create ecological cities, cities in balance with nature. At the birth of the Ecocity movement stood Richard Register, an internationally-recognised urban design specialist and activist. He founded Urban Ecology in Berkeley in 1975, and has organised a number of local conferences in his effort to transform Berkeley to an Ecocity. The group Urban Ecology was later transformed to Ecocity Builders, a non-governmental organisation dedicated to environmentally responsible urban development through public education and consulting with governments and planners. Its motto is "to rebuild our civilisation in balance with nature".

In 1990, Mr. Register initiated what has become a key component of the Ecocity movement, the International Ecocity Conference, which has been held every two years since, on five different continents. Last conference was held in Chinese garden town Shenzhen in August 2002 (see Appendix 6.2 – The Shenzhen Declaration). Since 1990, the conference has become one of the most important forums on sustainable development. Undoubtedly it has contributed to the smoothing of the former radical rhetoric and helped the brand Ecocity to become a widely accepted equivalent to the concept of sustainable city.

The principles of the Ecocity movement are fairly simple, Register points out: "We are building shopping malls and suburbs that will last much longer than the gasoline we need to get around in them, and this is a tragic folly. In an "Ecocity", people can live, work, shop, and play all within a short distance. "Transportation is what you do when you're not where you want to be," says Register, so the solution to smog, gridlock, greenhouse gasses, and the expense of owning a car is to gather

together the places people want to be. The transportation of choice will be feet first, bicycles second, public transit third, and only then, the automobile.

As explained by Australian architect Paul Downton (1997), an ecological city is “as much about balance within human society as it is about balance between humans and nature. An Ecocity is a brand, a package of ethics and programs for making cities that are places of ecological restoration. It goes beyond "sustainability" - sustaining what we now have would be like embalming a patient with a terminal illness. An Ecocity is about healing.”

The concept of the Ecocity finds that sustainable settlements are only one of the roots of the movement. The others are: appropriate technology, community-economic-development, social ecology, green movement and bioregionalism (Roseland 1997).

The planning principles of an Ecocity, with its concept of co-evolving cities and regions, branch from the same philosophical tree as Geddes, Mumford and McHarg. Architectural principles stem from Wright and the "organics" but locate most of the architecture in the urban ecosystem. Ecocity is opposed to sub-urbanity and sentimental ruralism and promotes a return to the measure of human bodies rather than machines - 10 minutes walk rather than 10 minutes drive.

The ideas supported by the Ecocity movement do not conceal the relation to the New Urbanism. The approach of the New Urbanists, in the words of some of their adherents is a “bridge strategy” and Register (2002b) would say that it is “a bridge to Ecocity, the city of buildings taller than four stories. And if we use terracing, if we plant rooftop gardens and invite in native birds and provide for high places for the citizens to visit, work or live, why cant we imagine really beautiful cities full of life and inspiration? Cities made up largely of such buildings would be part of an ecologically and socially healthy whole living organism: the ecological city.”

In Registers new book on Ecocities he writes that "urban ecology includes protecting and strengthening vulnerable urban communities, as well as protecting endangered non-human species. It means locating affordable housing within walking distance of transportation centres." If we add to the more diverse and compact land use patterns a hefty infusion of natural and agricultural restoration, and add to the whole matrix the 'appropriate technologies' of solar passive building, effective recycling, widespread gardening, composting, creek restoration, building of lively city and neighbourhood centres with plazas to host vital social and economic life and so on, we begin to visualise what ecological cities are all about."

In Downton's (1997) words, “building Ecocities also means building a culture and economy based on ethical behaviour, social responsibility and "clean" capital to maintain a non-exploitative relationship with the biosphere. Architecture must comply with the biological demands of ecosystems as much as it must respond to the physics of construction and laws of gravity. The design philosophy of Ecocity embraces the Gaia hypothesis of Lovelock and Marguilis and seeks to create architectural and urban entities which display the resilient, self-organising, dynamic balance of living organisms”.

As argued also by Register (2002b), the city could be seen as a living system analogous to other living systems, like biological organisms, and subject to the rules of ecology. “Complex, healthy organisms are essentially three-dimensional structures with overlapping organ systems connected to one another over short

distances for the benefit of the whole organism. It was Paolo Soleri who most clearly said it: cities are living complex systems that must be essentially three-dimensional, not two-dimensional, not flat like a piece of paper. Short distances of connection yield high levels of efficiency, low levels of waste. This requires a three-dimensional arrangement of the whole organism. Cities can be designed similarly and built like this”.

The Ecocity movement constitutes a special segment of the sustainable settlement aspirations. According to the classification of Mark Roseland, who classified the different existing movements creating four groups (designers, practitioners, visionaries and activists), the Ecocity movement fits into the activists group – we can define Ecocity movement as one among those that aims at achieving a new, consistent urban solution, while tries also implement this solution into the practice (Fleischer 2002).

The movement confines Ecocity to relatively small and spatially limited area where it seeks to create a liveable, and in each element sustainable urban (or rural) life possibility. On the other side, it aims at complex, holistic solutions in the selected area. Consequently partial solutions that try to organise the sustainable operation of the city in one single sector are not Ecocity movements in themselves, even if they can give important input to Ecocities. The Ecocity movement always involves a lifestyle commitment and a community element for those taking part in it (Fleischer 2002).

1.4 Major EU Policies and Initiatives on Sustainable Urban Development

Policies of the European Union are of growing importance for spatial structures and the state of the environment within the member states of the EU. The reasons can be found firstly in the Structural Funds and secondly in the ruling competencies the EU has acquired in many fields of spatial and environmental relevance.

It is however not possible to give here a detailed view on all documents, declarations, and initiatives released and coordinated by the EU and its bodies. Therefore we give only a short overview and some of the most important items are then discussed in a more close-up look.

Green Paper on the Urban Environment (1990)

→ Start of a new focus on urban issues at a European level

EC Expert Group on the Urban Environment (1991)

→ Integration of the urban dimension into environmental policy, with particular regard to sustainable urban development

Local Agenda 21 (1992)

→ Part of “Agenda 21” from the UN Earth Summit in Rio de Janeiro

→ Action plan for local authorities for sustainable development

Fifth EC Environment Action Programme – “Towards Sustainability” (1992)

- Identified seven themes or targets, including the Urban Environment

European Sustainable Cities Project (1993)

- Aimed to formulate recommendations for the EU institutions, national, regional and local authorities to assist the implementation of the Community's Fifth Environmental Action Programme.
- The European Sustainable Cities and Towns Campaign (1994)
- The European Sustainable Cities Report (1996)

Towards an Urban Agenda in the European Union: COM(97) 197 Commission

- EC stated its intention to “examine EU policies from point of view of urban impact and improve policy integration at urban level”

Sustainable Urban Development in the European Union – a Framework for Action: COM(98) 605

- Need for methods of monitoring progress on Local Agenda 21
- Need to reduce the “ecological footprint” of urban activities

EU Parliament Resolution on strengthening EU urban environment policy (A4-0177/98)

- Calls on the Commission to produce an urban environment programme aimed at sustainable development
- Calls on the Commission to devise and develop comparable sustainability indicators
- Calls on the Commission to develop, in conjunction with other parties, an overall vision for urban problems including sustainability issues, which takes into consideration the impact of EU policies on urban areas

Draft Decision on a Community Framework for Cooperation to Promote Sustainable Urban Development: COM(99) 557

- Legal instrument to allow Commission to improve cooperation with local authorities on sustainable urban development and Local Agenda 21, through networks of European cities

European Spatial Development Perspective / ESDP (1999)

- Balanced and Sustainable Development of the Territory of the EU
- Need for improvements in the quality of the urban environment

Towards a Local Sustainability Profile: European Common Indicators (2000)

- A Europe-wide sustainability monitoring initiative, based on a common set of integrated indicators reflecting the interactions between environmental, economic and social aspects

Sixth EC Environment Action Programme – Environment 2010: Our Future, Our Choice (2001)

- The Sixth EAP of the European Community contains several references to urban and regional development

European Sustainable Cities & Towns Campaign

European Sustainable Cities & Towns Campaign was launched by the EU Environment Commissioner at the First European Conference on Sustainable Cities & Towns in Aalborg, Denmark on 27 May 1994, and initiated by 80 European local authorities signing the Charter of European Cities & Towns Towards Sustainability (Aalborg Charter).

Within the EU context, the Campaign forms part of the Sustainable Cities Project of the European Commission and is related to the work of the EU Expert Group on the Urban Environment. This group is in the process of being re-launched which will allow for the links between the Expert Group and the various participants of the Campaign to be even further developed.

The objective of the Campaign is to encourage and support cities, towns, and counties in working towards sustainability and to promote development towards sustainability at the local level through Local Agenda 21 Processes in accordance with the mandate given to local authorities by Agenda 21 as agreed at the Earth Summit in Rio de Janeiro in 1992. Until the year 2000, nearly 2000 European local and regional authorities from 39 countries, through their signature to the Aalborg Charter, are participating in the Campaign. Each year, about 300 new local and regional authorities participate in the Campaign by signing up to the Aalborg Charter (see Appendix 6.3 for full document). An office in Brussels provides the focal point for the Campaign's activities (<http://euronet.uwe.ac.uk/>).

The URBAN Initiative

The URBAN Community Initiative is an instrument within EU Cohesion Policy, dedicated to the regeneration of urban areas and neighbourhoods in crisis.

The second round of URBAN ("URBAN II") consists of 70 programmes across the EU, covering some 2.2 million inhabitants. These areas often face quite severe deprivation and specific challenges - typically high unemployment, crime, and finally lack of green spaces.

Urban II aims more precisely to promote the design and implementation of innovative models of development for the economic and social regeneration of troubled urban areas. It will also strengthen information and experience-sharing on sustainable urban development in the European Union. The network of the URBAN II programmes ("URBACT") also gives an opportunity to exchange information and experience on sustainable urban development across the European Union.

Framework for Action for Sustainable Urban Development

In May 1997 the Commission adopted the Communication "Towards an Urban Agenda in the European Union" launching a wide discussion on urban policies and stimulating a great deal of interest from EU institutions.

To follow-up and reflect this discussion, in 1999, the Commission has decided to present a European Union Framework for Action for Sustainable Urban Development ("Sustainable Urban Development in the European Union: A Framework for Action").

The document is the starting point of several other political initiatives and is of great interest chiefly because the European Commission used it as a means of challenging and re-aligning its activities with regard to urban development. It aims at coordinating the policies of the EC with regard to problems of cities. Therefore, it is exclusively addressed to the political institutions of the EC.

The framework has four goals (see also Appendix 6.6):

- strengthening economic prosperity and employment in towns and cities;
- promoting equal opportunities, social integration and the rehabilitation of run-down areas;
- improving the urban environment (management of transport, waste, energy etc.);
- contributing to good urban governance and increased participation of local actors and citizens.

For each goal, the Framework for Action sets out policy objectives as well as models for action of an innovative nature, based in particular on partnerships involving the public, private and voluntary sectors. In total, 24 actions are proposed, which are guided by five principles, of which "environmental sustainability" is one. In the case of actions that may effect the environment, the authors point out the necessity to protect the environment, in particular with regard to transport policies.

The document also encourages the networking of projects and tools and the dissemination of "good practice". The idea is not to apply predetermined solutions but to start from local conditions, taking account of the institutional context in each Member State.

European Spatial Development Perspective – ESDP

The ESDP provides a policy framework for better co-operation at all levels: between Community sectoral policies among themselves as well as between the Member States, their regions and their cities. As a common vision of the European territory generated by the Member States and the European Commission, the ESDP identifies aims and policy options that will contribute to a sustainable European Union. This frame of reference, which is not binding, aims to reinforce synergies and trans-national co-operation in the sector of the development of space.

The ESDP is the result of a political and public process of discussion, which has lasted for more than five years, involving not only the Member States and the

European Commission but also at a very early stage parliaments, regions and institutions and groups responsible for spatial development. The final debate on the ESDP at the informal meeting of EU Ministers responsible for Spatial Planning on 10-11 May 1999 in Potsdam marked an important step in the European integration process.

Key guidelines

ESDP is included in the general guideline of balanced and sustainable development, which is promoted by European Union through three fundamental objectives:

- economic and social cohesion
- conservation of natural and cultural heritage
- balanced and effective competition across community territory

In order for the policies of the development of space to contribute to the promotion of those objectives, ESDP proposes three guidelines:

- polycentric spatial development and the reinforcement of synergies between urban and rural areas
- equal access to transport, communication infrastructures and to knowledge
- wise management of natural and cultural heritage

By bringing social and economic demands in line with the environmental and cultural functions of space, a more sustainable, balanced spatial development is intended. The normative statements have been grouped to three policy guidelines which centre on the urban system and the partnership between urban and rural areas, on the parity of access to infrastructure and knowledge, as well as on the development and conservation of natural and cultural heritage. Because there is an own policy guideline for the conservation of natural resources, and because ecological issues have partly been integrated into the other policy guidelines, all relevant environmental goals are addressed. Their level of specification is similar to that of the other goals. In the policy guidelines, several process-related statements concerning the consideration of ecological issues can be found. For example, with regard to the topic “improved transport links” the authors ask for a “territorial impact assessment”. Though the ESDP is legally not binding, it is of great value as a basis for environmental discussions because it represents a milestone for the application of the overall goal of sustainable development, and because it has been elaborated in a broad consultation process in which the member states have been involved (Leibenath & Pallagst 2002).

1.5 The Role of Planning for Sustainable Urban Development

Planning, as a system of instruments and methods for development is supposed to find optimal developing processes for spatial systems in the way of their sustainability at local and regional levels in integration of natural sub-systems and human sub-systems.

Planning processes take place in a real, legal, social and economic environment which to a large extent sets the framework limiting the possibilities for decision making. The planning process is embedded in a structure of institutional arrangements. This structure shapes the outcome of actions of citizens, politicians, policymakers and other professionals. The development is the outcome of such a process. It is necessary to be aware of the difference between 'urban planning' and 'urban development' and to pay special attention to participation and implementation.

Sustainability raises special emphasis to the complex web of interconnections between different issues, fields, disciplines, based on the ecological metaphor of the world as an organic system. This has huge implications for planning. It means that different specialties having to do with transportation, land use, housing, community development, and environmental protection should not be handled in isolation from one another, but should be integrated to the extent possible. Coordination of economic, environmental, and social goals within planning is also necessary (Wheeler 1996).

Carlos Verdaguer (2002) sets some rules for planning process that should be fulfilled if seeking for sustainable urban development. This kind of planning must:

- facilitate the local understanding of the global context
- meet objectives agreed by all the social partners
- transform the objectives to feasible and definite programs and projects
- submit the results to a continuous follow-up and feedback processes based on indicators, correcting the course whenever necessary
- build on an integral analysis (economic, social, urban, environmental, cultural, aesthetic...) of urban and territorial reality based on an in-depth knowledge of sectoral areas as well as on the participation of every social stakeholder. One essential reference concept for this analysis is the carrying capacity of territory.

1.6 Vision of an Ecocity

The role of vision is to make every participant in the planning process looking in the same direction, and at the same time, focusing on the same vision. The vision enables participants translate their common ideas into principles and measures of their own professional backgrounds. Thus, a vision is a tool to integrate different professional approaches into one cell of the "City-of" model (i.e. urban planners, transport experts and all other professionals committed).

Before the formal administrative part of the planning process starts, the process of searching for the vision as the best alternative of further development of the city have to be finished. If some of the subjects involved will come with a new relevant vision (e.g. if there is a change in external environment or some new knowledge appears) and responsible people decide that they would accept the vision, the whole process has to be returned back to the first phase, in which a new vision must be confronted with other visions. As a result, a the evaluation of the concepts will be repeated again and subsequently a new design or concept have to be elaborated.

Figure 2 Vision of an Ecocity

Outcome of the Ecocity Workshop II. (Vienna, June 2002)

City of accessibility for everyone	City with public space for everyday life	City in balance with nature	City with integrated green areas	City of bioclimatic comfort
City of minimised land consumption	Vision of an Ecocity	City for pedestrians, cyclists and public transport	City of reduction, re-use and recycling of waste	City contributing to closed water cycle
City of balanced mixed use		City of short distances		
City with new balance of concentration and decentralisation		City as network of urban quarters	City as powerstation of renewable energies	City of health, safety and well-being
City of qualified density	City of human scale and urbanity		City for strong local economy	City built and managed with the inhabitants
City of concentrating development at suitable sites	City integrated into the surrounding region	City of minimised energy consumption	City integrated in global communication networks	City of a cultural identity and social diversity

The role of the vision and the overall concept is determining for citizens and other relevant stakeholders in the process of developing the Ecocity. The vision usually starts in the imaginations of individuals and only after the process of verification it can be socially accepted by the community. Most of the planning visions usually divide the community to those who are in favour of the vision, those who are opposing the vision and finally those who are apathetic. In searching for optimal

solution it is necessary to involve a large number of participating subjects. This process gives both a chance and an obligation for the full application of public participation.

1.7 Glossary

Overall Concept is a vision of a city described as a system of the main objectives and principles, at which the city should operate and should be managed

Ecocity Concept is the metaphor of our vision of a sustainable city

Local Ecocity Concept is a vision of sustainable city within the specific local concept and formulated in a local specific metaphor as well

Dimensions of urban sustainability are the three main aspects of sustainability (ecological, economic and social dimension).

Principles of sustainability are understood as general standards of actions and processes working towards sustainable urban development. They serve as basis to elaborate more specific rules and measures for the model settlements.

Objective is a description of the desired results of realising an Ecocity

Scenario – scenarios describe some possible development trajectories towards sustainable settlement, diversified according to predicted changes of external conditions as well as planning methods and approaches used

Settlement - this term is used here for urban quarter or neighbourhood (model area of the project) as well as for the whole town

Urban quarter is part of a city forming a unit with identifiable borders and a small scale mixture of functions. Urban quarter is usually composed of more than one neighbourhoods.

Neighbourhood is community of people with a certain level of social cohesion.

Block of houses is set of built-up plots of land surrounded by streets or landscape (undeveloped plots).

Mobility - Mobility is described by the number of journeys for various activities, which can be done, respectively by the number of opportunities for travel, which are available in a defined period of time - high mobility is characterised by a great number of destinations accessible within a time unit, and not by covering long distances

Criterion - Characteristic of the settlement that is going to be assessed (e.g. consumption of heating energy)

Indicator - Qualitative or quantitative description of each separate criterion (e.g. kWh per m² per year)

Target value - Qualitative or quantitative target of the indicator (e.g. 15 kWh per m² per year)

Guideline – recommended rule for action or a procedure to acquire the defined standards of Ecocity

Local Ecocity Masterplan - is a local master plan in which the *Local Ecocity Concept* is expressed. The master plan is an indicative document from the point of view of the national planning law.

2. Principles and Objectives of Sustainable Development

Principles and objectives for planning sustainable settlements are the two pillars of the Overall Concept of the project Ecocity. They are listed in the tables 1 and 2. In case of principles, the relation to the three dimensions of sustainability (ecological, economic, social) is also recorded in the tables.

In the subsequent explanatory texts, each planning sector is described in more detail. Special concern is given to the issues on sustainable transport imperatives and their transfer into the design of urban structures.

As input materials, the Internet Tool Box from R. Messerschmidt (2002), the work of R. Hsin (1996) and other sources (Ahwahnee Principles etc.) were utilised.

2.1 Overview of Objectives and Principles

Principles and main objectives are divided according to sectors relevant for an Ecocity. The main cross-sectional groups *urban structure* and *transport* are further completed by a complex of supplementary sectors - energy, water, sewage treatment and waste, economy, social and cultural issues and landscape.

Defining these sectors is important not only to provide transparent grouping of principles and objectives for sustainable urban development but also for defining the interrelations between the fields that define the city as an organism (see Appendix 6.1).

Table 1 Main Objectives

Sectors	Main Objectives
Urban structure	<ul style="list-style-type: none"> • Integration of urban quarters into the city and the surrounding region • City organised as network of urban quarters • Self-sufficient urban quarters • Attractive urban design with human scale • Sufficient and attractive public space for everyday life
	<ul style="list-style-type: none"> • Concentration of urban development at suitable sites for public transport • Balance of concentration and decentralisation • Limited land consumption (Compact city) • Qualified density in ecological, economic and social context
	<ul style="list-style-type: none"> • Balance of uses in quarters, city and region and location of all necessary facilities at suitable sites • Best accessibility to all facilities for all inhabitants

Table 1 (continued) Main Objectives

Sectors	Main Objectives
Transport	<ul style="list-style-type: none"> • Urban structures designed for environmental compatible modes (pedestrians, cyclists, passengers of public transport and necessary car traffic) • Priority for the weaker participants of transport • "City of short distances" (need for travel as low as possible) • Minimum pollution effects and maximise safety of traffic
Energy	<ul style="list-style-type: none"> • Efficient use of energy (low energy buildings, solar architecture, equipment) • Extended use of renewable energies
Water, sewage treatment, waste	<ul style="list-style-type: none"> • Closed cycles (water, materials etc.) • Reduction, re-use and recycling of waste
Social and cultural issues	<ul style="list-style-type: none"> • Liveable city of health, safety and well-being • Alternative sustainable lifestyles • Cultural identity and social diversity • Involvement and participation of inhabitants in urban development • Consciousness of sustainability, solidarity and humility • City as the place of information exchange, beauty, complexity and respect for the cultural heritage
Economy	<ul style="list-style-type: none"> • Strong and diversified local economy using local resources • Application of information technologies in management of transport, energy, water consumption, etc. • City connected with global telecommunication networks
Landscape, nature and urban climate	<ul style="list-style-type: none"> • Balance of built-up area and nature • Integration of green and surfaces of water within the city • Different solutions for different climates • Bioclimatic and hygienic comfort (influencing outdoor and indoor temperature and humidity, air quality, noise)

Table 2 Principles for the sustainable urban development

Sector	Principle	Dimension of sustainability		
		Envir	Econ	Socio
Urban structure General	• Develop a town by controlled appropriate addition of largely autonomous urban units and sub-units		x	
	• Seek for a balance between spatial concentration and decentralisation (decentralised concentration)	x	x	
	• Strictly delimit boundaries of built up area within the community (boundary between city and landscape)	x		
	• Derive principal axes of urban structure with respect to landscape, topography, views, existing buildings, pathway network, street spaces	x		x
	• Develop urban patterns appropriate for sustainable transport (designing structures for pedestrians, cyclists, public transportation modes and efficient distribution logistics)	x		x
	• Provide choice of locations for urban development (site for new quarter/neighbourhood) to allow best integration into the public transport network		x	
	• Create logically composed and user friendly urban structure			x
	• Strive for diversity of urban fabric types and patterns			x
	• Avoid architectural barriers to accessibility (situation of buildings causing a long way round, steps)			x
	• Strive for variability and flexibility of urban forms and structures to facilitate change of use		x	
	• Create natural corridors permitting inter-penetration of nature and city	x		
	• Organise landscape and architecture (buildings, squares, streets) in a high aesthetic quality			x
	• Create structures that stimulate sound ecological and social behaviour of people			x
	• Restore and redevelop previously disturbed areas	x		
	• Set clear and genuine relation between function and physical structure		x	x

Table 2 (continued) Principles for the sustainable urban development

Sector	Principle	Dimension of sustainability		
		Envir	Econ	Socio
Urban structure Density	<ul style="list-style-type: none"> Set definite heights of buildings according to ecological aspects (relation to distances of buildings because of shading), spatial aspects (tower buildings for identification resp. orientation) 	x		
	<ul style="list-style-type: none"> Concentrate buildings in high density around stops of public transport 	x	x	x
	<ul style="list-style-type: none"> Optimise the density of settlements with regard to the contradictory requirements of transport (higher building density) and solar architecture (greater distances between buildings) 	x		
Urban structure Land use and urban functions	<ul style="list-style-type: none"> Strive for fine meshed mixed-use at neighbourhood level at building or floor level or side by side in different buildings 			x
	<ul style="list-style-type: none"> Approach/integrate living and working place; provide educational, shopping, service (including social services) and leisure facilities within neighbourhoods 			x
	<ul style="list-style-type: none"> Locate facilities to allow best accessibility for necessary transports as well as pedestrians 		x	x
	<ul style="list-style-type: none"> Keep travel and transport distances between necessary facilities short 	x	x	
	<ul style="list-style-type: none"> Add other uses into mono-functional areas 		x	
	<ul style="list-style-type: none"> Include general facilities servicing the whole community within the neighbourhood, looking after existing needs 		x	x
Urban structure Public space	<ul style="list-style-type: none"> Increase aesthetic perception of streets and squares 			x
	<ul style="list-style-type: none"> Create attractive ground floor facades facing to the public space supported by appropriate uses 			x
	<ul style="list-style-type: none"> Promote community culture through careful design of all the elements characterising public space: paving, street lights, street furniture, facades, shop windows, etc. 			x
	<ul style="list-style-type: none"> Provide elements of local identity and enhance existing ones, increasing the legibility of public space. 			x
	<ul style="list-style-type: none"> Offer enough opportunities for recreation as well as for healthy open space activities within the urban tissue (walking and cycling) 			x
	<ul style="list-style-type: none"> Diversify public spaces to various types (squares, green, parks) seeking for balance between public, semi-public, semi-private, private spaces 			x

Table 2 (continued) Principles for the sustainable urban development

Sector	Principle	Dimension of sustainability		
		Envir	Econ	Socio
Urban structure	<ul style="list-style-type: none"> Integrate new buildings into the natural environment and the urban landscape 	x		x
Buildings and materials	<ul style="list-style-type: none"> Adapt building and urban typology to the characteristics of the site 	x		x
	<ul style="list-style-type: none"> Facilitate transformation and adaptation of inner spaces by the user 		x	x
	<ul style="list-style-type: none"> Reduce maintenance needs of buildings 		x	
	<ul style="list-style-type: none"> Apply facility management to coordinate all efforts related to planning, design and managing buildings 		x	
	<ul style="list-style-type: none"> Reduce impact on urban life during demolition and construction of buildings, assuring at the same time that work conditions in the construction setting are optimal in terms of health and safety 	x		x
	<ul style="list-style-type: none"> Provide optimal conditions of liveability in terms of health and comfort in the inner spaces all along the life of the building 	x	x	x
	<ul style="list-style-type: none"> Use natural materials as far as possible 	x		x
	<ul style="list-style-type: none"> Consider the durability and life-cycle of materials 	x	x	
	<ul style="list-style-type: none"> Eliminate negative impact of certain construction materials on health, comfort and welfare of those manufacturing, manipulating or living with them 	x		x

Table 2 (continued) Principles for the sustainable urban development

Sector	Principle	Dimension of sustainability		
		Envir	Econ	Socio
Transport system	• Design a traffic net with the shortest paths possible for pedestrians and direct lines for public transport		x	x
	• Maximise the share of non-motorised and public transport in modal split as well as to provide optimal accessibility conditions for all sectors of the population	x		x
	• Provide best accessibility conditions at a local and global level for all inhabitants		x	x
	• Internalise externalities to allow a fair competition		x	x
	• Promote the multifunctional character of roads as liveable public spaces		x	x
	• Promote social control in transport corridors and open spaces			x
	• Use information system technologies for transport management		x	
	• Improve continuity of traffic while respecting pedestrians, cyclists			x
	• Reduce vehicle accessibility	x		x
	• Reduce the impact of motorised traffic on citizen's comfort and safety			x
	• Minimise collisions within traffic system		x	
	• Develop an integrated system of public transport (railway, light rail, ECO bus) to improve the connections within the town and in the region		x	
	• Provide the densest interconnected network of pathways, mostly independent from the network for cars			x
	• Create potential for car free living in an environment, which allows to experience all advantages of doing without a car	x		x
	• Reserve for car free areas	x		x
	• Promote car-sharing			x
	• Concentrate parking spaces in district parking garages	x	x	x
	• Reduce land consumption for parking	x		
	• Locate facilities with needs for transport of goods in greater volume at sites allowing short routes for city logistics		x	

Table 2 (continued) Principles for the sustainable urban development

Sector	Principle	Dimension of sustainability		
		Envir	Econ	Socio
Energy	<ul style="list-style-type: none"> Reduce energy demand and environmental impact of energy cycle while assuring similar or greater comfort level than with conventional standards 	x	x	
	<ul style="list-style-type: none"> Consider street orientation, density and placement of buildings to contribute to the energy efficiency 	x		
	<ul style="list-style-type: none"> Prefer compact forms of buildings with minimal exterior walls and roof areas 	x	x	
	<ul style="list-style-type: none"> Lower energy consumption of buildings by layout that takes advantage of passive cooling/heating and of natural daylighting 	x	x	
	<ul style="list-style-type: none"> Use renewable energy (solar, wind, biomass) whenever possible 	x		
	<ul style="list-style-type: none"> Prefer efficient centralised energy supply systems 	x	x	
	<ul style="list-style-type: none"> Provide appropriate infrastructure also in marginal areas of a city 			x
	<ul style="list-style-type: none"> Use information system technologies for energy management 		x	

Table 2 (continued) Principles for the sustainable urban development

Sector	Principle	Dimension of sustainability		
		Envir	Econ	Socio
Water, sewage treatment, waste	<ul style="list-style-type: none"> Maintain natural water balance using natural rainwater drainage - infiltration over surfaces, basins and hollows 	x		
	<ul style="list-style-type: none"> Supply water in the quality adjusted to different uses - partly replacing drinking water by rainwater or grey water 	x		
	<ul style="list-style-type: none"> Use water as element of sensorial quality associated to city greening to increase quality of public space, creating comfort and welfare conditions 			x
	<ul style="list-style-type: none"> Purify black and grey water with wastewater sewage wetland treatment facilities 	x		
	<ul style="list-style-type: none"> Reduce generation of urban waste and create optimal conditions for recycling and reusing of all resources 	x		
	<ul style="list-style-type: none"> Favour less waste-producing consumption habits, contributing to promote measures of reduction and re-use in production and distribution chain (less wrappings and packs, refillable containers, etc.) 	x		x
	<ul style="list-style-type: none"> Promote conception of waste as a valuable resource, generating local jobs through recycling and re-use of waste 	x	x	x
	<ul style="list-style-type: none"> Eliminate negative impacts of waste on users' comfort, health and welfare 			x
	<ul style="list-style-type: none"> Seek for satisfaction of potable water needs of all inhabitants 			x
	<ul style="list-style-type: none"> Strive for technologically closed production cycles 	x		

Table 2 (continued) Principles for the sustainable urban development

Sector	Principle	Dimension of sustainability		
		Envir	Econ	Socio
Social and cultural issues	<ul style="list-style-type: none"> Ensure affordable and appropriate housing for all social groups to achieve a balanced social structure 		x	x
	<ul style="list-style-type: none"> Provide attractive offers (housing, recreation facilities etc.) to all groups of population (different ages, forms of households) 			x
	<ul style="list-style-type: none"> Facilitate social integration 			x
	<ul style="list-style-type: none"> Consider the role of natural light and colours, of sounds and smells in the urban environment 			x
	<ul style="list-style-type: none"> Promote social innovations that enable integration of the technical, economic and social dimensions of sustainable developments (sustainable lifestyle) 		x	x
	<ul style="list-style-type: none"> Educate the user in the necessity of adopting an active role in the adaptation of the building to external conditions in order to get the best inner conditions of liveability all along the day 			x
	<ul style="list-style-type: none"> Build and maintain positive image of a city 			x
	<ul style="list-style-type: none"> Create opportunities to work also for disabled and disadvantaged groups of inhabitants (incl. children) 			x
	<ul style="list-style-type: none"> Respect culturally specific needs in housing and other activities as well 			x
	<ul style="list-style-type: none"> Keep cultural continuity and respect historical heritage (sensitive use of historical structures/buildings for new purposes, e.g. tourism) 	x	x	x
	<ul style="list-style-type: none"> Maintain continuity of traditional forms of production and crafts 			x
	<ul style="list-style-type: none"> Create settings and tools for the participation of the inhabitants in decision-making and management for a better identification with the quarter and for integration of the demands of the inhabitants 			x
	<ul style="list-style-type: none"> Facilitate democratic and transparent decision-making 			x
	<ul style="list-style-type: none"> Strengthen customer orientation of local governance 		x	x
	<ul style="list-style-type: none"> Provide sufficient infrastructure for education and learning to get for a learning city 		x	x
	<ul style="list-style-type: none"> Establish social networks and informal structures to promote personal interaction and development of social capital 			x

Table 2 (continued) Principles for the sustainable urban development

Sector	Principle	Dimension of sustainability		
		Envir	Econ	Socio
Economy	• Harmonise economic efficiency always with ecological compatibility of all activities	x	x	
	• Improve the market mechanisms to keep prices of plots at suitable sites affordable, allowing the location of all kinds of necessary facilities at these sites			x
	• Establish appropriate institutional environment for managing sustainable development		x	
	• Create opportunities for local development related with tele-work through a suitable design of new buildings with flexibility and versatility criteria		x	
	• Utilise local disposable products, material sources, and capacities of human resources whenever possible		x	x
	• Maintain continuity of environmentally compatible traditional forms of production and crafts		x	
	• Support small and medium sized enterprises, family businesses		x	
	• Support cluster development - clustering of activities		x	
	• Create conditions for intersectoral oriented development		x	
	• Support public-private partnerships as an instrument for implementation of local development, involving particularly the banking sector and other private investors		x	
	• Apply knowledge and facility management techniques in managing activities in all fields and sectors		x	
	• Use economic incentives to promote sustainable development (green taxes and tax relieves)		x	
	• Prefer light manufacturing		x	
	• Improve conditions for dissemination of know-how and good practices within the professional world as well as between inhabitants		x	x
	• Distribute equitably operation costs among users keeping economic and financial balance of supplying companies			x

Table 2 (continued) Principles for the sustainable urban development

Sector	Principle	Dimension of sustainability		
		Envir	Econ	Socio
Landscape, nature and urban climate	• Preserve ecosystem vitality (native vegetation and wildlife) in the landscape around the built up area	x		
	• Consider ecological bridges	x		
	• Create compact and interconnected system of open spaces	x		
	• Cultivate urban greenery using indigenous (xerophitic) and resilient vegetation to reduce maintenance needs of public spaces	x		
	• Integrate water elements into open spaces - creeks, ponds, fountains (considering also their aesthetic values)	x		
	• Support green tourism in co-operation with ecology oriented tour operators and travel agencies	x		x
	• Offer recreation areas in the surrounding landscape and attractive parks next to neighbourhoods to avoid weekend recreation away from home		x	x
	• Maintain and conserve climatic important elements and areas	x		
	• Improve ventilation conditions by development of connected open space corridors	x		
	• Consider the main wind direction for the spatial expansion of settlement areas		x	x
	• Provide a choice of climatic favourable forms for green spaces and buildings	x		
	• Increase filtering and absorption capacity of urban land, leaving wide areas with no paving	x		
	• Improve quality of air by avoiding or reducing emissions from transport and industry as well as by using trees and vegetation	x		
	• Protect inhabitants against noise, vibrations and other negative effects of transport, industry etc.	x		x

2.2 Urban Development towards Appropriate Structures for Sustainable Transport

The common definitions of sustainability emphasise saving of resources, preferring renewable ones, minimising pollution and improving the quality of life. This is called the *Ecocodevice* principle (<http://www.bk.tudelft.nl>). For urban transport resource saving (and reduction of pollution) means minimising of the need of transport (need of mobility) and shift of the modal split towards the more environment-friendly transport modes. Quality of life means here first of all accessibility, but also security, aesthetics and satisfaction. Motto for the sustainable urban transport can be: *more accessibility with less mobility*.

Within the Ecocity project we try to maximise sustainability and keep accessibility on the highest level possible. In order to adequately define *accessibility* the introduction of three assumptions about human behaviour is required, all of them well supported by research:

- People travel from the major part not just for the sake of it, but in order to participate in spatially disjointed activities (e.g. living, working, shopping, visiting in different places)
- People want to (and often have to) have a choice among so large number and so diverse range of activities as possible
- Travel costs, and particularly travel time (rather than travel distance) set a limit to these possibilities (in the form of total daily travel time budgets, travel-to-work time budgets etc.)

According to these assumptions accessibility can be defined as the amount of diversity of activity locations that can be reached within an acceptable travel time.

Our goal is maximising the synergy between sustainability and accessibility. This can be expressed as the goal of “*creating conditions for a so large possible share of the more environmentally friendly modes in urban mobility, while at the same time increasing the amount and the diversity of activity places that can be reached within an acceptable travel time*”

The above-formulated goal is a useful reference when identifying promising sustainable transport and land use concepts. In general terms, the sustainability with accessibility goal can be achieved if households and firms can link the same or a greater amount and diversity of places of activity instead than by car:

- without travel
- by walking or cycling
- by transit
- or by the use of more efficient and/or clean cars.

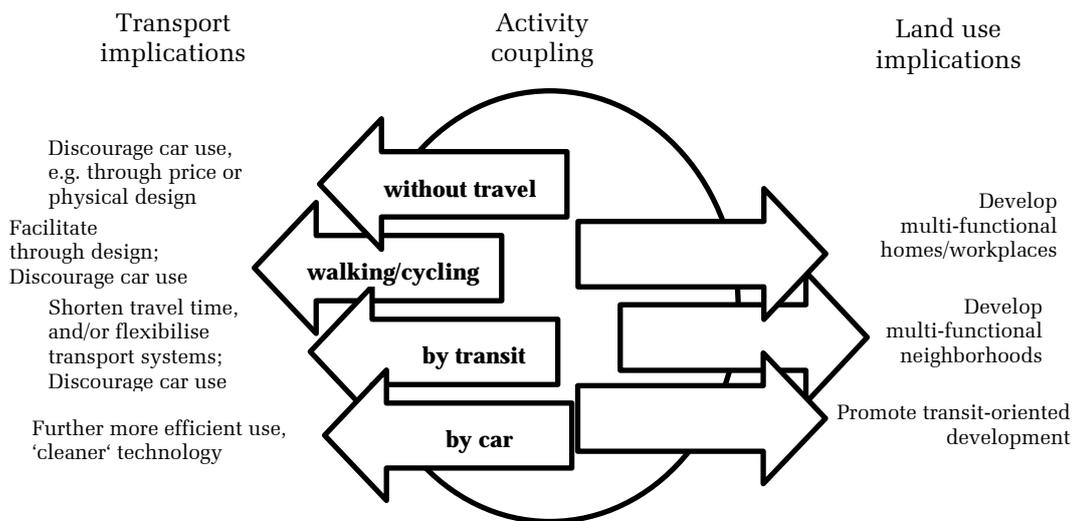
The need of accessibility is linked to the objective of equity, which is also mentioned in the common sustainability definitions as the equity in resource accessibility. In our context of transport and urban structure this can be interpreted as spatial accessibility (city of short distances), accessibility with different transport systems (holistic approach), accessibility for handicapped people (barrier-free city), accessibility for people without cars (public transport friendly city). Good

accessibility for all inhabitants within the framework of sustainability is one of the most important objectives of the Ecocity.

Resource saving is another objective. Like the trias energetica (<http://www.dubocentrum.nl>) there is a rule of priority:

- Don't use any resources,
- When you have to use them than use renewable ones,
- When non-renewable ones cannot be avoided, use the resources as efficiently as possible.

Figure 3



In our context we can speak not only about the “traditional” resources as the fuel (energy) needed - urban space is a resource too (limited and only partially renewable) and from the inhabitant’s point of view time has a high value. For any transport we need energy, space and time. So we first try to fulfil needs without travel, the role of telecommunications is a valuable one in the Ecocity. Secondly we try to fulfil local needs on the local level, within the neighbourhood or urban quarter (that is another common sustainability principle) – by doing so - we minimise the need for transport.

Our approach will facilitate walking and cycling by developing dedicated infrastructure (footpaths, bicycle paths), improving the speed and especially the flexibility of transit (as with light rail and park & ride systems), stimulating the introduction of cleaner engine technologies and when necessary at all the more efficient use of the car (e.g. through car-pooling or car-sharing programmes).

An accompanying, highly effective transport policy measure is in all cases of course (selectively) discouraging car use, for instance through parking regimes, pricing or

physical design. Examples of land use policy implications include the development of multi-functional homes and workplaces, e.g. allowing teleworking; developing multi-functional neighbourhoods allowing walking or cycling to workplaces, shops or other facilities; orientating the spatial development of urban regions to transit networks, as in 'transit oriented development'.

A variety of transport and land use packages can be derived from these policy implications. Local conditions will largely determine which are the most effective. However, some guiding principles can be identified and are introduced in the following. It is important to underline that such principles should by no means be seen as blueprints, but rather as visualisations of potential directions. Furthermore, their focus on the supply side of transport and land use measures should not obscure the fact that also demand management measures such as parking regimes or pricing of car use are an essential part of successful strategies.

Essence of the sustainable urban development is in the coincidence of interactions of the urban space and transport (which consumes energy, space and time). While free mobility of inhabitants is necessary for fulfilling of the needs of inhabitants and has to be maximised, at the same time resource consumption has to be minimised.

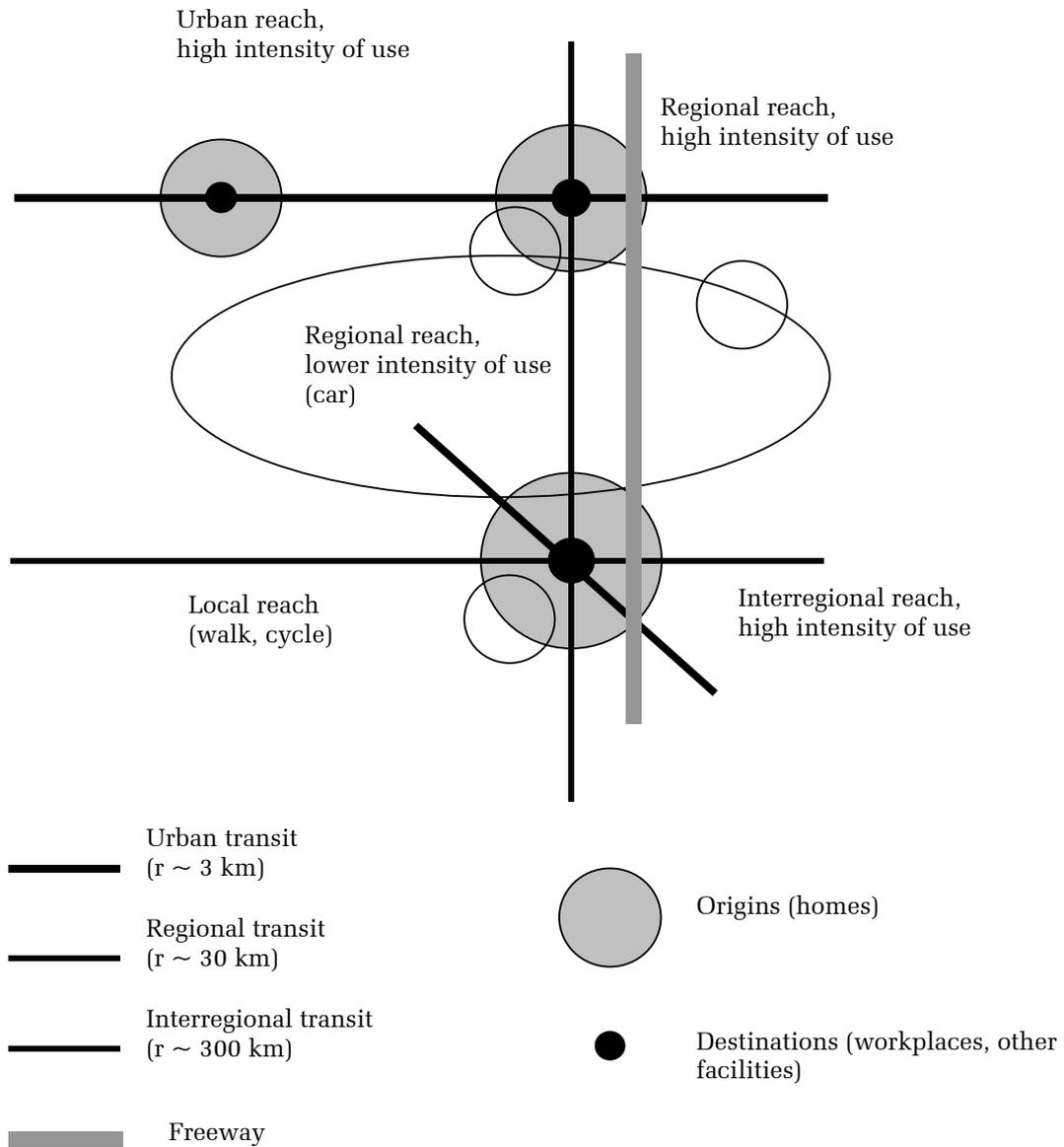
The central idea in forming these guiding principles is that the quality of the accessibility of a given location has to be matched by the sort of activity to be located there, exploiting the specificity of all sorts of transport modes. We define this philosophy as 'multimodal urban development'. In this perspective two dimensions are especially important: the spatial reach of an activity or function (or its market or 'catchment' area, e.g. expressed in kilometres) and its intensity of use (e.g. expressed in inhabitants, workers and/or visitors per unit of space and/or time). Given these two dimensions the features (e.g. speed, flexibility, capacity) of the different transport modes determine the preferred location of an activity.

On and around transit nodes (and activities) should be located with a spatial reach matching the scale of operation (and thus the speed) of the transport system and intensity of use (e.g. concentrations of office, leisure, shopping). Acceptable travel times to and from the transit node determine the extension of the 'nodal areas' where respectively origins (homes) and destinations (work, free-time) are located. Cycling and walking are the most suitable travel modes for activities with a low spatial reach (e.g. use of local services, neighbourhood visits). Public transport serves well for high intensity of use (dense urban areas, transit nodes). Crucially, only activities with a high spatial reach and a low intensity of use (i.e. low-density housing, work etc.) are best served by the car-system. This is because only in these cases the speed and the flexibility of the car cannot be matched by the alternatives. But these cases are avoided in the 'eco' urban structure and as a consequence in the Ecocity the car might be abandoned at all.

The essential elements of the ensuring multimodal urban morphology need to be illustrated. This is done in the figure 4 where a schematic transport infrastructure network determines the location of activities according to their spatial reach and intensity of use, following the criteria identified earlier (or, of course, the other way round: the location of activities determines...): activities with high spatial reach and high intensity of use around transit nodes, activities with low spatial reach in walking and cycling environments, only activities with high spatial reach and low intensity of use dependent on the use of the car. In practice both the spatial pattern

of activities or the pattern of the transport infrastructure could be the starting point of development.

Figure 4 Elements of the multimodal urban morphology



For the measuring of transportation process we use characteristics of demand (need of transportation of persons or goods) and supply (ability of transport systems to transport persons or goods). Supply and demand have to be in equilibrium and the transport system has to be designed in a way supporting achieving this equity of supply and demand in the most efficient and sustainable way. So the preferred system depends on the geographic level of transport and the intensity of use of the

mobility environment as shown in the figure. If the supply is smaller than the demand, accessibility (and with it life quality) is not sufficient. If it is greater, it supports unnecessary mobility and wastes resources.

Interactions of urban and transport structures happen first of all in the public urban spaces - streets and squares. Their quality can be assessed from the viewpoints of ecological, economical and socio-cultural dimensions of sustainability (for details see part 2.3.2). From a bit different point of view the criteria of this quality can be distributed into three groups: first one deals with transport economy and modal split (traffic volume, modal-split, parameters of road profile, traffic speed, traffic safety, pedestrians in the corridor, cyclists, crossings and permeability, parking and facilities, public transport), the second with land use and environment (structure of function, width of corridor, operating of zone, density of built area, density of peoples in open space, traffic calming elements, building quality, spatial barriers, ground-level facilities, lighting of public areas, height of buildings), the third one deals with the socio-cultural demands (natural elements, cultural heritage, interaction of functions, noise, air pollution, vibrations, dazzling effect, safety of space, social and psychological barriers, aesthetics of street or square, visual pollution). For details see Criteria Catalogue.

Urban development towards appropriate structures for sustainable transport is supported by these planning tools: strategic vision, organisational management, technique and design. They can be used for all relevant transport modes and transport infrastructure (walking, cycling, car transport, public transport, city logistics of goods and information technologies). Each type of replacement in the urban space has to be anticipated, modelled and organised, respecting the following fundamentals: safety, fluency, and convenience. For Ecocity we expect a mixture of *integration and segregation* of different transport modes. Parameters for decision-making in this field are:

- density of people in the urban space
- speed difference of pedestrians and vehicles
- local specifications and limits.

According to the core topic of the project Ecocity, urban planning strategies shall give priority to the requirements of sustainable transport. Therefore urban structures convenient for pedestrians, cyclists, public transportation and efficient distribution logistics are treated now in more detail. Spatial and traffic structure should be such that people choose walking most of the time, cycling and public transport frequently, but individual car transport only occasionally.

Urban structure for pedestrians and cycling

The most important aspects determining the urban structure are short distances (as pedestrians prefer the shortest paths possible, it is important to avoid long ways round) and attractive pathways (as the build up surroundings are very important for route-choice and the way pedestrians “feel” the public space, an integrated approach from traffic experts, architects and city planners, is proposed). For short distances main requirements are high density and mixed use. To obtain a space-saving urban structure as well as the minimum number of inhabitants, allowing a balanced mixed use with a great variety of ecologically business and trade facilities,

an appropriate, qualified density is necessary for urban quarters. Mix of functions: (housing, working, education, supply (goods and services), recreation and leisure activities) is proposed, dwellings, places of employment, schools, shops and service- (commercial, social, administrative) and leisure facilities should be easily accessible for pedestrians. A mix is also necessary within the functions to allow a choice for the inhabitants: e.g. a variety of branches for places of employment or for supply of goods (trade).

Mixed-use structures can be observed at following distinctive levels: at floor level (e.g. housing and working mixed on the same floor), at building level (different facilities e.g. housing, working, shopping in the same building), at block-of-houses or neighbourhood- level (different facilities for e.g. housing, working, shopping in different buildings side by side: residential building, office building, department store) or at quarter level (small residential or business areas - wide-meshed mixed use structure with further mixed use). The proper location of the facilities for mixed use is important to achieve the short distances from home for the pedestrians. Development of instruments enabling for the inhabitants to find employment within the settlement unit is of special importance (to prevent commuter-traffic). It is important to establish a regional management for co-ordination of constructional and organisational measures for mixed use in urban and land-use planning as well as providing an information system on real estates (dwellings) and jobs available in the communities of the region.

Attractive pathway net means densest interconnected net of pathways independent from the network for cars, design of pathways for convenient walking, weather protection (arcades, passages, roofed pavements should be provided continuously along the main routes, especially for those directed towards the stop of public transport), avoiding of steps (especially important for handicapped, but also for the use of baby carriages and carts to transport goods), a diversified surrounding (makes walking attractive – design of facades, shop windows, plants, “urban furnishing”, banks, wastebaskets, fountains, art - paintings, monuments), space for communication (meeting points in open space (places, parks) and under the roof (reserved spaces in passages, lounges) with public seats and tables) should be provided, measures for transport of goods home from shops (e.g. shopping carts, delivery service)...

To make an urban quarter appropriate for pedestrians (“City of Pedestrians”) the area of a unit covered with buildings should be limited by comfortable walking-distance. The boundary line for building against the surrounding natural landscape should be observed strictly to bring about a compact city.

Cycling: less dense net of pathways, main routes separated well identifiable from pedestrian paths also to be used by ambulance, fire brigade, vehicles for goods delivery and waste collection...

Urban structure for public transport

Most important for making an urban structure appropriate for public transport is the choice of sites for new construction, for a new settlement. As the appropriate structure for public transport is a linear development (chain of settlements), development axes should be selected, where a concentration of future construction of buildings in dense settlement units (urban quarters) around stations, integrated between existing settlements, could be the basis for an attractive public transportation line. These settlement units, well separated from each other by green belts, should be concentrated in walking distance around the stops of a public transportation line. At the same time a hierarchy in the road network has to be made so that the appropriate service and quality is offered for each trip (it is not necessary to serve a 20 km trip with roads appropriate for 120 km/h...

Public transport lines should be direct – therefore linear development is important to avoid detouring. Thus also the necessity of changing is minimised. Design of the stops: Clear information (name of the stop well visible, maps of the lines, timetables, map of the community...), weather protection. Tram or bus can also go through pedestrian zones.

All public transportation modes (railway, light rail, regional and urban bus, demand responsive transport etc.) have to be considered as one functional element, one integrated transport system with carefully designed and located entry points. Connections between sustainable modes means developing of nodes, linking different public transport lines, cycling- and walking-routes. Appropriate location of greater facilities of regional importance is nearest to the central railway station as main node. Each stop should be a central point of pathway nets for pedestrians and cyclists.

Urban structure for efficient distribution logistics

The requirement of distribution logistics is to locate facilities with demand for transport of greater quantities of goods at sites, which allow short routes for the transport vehicles (the track of a light rail line could be also used for the transport of goods). The greatest possible number of various facilities should be accessible in walking distance from home. This means: Vicinity of residential house – within a radius of 100 – 200 m (2 minutes walking, e.g.: common facilities, play-grounds, green areas, recreational facilities), settlement unit (urban quarter) – within a radius of 500 – 700 m (10 minutes walking - e.g.: shops, social and cultural facilities, primary school), in travel distance with public transport - Town, partially region – within a radius of 15 km (30 minutes travel time, - e.g.: regional and local administration, shops for very long term demand as furniture etc.).

The spatial distribution of all different facilities in the settlement area is determined by the best opportunities for supply with goods and for the accessibility by the users adjusted with the frequency of use. Facilities with demand for transport of greater quantities of goods respectively heavy products (ecologically-compatible production enterprises) should be situated at the boundary of a settlement unit (at the primary axis). Facilities with demand for transport of goods as well as for good accessibility by the users (shops) should be situated in central sites along the primary axis. For the location of all other facilities passenger traffic is the

determining factor - facilities, which only exist once in a settlement unit from the centre to guarantee best accessibility for all inhabitants; facilities which are required more frequently are joined in sub-centres. Concentration of shops and services in central points (centre, sub-centres) is optimal. Decentralisation means distribution of smaller units of facilities for daily needs in different parts of a greater quarter. It is fine to develop "service units" around meeting points, including mailbox, telephone (+ fax, e-mail), public toilet, drinking fountains, to distribute them over the quarter to provide these services in the vicinity of all residential houses.

Non-motorised (pedestrian and bicycle) and public transport are characterised as sustainable transport modes, which are worth to be supported in urban design as well as in organisation of the city life. Support for pedestrian transport means first of all short distance urban structure with attractive paths, but traffic calming enabling traffic area integration is very important too and the attractiveness of walking rises with decreasing number of car in the streets. For cycling not only separated bicycle routes are important (there should be a hierarchy of them), integrated traffic is possible too and the possibility of parking of the bicycles increases the attractiveness of their use. The factor of possible speed of this mode of transport is also interesting for its potential users. The same is even more important for the public transport - precedence of buses or trams at the crossings, special traffic areas for them is a simple tool how to make them more attractive, good accessibility of route targets is connected with urban structure.

2.3 Urban Structure

The urban structure in the context of Ecocity should follow a vision of an ideal "sustainable" urban design. This vision has to be one of the results of the whole research, including guidelines for town planners and decision makers, but it is very useful to have some working hypothesis, which helps to define the problem. We try to define such "working vision" now. We can speak about healthy, liveable, saving and just city (see Elkin 1991 or Pifko 1997) and the aim of the sustainable urban development can be preliminary defined as the improvement of the quality of life of the city inhabitants (as individuals, families, neighbourhoods, communities, and including handicapped people, or future generations).

Saving city utilises its resources in sustainable manner: prefers renewable resources (renewable energy sources, recycled materials...), saves non-renewable ones (e.g. area of the city, surrounding country, or building materials...). Its form has to be compact not to waste energy for unnecessary transport or covering unnecessary heat losses, on the other side it has to enable passive use of solar energy. Re-use of existing buildings and urban structures saves resources too, recycling creates new jobs. Saved energy brings another savings – you don't need to build new energy sources.

Liveable city is of high quality of life (which is not equal with the "material consumption" of inhabitants), it enables and supports rich social contacts, enables self-realisation of the people including their real participation on the management of their city, on the definition of its development strategies and on the control of their every-day issues. It has easily reachable facilities; much of green (parks, gardens, wilds, urban woods...) and transport system preferring and supporting non-

motorised and public transport (traffic calming is an important tool here). Liveable city has space for playing children on its streets as well as space for social contacts of their parents. Important issue here is satisfying of the local needs on the local level (this enables to avoid unnecessary transport). Liveability means also identity, urban aesthetics, psychologically interesting environment, historical continuity, and human scale.

Healthy city has healthy environment (un-polluted, ecologically stable), but also healthy society (co-operation, security, identification and involvement are few of the keywords here) and healthy economics ("soft" production, use of local resources etc.) – this all influences human health. We need not only fresh air, secure and silent streets, but also nice houses, good jobs, possibility of participation...

Just (righteous) city compensates disadvantages of some of its inhabitants (small children or elderly people, paraplegics, mothers with small children, people without car...). We can speak about equity too – in the sense of accessibility of workplaces, facilities, schools, accessibility of healthy living, food, water, and in the sense of the equity of chances for all inhabitants. The inhabitants have to benefit from the improving of the living conditions in the city.

How to fulfil this vision? Possible approaches are as follows:

Built environment has to be created on the principle of decentralised concentration (to save space and fulfil local needs on the local level), we prefer mixed use of the urban space, mixed functions and time/space sharing. This can reduce the need of traffic, save fuel (energy) and time; woonerfs and areas with calmed traffic can be created. Economic activities have to be oriented not (only) to the production growth – important is to utilise local sources, prefer environmentally friendly activities, local economies. Saving of energies has too main levels: building usage and transport (and both are influenced by the urban structure too); we can use "least-cost planning" and support utilisation of renewable sources. Other issues are waste management (recycling, sorting at the source), sustainable agriculture in the city surroundings. On the field of the nature preservation we have to create frameworks of the ecological stability in the cities, to plan refugial biotopes, to apply ecological criteria to park design.

Urban functions and mixed use

Increasingly, mixing different land uses in the same geographical area is seen as a positive contribution to planning policy. It is hoped that increasing of the mixed land-use (especially in residential areas) will lead to more sustainable lifestyles, and to minimised use of private cars. Towns and cities will become more attractive, viable and safer to live and work in.

For functional optimisation of urban structure it is necessary to follow these points:

***Balance of all different uses in quarters, city and region;
location of all necessary facilities at suitable sites***

The main proposition is that mixed use developments combining residential and employment functions will allow people to live close to their workplaces and so to reduce the intensity of commuting and transport in cities.

Successful urban neighbourhoods integrate a range of services and jobs without creating single-use zones of shopping, business and housing. There is a greater concentration of public amenities around the streets and public spaces near the centre of the neighbourhood or district.

City centres and commercial centres should combine office, retail, leisure, civic and high density residential uses in close and overlapping patterns to increase the viability and vitality of the centre and facilitate multi-purpose trips.

Best accessibility to all facilities for all inhabitants

Mixed-use structures with higher densities are organised around public transport nodes (rail, bus and underground stations), around urban centres and local hubs, streets and public spaces. The intensity of activities is clearly dependent on the number of uses.

The hope is that more mixed-use areas and more residential development in cities will reduce car use. More city centre residents with access to good public transport would be willing to use this way of commuting to work or out in the evening, rather than using their car. Most people are prepared to walk five minutes to reach their shop, school or local bus stop in the neighbourhood.

Mixed use of space brings vitality back to many parts of city, and in turn enhances security in public places for disadvantaged groups. Traditional streets and other public spaces provide security through its high degree of natural, collective supervision that has received most recent attention. Mix of working, service and living activities provides a lively, stimulating and secure public realm, and by this means also promotes a sense of community within a neighbourhood. Mixed use brings greater activity and therefore supervision within the area - it is thought that crime can be reduced this way.

Long-life, loose-fit, low energy buildings

To ensure sustainable urban development, new buildings must be designed to respond to the interlinked concepts of “long-life, loose-fit, low energy buildings”. These concepts ensure that buildings are built to last, by considering each structure as a long-term investment, involving:

- usage of durable materials and efficient systems of fabrication;
- design for changing user demands and lifestyles, flexible and cost-effective layouts, finishes and materials;
- resource efficiency: exploiting passive energy design and employing appropriate environmentally responsible construction techniques.

Life cycle management can ensure minimal environmental impact of the building before and during its construction (appropriate building materials and technologies), during its exploitation (energy use, maintenance, adaptability) and after its demolition (recycling potential, waste manipulation).

Building to last

Building should be designed to be durable over many generations and through changing social and economic needs providing adaptable and flexible environments that are not fixed in single-use, single-occupier roles.

Low energy buildings – sustainable buildings

Buildings, landscape and public spaces should be designed and built to high aesthetic and structural standards, with appropriate technology, which minimises energy use and encourages recycling.

Principles and measures detailed

Some of the principles and measures of the above-mentioned approaches are explained here in greater detail; even more detailed information is included in the chapters Criteria catalogue and Guidelines.

1. Model areas should be structured for mixed use

- In relation to size and placement of the mixed-use areas, a limit at 300m x 300m (nearly 10 ha) structural differences is recommended. If the model settlement is mono-functional, other uses can be added to the area. This mixed use would also integrate living and working place. Both the fine-meshed (within building) and wide-meshed models of mixed-use structure (at the urban quarter level, city-wide level) have to be applied.
- Recommended ratio of functions (composition of floor areas for a mixed use): housing from 30% min. to 80% max, work from 20%min. to 70% max.

2. Lines of new urban structure should be derived from the existing urban and regional environment to back up continuity

- Appropriate planning areas have to be defined to integrate new urban quarters or neighbourhoods (the model settlements of this project) into their surroundings in the urban communities and the associated regions. When locating the development, following phenomena should be considered:
 - Landscape, topography,
 - Climate and microclimate,
 - Urban and cultural context,
 - Existing buildings and street spaces,
 - Existing transport network, pathways,
 - Connection to adjacent areas
 - Views, landscape structures,
 - Orientation to the sun,
 - Preferences of (future) inhabitants.

3. Development should respect the criterion of the so-called „qualified density“

- A high density of development promotes a high social and spatial-visual density, reduces land consumption and makes a contribution to soil conservation. Vice versa the density of development is limited by demands of uses (i.e. open spaces near dwelling environs) and the necessary keeping free of areas that are important for the town (i.e. cold air corridors, habitats)

and the district (i.e. the providing of areas for ecological infrastructure like wastewater sewage wetland facilities), otherwise this infrastructure must be shift to other places and occupies areas there.

- We have to optimise the density of settlements with regard to the contradictory requirements of transport and economy (higher building density) and user- or environment-friendly architecture (greater distances between buildings with limited height). Density is here defined as floor area and building coverage/plot ratio. In extensively used areas densities can be increased through additions of buildings. It is recommended to respect following indicators of the floor area ratio of building typologies: high-rise buildings: 1 - 2; detached and semi-detached housing: 0,2 - 0,3; mid-rise dwellings development: 0,4 - 0,8; and block developments: 1,1 - 2,3.

4. Urban structure should be designed to comply the criteria of variability and extensibility

- Methods of recycling, retrofitting, and re-using buildings rather than demolition and new construction should be explored. These methods should be used also in larger scale - i.e. for whole areas (functional conversion of zones). Mixed use and fine pattern of urban structure shows more variability after the change of use. Such structure also allows addition of new urban quarters and quicker consolidation of both new and old structures.

5. Housing should follow the criteria of liveability, economic efficiency and diversity serving different needs of different groups of population, inclusive social housing

- It is necessary to provide housing at all levels and scales, including affordable housing, rather than limiting housing to just one segment of the population. This discourages segregation and promotes population mixing and social equity. Sound housing should stimulate sound ecological and social behaviour of inhabitants. Culturally specific needs have to be respected in the housing too, it is fine to stimulate constitution and performance of local housing association. It is possible to provide plots for building associations to save money in comparison to buying dwellings from developers or building companies, and it is possible to develop multi-family houses with a variety of attractive dwellings and common facilities in an attractive surrounding.

6. Basic facilities should be located to allow best accessibility pedestrians

- Location of public services is important: 500m to public facilities, 300m to childcare facilities. Access of necessary transport is important too.

7. Previously disturbed areas and brownfields should be restored and/or redeveloped

- We should prefer brownfield areas to greenfields when locating new structures. It is possible to use fiscal or other incentives (or sanctions) to stimulate redevelopment of brownfields

8. Local culture and historical heritage should be protected and developed

- Significant buildings and structures of the region have to be protected. This will help to create a sense of place. Architectural elements and features characteristic for the city or for the locality/region can help with this too. In

special cases cultural and historical heritage protection can have greater weight than the other Ecocity principles.

9. Streets and squares should respect the human scale, adopting interconnected structure of open spaces, with attractive design

→ Creation of user-friendly urban places and elements, legible and logically composed structure for better orientation in space also helps to enhance humanity of the settlement (humanity as immaterial component complementary to human scale as physical phenomenon). Street elements as trees, planters and seating should be included into sidewalks. This would make the sidewalk a more desirable alternative. Open spaces should be structured according to the needs of various social (age, interests...) groups. Another structuring of the open space should seek a balance between public, semi-public, semi-private and private open spaces. Streets, squares, patios and inter-blocks spaces should be regarded as places for encountering, communication and enjoying representational and symbolic values, not exclusively as traffic corridors and crossings, or residual spaces (*non-places*). To provide lighting of streets and open areas is necessary too.

10. Urban environment should not contain architectural barriers to accessibility

→ Also disabled and disadvantaged people should be able to use all facilities without major discomfort. This means not only barrier-free streets and buildings, but also (at least partially) barrier-free public transportation. Usually paraplegics are cared as the main group of disabled or disadvantaged people, but there is a great variety of other ones, blind and deaf men (especially endangered by the traffic), or young mothers with baby carriages, which need some space for comfortable accessibility too.

11. Non-toxic and natural building materials should be used as much as possible considering also the durability and the life cycle of the building

→ Products such as buildings, household appliances, entertainment electronics or cars should be constructed for a long life, expansion and modernisation should be possible, and finally they should be easily dismantled and recycled. We have to eliminate negative impact of certain construction materials on the health, comfort and welfare of those manufacturing, manipulating or living with them. We can use materials with low hidden energy costs of producing a material; materials from a renewable or sustainable resource should be preferred.

12. Local sources (materials, labour) should be preferred

→ Use of the locally produced building materials has to be preferred whenever possible. This preserves regional identity, bolsters the local economy, and helps the environment by reducing the need for transportation of materials. The same concerns labour: use local labour whenever possible. It has considerable advantage for the local economy.

2.4 Transport

One of the main objectives concerning transport is to match the design of urban structures with environmental friendly transport modes such as pedestrians, cyclists and passengers of public transport. The project Ecocity is intended to carry out the concept of *City of short distances*.

There are three dimensions of sustainable urban development relevant when speaking about transportation activities. First is the *ecological dimension*: as the main objective shall be highlighted reduction of traffic impacts (air and noise pollution) as well as facilitating the transport needs by sustainable transport means. Thus, increasing the share of sustainable transport modes (non-motorised, public) in the modal split, minimising the use of non-renewable resources and negative environmental impacts are the criteria for this dimension of sustainability.

Next dimension represents *economic* point of view: A transport system makes areas accessible. So the diversity and number of activity-places, which can be reached within a specific time frame by foot, public transport, or by bike or car is the next criterion. Since the urban development in an Ecocity is oriented towards public transport rather than to individual transport by private cars, the number of potential passengers will increase, and public transport can be more profitable. Adopting transport reduction, local economy will be forced to prefer local and regional products. This can create additional workplaces and open way for soft (green, agro-) tourism.

As distances within a city are short, and the part of a journey by car which is travelled in the city is small, there is no need at all for high speeds for cars in an urban environment. Driving by an average speed of 30-40 km/h means to avail of the maximum capacity of streets and crossings. In principle the design of the urban environment should be such, that everybody would recognise it immediately as a 'walkable' surrounding, where a car is accepted as a guest and has to behave as such. Design of roads in the urban area should support this behaviour. So narrow driving lanes, with no possibilities to overtake are preferred. The "pedestrian-friendly" image of the streets is supported by the architectural view too.

Third dimension is the *socio-cultural* one: there should be more possibilities for all inhabitants to be mobile and as a consequence their health, comfort and satisfaction will increase. Accordingly, applying all relevant measures, safety has to be increased too (less traffic accidents). Suppressing the motorised traffic will leave more space for other public activities. And as last but not least, the aesthetic perception of streets and squares can be improved.

People want to get the possibility of choice among more transport modes (for different travel distances, with various quality of offer): walking, cycling, bus, taxi, tram, train, car (+ their combinations). They like the possibility to combine travel time with other activities (talking with friends, reading newspapers, enjoying the view...).

Safety is to be guaranteed for the users of urban space: pedestrians, cyclists, people who are waiting on bus stops, sitting on streets, buyers and sellers, and many others (including car drivers). Layout of buildings, equipment of shops, restaurants and cultural institutions should be subordinated to the aesthetic perception of streets and squares. This also influences the quality of public area surfaces (sliding, water,

mud, dust, and ice); information and notice boards are regarded as an undesirable visual pollution of public space.

There are many activities with certain potential to be helpful in achieving sustainable urban environment. In transport system, the integration of the quarter/neighbourhood into the urban and regional context can be used to achieve the objective of sustainable urban surrounding. Paths for pedestrians must take the shortest possible route, should be visible, should provide dense network, and should follow orientation lines and urban landmarks to be used by people.

Another question is the price of transport. Internalisation of external costs will allow fair competition between various kinds of transport. This feature might be used in pricing systems. Multi-functional use of streets (time/space sharing) or full separation of motorised and non-motorised traffic are two typical ways to solve transport problems in urban areas. The aesthetic perception of streets and squares as well as the comfort of pedestrian and cyclist routes are tasks for the refurbishment activities. Careful placing of parking areas enables to create car-free environment.

Measures for sustainable transport

By developing this methodology, we should take into account the choice of legal and regulatory arrangements for sustainable transport in cities, elaborated in the *Project LEDA*. The project provides 20 sustainable measures for sustainability that proved to be so-far transferable in 15 European cities. The recommended groups of arrangements are as follows:

- *accessibility regulations*: increasing accessibility in Lisbon, limited access to the centre in Erfurt, access pricing in Oslo, traffic calming measures in Bologna, environmental zones in Lund,
- *parking policies*: parking policy in Evora, global parking policy in Luxembourg, parking charge system in Ghent, Car-sharing parking space in Wiener Neustadt,
- *public transport*: bus priority scheme in Budapest, quality bus corridors in Dublin, bi-directional bus lane in Zug, shared bus/bike lane in Gent, accessible taxis in Edinburgh, transport Levy on companies in Strasbourg,
- *cycling and walking*: bicycle priority street in Lemgo, pedestrian streets in Copenhagen,
- *land use and environment*: ABC policy in Hague, getting the business in the right place in The Hague, air quality legislation in Lyon.

Figure 5 Measures for sustainable transport as a basis for developing the criteria

Economic aspects	Socio-cultural aspects	Environmental aspects
Traffic volume	Structure of urban functions	Friendly interaction of functions
Modal-split	Width of corridor	Noise pollution
Parameters of road profile	Social control of urban areas	Air pollution
Traffic speed	Density of built areas	Vibrations, dazzling effect
Traffic accidents	Traffic calming elements	Safety of urban space
Pedestrians	Quality of constructions	Visual pollution
Cyclists	Spatial barriers	Natural elements
Intersections and permeability	Parterre facilities	
Car parking	Lighting of public areas	
Public transport	Height of buildings	
	Cultural heritage protection	
	Aesthetics of streets, squares	

2.5 Energy

For the energy saving “trias energetica” is a nice guideline:

- Don't use energy,
- When you have to use it, get it from renewable source,
- When non-renewable resources cannot be avoided, use them as efficiently as possible.

We have to optimise energy production, distribution and use; energy distribution infrastructure is one of the fundamental starting points of any development.

Optimisation of energy production

Utilisation of fuel-energy basis like gas or oil as well as utilisation of renewable energy sources (different forms of biomass, wind or water power, geothermal energy...) reduces the negative environmental impact of energy sources. The potential for improvement for the “classical” sources is also in an effective combustion process during the heat production - it can be done for example via utilisation of low-temperature and condensation boilers. Heat recovery from the combustion gas is another solution. All these measures lead to the reduction of pollutants (particles, SO₂, CO, CO₂, NO_x).

Optimisation of energy distribution

Optimal energy distribution considers efficiency in:

- thermal energy (vapour, hot water and warm water piping),
- electrical energy
- gas supply systems

Reduction of energy consumption of buildings

Energy influences the environmental quality by a great deal. Therefore it is important to reduce its negative impact. Effective use of energy by constructing low energy buildings or renovating the existing ones considering the thermal insulation, shape and orientation of the building are some of the possible means. Also the utilisation of renewable energy sources would reduce pollution, especially the CO₂ emissions.

Economic-technical solutions

Economic-technical evaluation consists of the evaluation of energy savings, investment, payback and determination of prior measures. Energy saving policies should consider measures in building construction, heating systems, ventilation and air-conditioning, hot water preparation, fans and pumps operation, lighting, and operation of different equipment. Since it is possible to express all the savings in finances, economic evaluation is used for the determination of payback of different measures as well as for the determination of their priorities.

Another factors with considerable influence on the energy efficiency are reconstruction, lifetime and energy performance contracting (EPC). Investment cost can be lowered through periodic maintenance of the energy equipment and sophisticated energy management based on information technologies. State can support energy saving through tax relives, subsidised (or state guaranteed) credits, and favourable national regulations and legislation.

In general, energy consumption has an influence on prices of products, salary of citizens as well as on a family budget. In respect to the cultural dimension of sustainability, it is important to support ecological awareness in handling with resources through innovations of educational system, or utilisation public media or state programs/grants supporting the energy saving (legislation...).

Reduced exploitation of the natural resources as well as proper design of the distribution system might contribute to improvement of aesthetic qualities of urban and landscape environment.

Principles and measures detailed:

1. Energy consumption of the model settlement should be reduced using efficient technologies and saving programs

- Reduce energy demand and environmental impact of energy cycle by increasing efficiency in supply as well as by reduction of maintenance costs in buildings and public spaces, assuring similar or greater comfort level than in the framework of conventional standards. Buildings should be equipped with energy-efficient devices and technologies, or older buildings can be outfitted with them. They could contribute to higher energy efficiency in combination with energy-efficient strategies.

2. Layout and location of buildings should take advantage of the natural daylighting and of passive cooling/heating

→ In general, the longer side of buildings should be oriented on an east-west axis (45° maximum deviation) to maximise solar heat gain - potential savings are up to 10%. At the city level, street orientation can contribute to the energy efficiency too. Buildings should be shaped to divert wind in cold climates. Much energy can be saved through provision of natural lighting as an alternative to electrical lighting. Skylights, light-shelves, light-wells, and windows can be used to provide natural lighting in buildings.

3. Compact buildings bring considerable savings and should be preferred by developing new structures in the model settlements

→ Terraced houses / multi-storey housing complexes are better than detached one-family-homes; rows are better than plots - potential savings: 5-30%. Clearly defined volumes of buildings: reduction of projecting parts and niches in buildings - potential savings: 1-2%.

4. Beside reduction of energetic demand also alternative sources should be utilised in the model settlements

→ It is possible to introduce one or more alternative energy sources (not necessarily all types) from the following options directly in the model settlement:

- solar power (as active solar installations on buildings or solar power plants)
- wind power
- water power
- geothermal power
- biogas power
- co-generation

2.6 Water, Sewage Treatment, Waste

One of the most important steps towards sustainability is rational use of energies and natural sources. Beside information technologies, also pure water will be the strategic source of 3rd millennium.

Understanding the earth's natural water cycle and the land's watershed are the keys to sustainable water management. Man's interventions to the watershed has led to many environmental problems including, flooding, droughts, extinction of native plants and animals, water contamination, and depletion of freshwater reserves. Managing this watershed sustainably can enhance the natural habitat, conserve water, and provide long term water storage and flood protection.

The water supply and management system can be described with:

→ **Points** – drinking water resources and its hygienic protected areas (their location within Ecocity model area is not supposed). Its exploitation and protection of mineral and geothermal waters to special statute denomination is possible.

- **Lines** – in case of existing industrial plants situated on the upper bank of the river, the stink pollution is not allowed. The flow regulations should be utilised in minimal extension only.
- **Areas** – the impacts on existing lakes and wetlands should be minimised. It is necessary to keep the natural water exchange.

Protection of water quality could be carried out using non-investment measures like:

- Permanent control of pipeline systems of drinking water, grey and waste water,
- Segregation of drinking and non-drinking water supply
- Harnessing water as an aesthetic element – point objects (fountains, small pools with flowing water), line objects (river promenades, appropriate garden and artificial creation), area objects (lakes, possibly used as recreational biopark),
- Differentiation in payment according to individual consumption of drinking, grey, and waste water.

Actions and measures related to water and waste management are following:

- Maintain natural water balance
- Manage natural rainwater: infiltration over surfaces, basins and hollows
- Satisfy needs of water consumption, adjusting quality of water to the different uses - partly replacement of drinking water by rainwater or grey water (e.g. for use in toilets)
- Use water as an element of sensorial quality associated to city greening in order to increase quality of public space, creating comfort and welfare conditions
- Reduce urban waste and create optimal conditions for recycling and reuse
- Eliminate negative impacts of waste on users' comfort, health and welfare in Ecocity

Considering the needs of citizens, Ecocity should provide appropriate water distribution, with minimal load caused by water management.

The infrastructure for waste collection, treatment and recycling must be located in marginal areas of the city. It should fulfil citizen requirements for drinking water in public areas to refreshing, toilets, also free water surfaces may contribute to higher quality of open spaces. For maintaining good hygienic quality, the concentrated waste from the particular purification processes must be exported into treatment plant outside the inner city.

Water as a natural element, must be respected in all forms – as sources (mineral, geothermal, drinking or grey water), as lakes and rivers – they all impart aesthetic values to the complex space of Ecocity.

Reduction of drinking and technological water, recycling and re-using of using water (activities in housing, production and services) is an objective to be met in Ecocity. The objective of minimisation of waste and waste water could be gained

through recycling without using polluting treatment technologies and collected in separated forms. The optimisation between input and output quality of water uses biological self-clearing, renewal of natural sources and reasonable consumption of inhabitants and producers in (or over) Ecocity.

The distribution systems for drinking-, grey- rain- and waste water must be placed in separated corridors, if possible, in crossable underground tunnels, proper for technical maintenance.

Principles and measures detailed:

1. All resources must be recycled and re-used keeping the waste production to lowest possible level

- Separation of valuable products, interim storage, attractive design of the containers' location
- Recycling of construction rubble, if possible in the area nearby
- Promote conception of waste as a valuable resource, contributing to reduction and re-use of waste in origin and generating local jobs.
- Composting produces a nutrient rich material which is often used to improve soil quality. It is inexpensive and can be done on an individual scale or in centralised composting facilities (preferably)
- Recycling is a logical option for materials not suitable for composting. Metals, plastics and glass are the most common of these materials
- Indicator to be fulfilled in the model settlements: more than 50% of materials should be recycled or reused

2. Water consumption and exploitation should be reduced while assuring equal distribution of potable water for all inhabitants and households

- Replacement of potable water by rainwater or grey water for use in toilets, washing machine, garden watering, car wash; installation for toilets: 10m² roof surface per inhabitant, with washing machine necessitating an additional 20 - 30m² (depending on the type of roof) > potential savings: up to ca. 50% / 50 l per inhabitant and day (potable water)
- Saving of rainwater with green roofs, ponds > potential savings: up to ca. 10% (draining away of rainwater)
- Natural rainwater management: infiltration over surfaces, basins and hollows, combinations with trench drain infiltration > potential savings: up to 90-100% (draining away of rainwater)
- Creative work with water to make people in cities become aware of the cycle of water
- Use separate sewage system instead of combined sewage system > potential savings: ca. 25%
- Use compost toilets (different storage sizes, internal and external compost systems, with or without biological waste), separating toilet systems > potential savings: ca. 45%

→ Do not forget that every site/plot should be connected to potable water supply

2.7 Economy

Sustainable development has the important economic component that have many facets as described in the table of principles for the sustainable urban development. In this subchapter we give the short characteristics of the most important ones.

Public-private partnership is any form of joint business venture, where different partners from public, private and eventually third sector are working together in order to attain common goals. Public private partnerships often prepare and implement projects that are too risky and not too profitable for the private sector, and too expensive for the public sector. Cooperation of both sectors on such projects enable to divide the risks among partners in order to attain the public social and societal goals with reduced funding from the public sources, and raise the return on investment on related private investments.

Intersectoral development means the elimination of the economic monostructure that is equally vulnerable as the agricultural monostructure in the period of crises. Moreover, the diversified intersectoral economy provides good conditions for the clustering of economic activities. It is necessary to evolve both primary (to lesser extend), secondary and tertiary sectors of economics.

Industrial clusters represent critical masses of skill, information, relationships, and infrastructure in a given field. **The clustering of activities** leads to reduction of the transport distances, and that means lower transport costs and environmental load. At the same time, such economic structure can be more sustainable. They attract highly qualified people, moreover, because of the rich economic tissue of the production facilities are investors less likely to move out their investment to other countries, or cities.

Modern telecommunication technologies such as optical cables, internet, mobile telephones, telecommunication conferences, software for workflow, etc., are the important preconditions for effective management of the network organisations, for the functioning of virtual labour teams, international research activities, access to scientific knowledge, culture, recreation activities, shopping and information exchange. These technologies enable telecommuting, so that a part of the employees does not have to travel to the offices each day, and that brings saving of energy for travelling, less energy spend for air conditioning and heating, less space needed for offices and car parking, and less traffic in the rush hours. Another aspect brought by the new telecommunication technologies refers to allocation of the investments. Areas that have been previously geographically less advantageously positioned, may become more attractive for investors, and that in practice translates into the creation of the new job-places, and the reduction of the level of unemployment. Having access to broadband is especially important in attracting technology-creating companies. It is also important for the heavy IT using companies. Increasing number of companies are able either to locate so-called back office operations in distant areas or to outsource those operations entirely to companies located in lower-wage areas.

Social innovation is necessary prerequisite for the **dissemination of the sustainable lifestyles**. The prevailing consumption patterns of the population, marketing practices, social inertia, and social stereotypes create important barriers for acceptance of the sustainable lifestyles. The profit seeking behaviour, taking no regards to damages to the environment is difficult to change. Moreover, prevailing unsuitable life styles are used as the basis of the motivational schemes for the labour force. Changing the lifestyle means also changing of the marketing practices, motivational schemes in the corporations, existing management approaches, and the social responsibility of business sector.

A growing body of evidence indicates that the size and density of social networks and institutions, and the nature of interpersonal interactions, significantly affect the efficiency and sustainability of development programs. Social networks can help in the process of **social capital formation**; and to contribute to the development of indicators for monitoring social capital and methodologies for measuring its impact on development. Martin Paldam and Gert Svendsen define social capital as mutual trust. It is related to production by a key hypothesis: social capital determines how easily people work together. Hence it is both a production factor which must be added to human and physical capital, and a instrument that reduces either transaction or monitoring costs.

It is necessary to **raise the interest of the investors (banking sector) for the sustainable development**. The investors must be convinced that it is a good idea to prefer sustainable development and not the unsustainable ones. Meanwhile there is, however, a lot of problems in this area. For instance, in USA the mixed use developments are perceived as the risky one by banking institutions. The banks do know how to evaluate risks in the non- mixed used development, but on the contrary they often lack the adequate models for the evaluation of the risks of the mixed-use development. Therefore they are willing to finance the mixed-use development with higher interest rate credits and that makes the sustainable development more expensive. It is thus necessary to remove the obsolete banking practices.

Present consumption patterns are sometimes irrational. Marketing often tries to promote the products that people do not really need, yet for their production is necessary to use the non-renewable resources. Rapid innovation makes soon obsolete the older products. These products are then substituted by the new ones, although the older products could still operate or could be repaired. Such production logic then leads the producers to use less **durable materials**, so that the customers are forced to buy the new products after limited number of years. Such an approach makes the volume of the municipal waste greater, and the related costs growing. The similar problems are caused by the non-recyclable packages etc.

Non-renewable resources are often consumed in the excessive way, because they are relatively inexpensive. Their costs often do not reflect the fact that they are non-renewable. The truck toll payments on the freeways in Western Europe do not cover the real operational cost, they do not compensate the population for the negative externalities from the transport such as noise nuisance, pollution, lowered safety, and the destruction of the landscape. Moreover the negative externalities from transport, unsustainable developments such as the excessive construction of the hypermarkets are difficult to estimate, and therefore they are rarely internalised to agents that are profitable, but they are damaging environment, and existing social, economic and urban structures. **Green taxes can thus provide the disincentives to**

unsustainable development and by the tax relieves they may provide the incentives for the sustainable modes of economic and urban development. Implementation of green taxes and tax relief is not easy, however. The competition of the cities for the investment is the counter force against the rational introduction of the green taxes.

Each build-up area, infrastructure, public and green spaces need the maintenance during their existence. Thus, during the construction of these artefacts it is necessary to think about the **minimisation of the cost of maintenance** – it means the use of durable and reliable material and systems, creation of efficient management structures, good facility management of buildings and infrastructure.

It is always necessary to evaluate how well are the objectives of the sustainable development attained in practice. Hence the **functioning information system** must be developed. First of all it is necessary to develop a set of indicators – both quantitative and qualitative that enable to evaluate different facets of such a development (this is practically done in the framework of the present research program). Then periodical monitoring of the progress in the sustainable development by measuring the indicators of the sustainable development and comparing them to their benchmarks is necessary. The measurement or acquiring of the value of the indicators may in practice be connected with non-negligible problems. The information from the information system must be periodically disseminated to stakeholders such as public administrators, citizens, politicians etc., so that the progress or problems could be identified.

Knowledge management is a set of techniques, tools and activities focusing on helping organisations to capture and communicate their "resources, tacit and explicit perspectives and capabilities, data, information, knowledge and maybe wisdom." As the result of the information revolution, the productive capability is no longer completely dependent on capital and equipment; information and knowledge assets are increasingly important. The result is a new challenge to the practice of local economic development. In this information economy, success comes from harnessing the information and knowledge assets of a community and from helping local businesses succeed in the new environment. Knowledge Management can provide the tools to help economic development practitioners accomplish that task. Just as knowledge management techniques are useful in capturing and sharing local tacit knowledge, they are also useful in building the social capital and information sharing mechanisms needed to create successful economic clusters and aid in sustainable development.

Facility management is the discipline being responsible for coordinating all efforts related to planning and managing construction systems, equipment and furniture to enhance the organisation's ability to compete successfully in a rapidly changing world. Facility management consist of three distinct but interrelated areas: the management of support services (1), the management of property (2), the management of information technology (3).

The family firms and SME's are an important engine for the creation of the new jobs, they foster local competitiveness and innovation. The SME's could become more easily the part of the mixed use development. Well developed structures of SME's, especially in service sector, is one of the prerequisites for attraction of the larger businesses into the territory, since they can become adaptable and flexible providers of the services needed for the larger players. The diversified structure of

SME's helps municipalities and regions to avoid the economic monostructures that can be destructive for the local economy in the period of economic crisis. Moreover, SME's incline to use local resources more adequately in comparison to greater firms that rely more on the transport of materials and other commodities from the long distances.

It is necessary to ***create the prerequisites for the socially and environmentally responsible investments***, and the disincentives for investment that damage the existing working social, economic and urban structures, and the environment as well. Some factory outlets can serve as such negative examples. Despite that they operating just some few years, they are still able to destroy the vibrant city centres. After their collapse, it is difficult to recreate the small commerce structure in the centre, and at the same time the city have to face the problem of redevelopment of the brownfields. Similar problems are related to the business investment in the greenfields. In strive to allure new investors, cities offer non-negligible investment incentives that are used by the investors for several years and when the incentives cease, some investors decide to leave the country and close the plants.

Institutional environment in form of formal or informal rules that would push forward sustainable development is another issue that should be mentioned. Both formal and informal rules embody the opinions on what is legitimate, equitable, right or wrong. Institutions are the result of the collective actions. In such a way they limit or make free behaviour of the individuals, they may promote cooperation or incite the conflict. It is necessary that existing legislation or regulation in urban planning does not create obstacles to implement concepts of sustainable development. Shared ethical values whether formally or informally acknowledged by the majority of member of the community may have profound influence on the willingness of the community to pursue the objectives of the sustainable development or not.

2.8 Social and Cultural Issues

To meet social and cultural sustainability in the Ecocity concept, it is necessary to fulfil the needs and requirements of the citizens and sustain cultural values they respect.

Social and cultural issues are related to the value system of the citizens. The most important is to follow that environmental orientation of people is integrated into the value system and along with other values it should become part of their ability to participate in the planning processes.

Fostering the sense of community and identity

Territorial identity (social need to belong somewhere) is an important source for forming the personal human identity. This kind of identity is based on feeling of togetherness to region, city, civic group or state. This bound is common for people living in certain geographical area or having common origin. Territorial identity of Ecocity is a sample of signs and characteristics defining the subject in external and internal manner. There are historical, geographical, cultural, political and ethnic issues included.

Every advanced city takes a profit from its identity. The most effective profiting cities and regions are highly targeted to form their own identity. The behavioural expressions of these subjects might be denominated as a professional manner. Strongly profiled identity of the Ecocity may continuously become a part of image and identity of domestic commercial business organisations, institutes, and all the subjects communicating in external and internal ways towards the public of the Ecocity.

Experiences and recent development show that the cities and regions holding on strategic visions and values are most successful in long-term competition. Only cities, which are transparent, intelligible and strongly value profiled, will be sustainable effective in their growth and able to meet the diverse needs of the public.

Democratic and transparent decision-making and communication

Democratic and transparent decision-making requires democratic, open and honest communication - communication with the public and inhabitants of the Ecocity is neither advertising nor promotion. Although the primarily target of decision making and following public communication is a (maybe non-financial) profit of Ecocity, this profit cannot be reached by tools injuring the other interests (public, competitors, social groups). Described approach is based upon the ethics of communication. This kind of communication is not held in strict outlined frame - sender-receiver, but it is producing a very dynamic system of mutual feedbacks among all of communication partners.

This approach to decision-making and public participation is predestined to become a platform for meetings of partnership communication. The values, mutual respect, feedback and the "revival of words and feelings" are the basic tools of this kind of communication. Hopefully, the concept of sustainable urban development should help to keep these principles alive.

One of the main social objectives is to achieve social equity in the accessibility of the space from the inter-generation point of view in order to safeguard the needs of vulnerable social groups like disabled people, young families with children, one parent families as well as from the inter-generation social equity point of view in order to ensure the needs of future generations. The main principle to achieve social equity is to focus on prevention and introduction of several measures and tools how to achieve it through effective planning concept and policy.

Preservation of cultural identity of community and environment

Culture is a complex phenomenon; it is a part of social base for human being. It is immanent to mankind - all the expressions of the social interaction do include social elements and in turn, all the cultural elements are expressions of social interaction.

Cultural identity of Ecocity is influenced by respectful behaviour towards the environment, sense of community, responsibility toward the future needs and preservation of cultural heritage. Leaders of community should promote these values and norms and they are supposed to be accepted by most of the community members. Values, beliefs and norms are visible in many forms - urban structures, visual communication, orientation systems, local authority decisions, human friendly environment etc. These issues should be the factors of stability of

community. The practical and common system of values and norms enshrined in tradition and the used forms of social behaviour and relationships is often stronger norm factor than a formal law system.

Culture is a continual phenomenon - culture is considerable as an accumulation of subject's history. Culture is often declared as the toughest bound between past and future success (or failure). It is extremely valid for the Ecocity concept. There is no possibility to reform a culture within couple of days, because of strength of routine. Reform of culture depends on the depth of cultural roots in minds of people, which may become a positive or a negative factor. The culture of Ecocity cannot be prescribed - people must share it.

Public participation

One of the main tools to achieve social and cultural sustainability is the process of participation in planning, in which all stakeholders involved in planning take part - the citizens, NGO's, interest groups, businessmen and local authority. The initiative of local people and public participation is crucial for the success of the Ecocity project.

Participatory approaches provide opportunities for people to better understand policies and projects, and to identify possible alternative solutions to achieve the planned goals. Furthermore, early participation can help to avoid planning mistakes and may increase the acceptance of a project. Generally, it is accepted that an increase in citizens' participation is extremely valuable in terms of transparency, accountability, equity and efficiency. The results of social acceptance can be crucial for making the Ecocity living.

There can be distinguished formal and informal processes of participation. While formal processes are based on a legal background and refer to the conviction that citizens must be given the possibility to formulate their concerns, an increasing number of informal, non-statutory, processes also take place.

However, participation also implies risks and planners should be aware of them before starting any type of initiative. Citizens' participation programs can increase the costs and timescale of a project. Further problems may concern difficulties in leadership and management as well as in the generation of conflicts and in reaching consensus. Furthermore, poorly planned participation may focus decision-making on the views of groups who are experienced in influencing politics. Therefore, the participation mechanism must be well prepared.

The concept of participation of the citizens in Ecocity projects will follow these objectives:

- to raise public awareness and involvement of the citizens in planning of the Ecocity by providing the necessary information
- to prepare formal and informal processes of public participation in the Ecocity projects
- to implement the results of public participation in the design of Ecocity,
- to prepare guidelines for successful public participation in the Ecocity projects

In order to deliver the mentioned methodology to assess new participatory approaches, next steps ongoing are as follows:

- Public involvement frameworks will be developed to help planners and decision makers to organise and facilitate stakeholder involvement in a variety of planning and/or policy contexts.
- An analysis of communication processes between decision makers and stakeholders and their results on urban planning. The research will focus on tools to improve information and communication analysing current communication processes as well as new concepts for communication (e.g. Internet, 'virtual planning').
- Choice of best instruments and tools for citizen and stakeholder information, communication and participation. As public information and participation may help to overcome barriers and achieve the acceptance of integrated projects, participation must be taken seriously in future. This requires the development and implementation of co-operative approaches.
- Other methods to be used for public participation in the Ecocity model settlement should be the focused interviews with the key representatives of the public and NGO's, as well as vision workshops with the citizens and roundtable discussions to the achievements of public participation.

One of the fundamental purposes of the public participation on Ecocity project is to gain the mental maps. The future users of the project in the model settlements do possess their own beliefs, ideas and feelings regarding the current standings and positive/negative traits of the city.

2.9 Landscape and Nature

Nature and greenery are integral components of the city. One of the goals of the sustainable urban development is to minimise negative influence of the cities on the natural ecosystems, another one is to connect landscape with the urban life. Current city greenery has usually poor ecological value, the esthetical one is not better. The traditional gardening approach still overwhelms the ecological approach. A sound alternative to the traditional parks and lawns is a natural greenery. If it consists of local plant and tree species, it does not need much of care, gives more freedom of use to inhabitants and has great ecological value.

In addition to ecological values, natural green elements have also many economic and social advantages. First of all, they are much cheaper (maintenance needs are only 50% of those required by traditional artificial parks, and only 20% in comparison with concrete pavements). Natural green areas consisting of resilient xerophytic plants are well adapted to the urban environment, produce raw materials (wood and hay), and may be located also in inundation areas.

Greenery is of great value in protection of the physical and psychical health of the population, improves urban climate and hydrologic situation and therefore it should be planted and protected on all suitable areas and in all forms – from woods, meadows, and productive farms to planters on balconies (Pifko 1998).

Principles and measures detailed:

1. Natural elements such as trees, vegetation and water are to be used to improve climatic conditions, ecological stability as well as aesthetic values of the urban environment

- The climate and the quality of the air could be improved through generous green spaces and fallow lands due to their function as filter and collector of dust and harmful substances; the air cooling effect over these areas can still be perceived at a distance of one kilometre in the polluted quarters around
- Connecting agricultural and forest surfaces on the outskirts of the city with the dense centre for a better urban ventilation;
- All plantation should be structured with lower woods and hedges on the outside and trees and higher plants in the inside to assure differentiated biosphere and to create a zone of transition;
- Preserve and restore especially the native vegetation (site specific plants) and avoid using exotic species - this is essential for maintaining the health of the local ecology. Non-native plants are to be used only if they can co-exist with the local environment.
- Forest patterns: hedges, hedge-rows, hedge trees; hedges are important in a free space network (small habitats)
- Hedges should be at least 4m deep and as long as possible; distance between hedges not more than 300m;
- Grassland: provides long-lasting symbiosis of grass plants and herbs; site and cultivation are important for the development and species combination;
- Water: various free space elements makes people understand natural processes, positive for the micro-climate; a high ground-water level, humid soil, clay soil (no sealing of the soil necessary) as well as the combination with wastewater sewage wetland plants and surface drainage systems are favourable; a varied shoreland, long embankments and a change of deep and shallow parts are important for animals; running water: to re-establish the natural stream form, surface system for the draining away of rainwater into inshore waters

2. Green spaces for recreation are inevitable for human health and must be present in all neighbourhoods

- Free spaces are very important for people, as they give the chance to experience nature in a conscious way; the participation of the future users early on in the natural green space planning process is important; green spaces can encourage the users to pursue various activities
- Supply specialised types of open spaces (squares, parks, promenades, playgrounds, etc.)

3. Catalogue of Criteria for Sustainable Urban Development

The purpose of developing of this catalogue is as follows:

- a) to use it for the case studies
 - to estimate changes against the present state (both positive and negative)
 - to compare cases with each other
 - to provide arguments for decision
- b) to recommend it for the future

3.1 A Short History of Indicator Research

The roots of social scientific indicator research go back to the 1950s, to the time when the United Nations started to draft development programmes for measuring the social and economic development in third world countries. In the 1960s, the United Nations Research Institute for Social Development, UNRISD, was founded in Geneva for this purpose. It took on the responsibility for developing methods for measuring social development, while the International Monetary Fund, IMF, and the World Bank focused on measuring economic development in particular. Other international organisations also started indicator development work, e.g. OECD.

The methodological bases for indicators were founded in the 1960s. At this point, the main focus was however on comparisons that were made between different countries. But the UNRISD, among others, also developed regional and local indicators, which were then applied to measuring development in various developing countries. From the 1960s on, academic researchers in Europe and America also became interested in developing indicators. The results of this first phase of indicator development were used for making social and economic comparisons between different areas in different countries, regions, municipalities and local communities. In the 1960s, the indicators were characteristically quantitative and based on statistics. The 1970s brought a new approach: more attention was given to non-measurable qualitative factors and to the comparison of these.

Towards the end of the 1960s, people involved in indicator work at the UNRISD became interested in developing environmental indicators and combining these to the analysis of social and economic development. This is an area that has since that time become central in indicator development. One example of this is the development work on local settlements launched by the HABITAT Conferences of the UN. The strengthening of the European Union has had the impact that the development work on indicators for local communities has become topical in the EU countries in the 1990s.

The aim of this second phase of indicator development in the EU community is similar to the one the UN have had earlier, in other words, measuring the efficiency and results of the use of received aid in different countries and comparing the social and economic situation and development in these countries, as well as measuring the results of local best practices tests. In the 1990s, the development of indicators

has been restricted to development of quantitative statistical factors. Only some time later have qualitative factors started to attract people's attention.

It is noteworthy that the 1990s indicator boom has hardly learnt anything from the earlier development, and many of the indicator developers do not seem to be aware of the extensive amount of material that was produced in the 1960s and 1970s about the limits and problems of measuring. Instead, these developers seem to have tackled their task with the attitude that they were pioneers of indicator development. Typical of the 1990s wave, which still continues, is that people have found all manner of statistical figures to serve as quantitative indicators. There is no reference to any theoretical base or systematic thinking in this search for indicators. Therefore many indicator lists contain this and that, with no systematic grounds for the content of the list or for the relationship between the various indicators. In addition, many of these so-called „indicators“ do not fulfil the basic requirements for indicators.

Since the EU has in the 1990s emphasised sustainable urban development, its programmes have also contained measurement systems with urban sustainability indicators, as well as general country based environmental indicators. European research on urban areas, as well as EU programmes, differentiate between the study of megapolises and the study of small and medium-sized cities. This is practical because economic and social as well as environmental problems and the policies that are used to tackle these problems may vary a great deal between a metropolis and a small or medium-sized city.

This paper will leave megapolises aside and focus on the problems of smaller cities. The EU projects from the 1990s that have developed the most important and noteworthy indicators in this respect are the Research Network Medium-sized Cities in Europe (European Foundation for the Improvement of Living and Working Conditions, Dublin, an own research institute of the EU) and the Sustainable Cities Project (The Expert Group on the Urban Environment, the EU). The work of these two projects will probably be most valuable when urban indicators for the Ecocity project are developed. We can draw on their work when seeking to construct quantitative and in part also qualitative indicators suitable for measuring local communities. Like in the Ecocity project, their focus has been on Western-European local communities.

Towards the end of the 1990s, the Sustainable Cities Project started a new phase in indicator development that can be called the third phase of indicator development. Characteristic of this phase is that it is no longer sufficient to just develop indicators and indicator groups, the focus is instead on developing key indicators that would be related to several underlying theoretical concepts. Simultaneously, these indicators would describe central junction points on the way towards the goal of sustainable development.

What is an indicator: From components to indicators or vice versa?

When speaking about indicators for a city, the underlying question is: What is a good city, or what are the present problems of cities in relation to a good city, or what are the means for reaching a good city? The idea of using indicators is based on the assumption that the qualities of a good and a bad city can be divided into subqualities (components) and that these subqualities can be measured by means of statistical, i.e., quantitative indicators or they can be otherwise examined separately

using distinguishable qualitative characteristics as the means. Similarly can the various means for realising a good city be separated from one another and comparisons be made about the preliminary and final stage of the city.

When we consider a good city to be a sustainable one, we can divide sustainability into subgroups and think of the city as environmentally, socially, culturally and economically sustainable. In this case we assume that sustainability and its subgroups are known concepts. We can, for example, create components for a socially sustainable city that will characterise the various sides of urban social sustainability. These components are measured with statistical ratios, for example in the following manner: How many of the city's working age population who are willing to work are employed at the point of time t1? The change is measured by the difference in numbers at point t1 and t2. The assumption is that the indicator reveals essential information about social sustainability and that it is only one of several indicators.

The problem will be whether we can measure all the essential, let's say, social dimensions of sustainability, or whether there will be unmeasurable aspects in which we can only rely on qualitative information, and whether we can give the same weight to all the indicators. If their weight varies, who will have the authority to say what the weight of each indicator is, and how will we be able to form a component out of the separate indicators? By adding together equal/weighted indicators or by using some method other than addition? And what is the relationship between quantitative and qualitative factors, and what conclusions can we draw on the basis of measurable and unmeasurable knowledge? A certain statistically formed quantitative indicator can also be related to several components. For example, the indicator for social sustainability describing job market opportunities is simultaneously an indicator for the city's economic sustainability. Another issue is whether the indicator is in direct or in indirect relationship with the goal and whether a change in the state of affairs causes positive or negative side effects. Are there chains of different factors that would lead to a sustainable or to a non-sustainable direction?

By using indicators, we can seek to measure the **state** of the city in relation to a good, in this case, sustainable city, which is the target state. The state can also be also measured as problems or deficiencies in relation to the target state. Then we can measure steps; this means that we measure the state and the extent of **change** in the state at different points of time in relation to the goal. Flow concepts are used to measure the **inputs**, in other words, the measures taken and the policies used to change the state. We can also form indicators by observing who are the **agents** that cause change to the state of the city.

Environmental indicators must be representative, simple and easy to use. They must describe well the matter that will be measured and they must be founded on reliable knowledge that is easily available. In addition, they must be regularly updatable. These kind of qualities are suggested for the evaluation of projects that are financed by the European Structural Fund (European Commission DG XI 1998).

City planning and the following building programmes have an impact on the city's functional and physical overall structure by means of changes in land use and services and by means of technological infrastructure. All of these have direct and indirect effects on what kind of life the inhabitants of the city will be leading, on the city's economic actors' possibilities to act, as well as on the city as a historical and

cultural conception. Considering sustainable development, these functions need to be examined simultaneously from today's viewpoint and from the viewpoint of the coming generations. A good city is also a city of the future.

Overall, statistical indicators are only a tool with which we can draw a rough picture about the situation, about the changes in the situation, about the agents that cause change and about the activities of these agents. Quantitative indicators can and should be supplemented by qualitative factors and general qualitative descriptions, so that we can get an understanding of what a good or sustainable city is in different contexts. The cities of the member states of the EU do vary a great deal in character because of their different climatic conditions and their different historical and cultural backgrounds. We should therefore be cautious when developing the indicators, they may not be applicable in every place. For example, the indicator „the proportion of school children with a socially and physically safe way to school” may be a very useful one for the cities of Northern Ireland and Manchester, UK, but it has very little relevance in small towns in Finland, because situations that compromise safety are exceptional and children generally walk to school alone. These kind of examples give us reason to reflect on whether we should be more interested in components, in other words, qualities of a good city, than in individual indicators.

3.2 Requirements for Sustainability Criteria

General requirements – criteria should be:

- representative
- simple
- easy to use
- founded on reliable knowledge that is easily available
- regularly updateable
- well organised
- comparable in Europe (preferable is global comparability)
- holistic and comprehensive

All sustainability criteria have to represent a characteristic of sustainability. That means, they have to reflect on the goal of sustainable development. Criteria must be relevant from the view of sustainability. However, one of the biggest problems with developing criteria of sustainability is that frequently the best indicators for the criteria are those for which there is no data, while the indicators for which there is data are the least able to measure sustainability.

Criteria of sustainability are different from traditional indicators of economic, social, and environmental progress. Sustainability criteria and indicators reflect the reality that the three different segments are very tightly interconnected. It is of importance that the criteria address these linkages between a community's economy, environment, and society. Traditional criteria tend to be one-dimensional measures that only look at one aspect of a community, such as water quality or number of jobs. However, sustainable community criteria highlight links among different areas of a community.

Criteria must be understandable. They should not only be understood by experts but also by community and common people, which is in fact the intended audience.

Criteria must provide a long term view of the community. They should help measure progress toward that long term goal, not only the current state. Sustainability indicators have to show how near or far the investigated situation is apart from meeting this goal.

Organising or sorting the criteria is necessary for easier evaluation of the effectiveness of the entire set of criteria. It is also important that the final set of criteria cover all the issues that are important to the community. There are more methods for organising sustainability criteria. Category or issue lists based on the main focus of each criterion show whether all aspects of the community are represented. A goal-indicator matrix can show how each criterion relates to many issues or a set of community goals. The matrix shows whether all issues or goals are evenly addressed. In the Criteria Catalogue we used the first method.

For the ecological dimension of sustainability, the goal has been further developed and specified by the Austrian SUSTAIN association:

- Protection of global resources and buffers: All material flows caused by humans must not change the natural global material and energy cycles. That means for example, that fossil energy resources, the atmosphere and the oceans have to be protected.
- Protection of local resources and buffers: The preceding objective is also valid for smaller regions (nations, cities, catchment areas of rivers, etc.). The limitations for anthropogenic material flows are depending on local resources (e.g. potable water, wood), on local buffers (e.g. soil composition) and on local geogenic flows (e.g. natural contamination of rivers)
- Preservation of high diversity (of landscapes and species)

Representative criteria for ecological sustainability have to reflect substitution of not renewable resources with renewable resources, closing of substance cycles in the anthroposphere and reduction of material intensities per service unit.

3.3 Ecocity Specific Requirements

The scope and objectives of the Ecocity Projects have a big influence on the selection of criteria and indicators:

1. Criteria are divided into two groups:
 - Quantitative criteria
 - Qualitative criteria
2. Qualitative criteria are supplementary to the quantitative ones, i.e only those criteria are included in the set of qualitative criteria that are not possible or effective to be expressed by quantitative indicators
3. Indicators and/or rating system are affiliated with the selected set of principles handled afterwards as criteria.
4. Qualitative criteria are associated with rating system (scale 1-5). Qualitative criteria will be translated into equivalent rating system (scale 1-5) through target values, which will be set individually at the phase of evaluation for each model settlement.

5. Only those criteria that have direct (noticeable) relevance to the principles of sustainable urban development are integrated into the catalogue. The structure of the criteria keeps continuity to the Overall Concept (objectives and principles).
6. Criteria are categorised according to their weight into 3 weight categories with different weight index varying from 1,0 (I.) to 0,4 (III). Weight categories will be assigned in the phase of evaluation.
7. Only those principles and objectives are selected for criteria catalogue that are possible to be evaluated in the evaluation phase of the projects and due to the scope and the methods of the projects (Local Ecocity Masterplans) as well.
8. The catalogue is conceived as a list of criteria, concisely formulated in order to facilitate easy evaluation

Specific data that are necessary as inputs for the criteria catalogue are gathered in table 3 – Quantitative characteristics of the model settlement. These data could be regarded as criteria only if related with other values (e.g. number of inhabitants/hectare or floor area /plot area).

Table 3 Quantitative characteristics of the model settlement - example

(data inputs for the qualitative criteria)

Urban Structure		Transport	
Number of inhabitants (area; whole city)		Length of internal road network	
Number of dwellings		Area of pedestrian facilities	
Total land area		Length of internal road network	
Built up area – total		Number of parking places	
Total floor area		Length of bicycle paths and lanes	
Floor area – housing		Energy, water, waste	
Floor area – services		Energy demand	
Floor area – offices and business		Water demand	
Floor area – production		Length of networks (outside build.):	
Area of public spaces		- Electricity,	
Green area		- gas,	
		- heating,	
		- water supply,	
		- sewage	
Demography		Economy	
Age groups:		Amount of workplaces (area; whole city)	
- 0-15		Investment costs	
- 15-65		City expenditure	
- over 65		City incomes	

3.4 Quantitative Criteria

Table 4 Set of quantitative criteria

Sectors	Quantitative criteria	Definition or description	Number / Dim.	Target Value*	Equiv. rating 1-5	
Urban Structure	Population density	Inhabitants per total land area	pers/ha			
	Service density	Area of service facilities per total land area	m ² /ha			
	Dwelling density	Number of dwellings per total area	dw/ha			
	Dwelling size	Net floor area per inhabitant	m ² /pers			
	Floor area ratio	Gross floor area per total land area	m ² /m ²			
	Height of buildings	Average height of buildings Maximum height of buildings	storeys			
	Building coverage ratio	Built up area per total land area	%			
	Transport area ratio	Transport area per total land area	%			
	Share of public spaces	Area of public spaces per total land area	%			
	Share of reconstruction	Share of reconstruction on total construction volume	%			
	Urban sprawl avoidance	Ratio greenfield/brownfield development	%/%			
	Absorption capacity of land	Ratio of permeable/impervious surfaces	%/%			
	Transport	Pedestrian facilities	Area of pedestrian facilities per total land area	m ² /ha		
		Bicycle facilities	Length of bicycle paths and lanes per total land area	km/ha		
Road facilities		Length of internal road network per total land area	km/ha			
Parking places		Parking places per total land area Ratio of underground parking places Land consumption per 1 parking place Average distance from dwelling	pp/ha % m ² /pp m			

Table 4 (continued) Set of quantitative criteria

Sectors	Quantitative criteria	Definition or description	Number / Dim.	Target Value*	Equiv. rating 1-5
Transport	Degree of public transport coverage	Percentage of inhabitants living within a radius of 400 m of stops	%		
	Average commut. distance	Average distance dwelling-workplace	km		
	Trip distance	Overall average trip distance per capita	pers. km/day		
	Ecologically clean transport	Share of automobiles using ecologically cleaner fuels (gas, electricity)	%		
Energy, water, waste	Energy demand	Primary energy consumption per total area	KWh/m ²		
	Heating or cooling energy	Energy per floor area	KWh/m ²		
	Heating efficiency	Efficiency of heat production and distribution system. Usable energy per primary energy	%		
	Municipal waste	Municipal waste per capita	t/pers		
	Recycling	Share of recycling on the amount of waste	%		
	Potable water supply	Percentage of building plots connected to potable water supply	%		
	Water consumption	Water consumption per capita	t/pers		
	Sewage water treatment	Share of treated sewage water	%		
	Renewable and alternative energy	Ratio of renewable usable energy and cogeneration per total usable energy	%		
	District heating	Share of households with district heating	%		

Table 4 (continued) Set of quantitative criteria

Sectors	Quantitative criteria	Definition or description	Number / Dim.	Target Value*	Equiv. rating 1-5
Economy	Workplaces	Workplaces per 100 inhabitants	wp/100 pers		
	Structure of workplaces	workplaces in production sector/workplaces in services	%/%		
	Local capital	Share of locally owned companies on the local turnover	%		
	Internet penetration	Percentage of inhabitants with access to global information networks	%		
Social and cultural issues	Social housing	Number of dwellings per 100 inhabitants	dw/100 pers		
	Affordability of housing	Housing price/average wages per month	months		
	Income polarisation	Split of income groups: top 20% / least 20% of population	%/%		
	Graduation	Percentage of high school graduates	%		
	Demographic vitality	Index: young people under 15/elderly people (65+)	-		
Landscape	Ratio of green area	Green area per total land area	%		
		Green area per inhabitant	m2/pers		

Remarks: pers = person; wp = workplace; dw = dwelling; pp = parking place; sf = service facilities; a = year; t = 1000 kg; ha = 10.000 m²

Rating system: 5 = most sustainable ~ 1 = least sustainable

* Target values will be set at the phase of evaluation

3.5 Qualitative Criteria

Table 5 Set of qualitative criteria

Sectors	Qualitative criteria	Weight of criteria*	Rating 1-5	Remark
Urban structure General	Diversity of urban fabric types and patterns			
	Adaptation of urban structures to landscape and topography			
Land-use and urban functions	Mix and diversity of uses at all hierarchic levels			
	Accessibility of basic services and facilities			
	Accessibility for disabled and users with special needs			
	Diversity of facilities in mixed use			
Buildings and materials	Durability and recyclability of materials			
	Variability and flexibility of buildings			
	Preference of local materials			
	Building scale: correspondence to consolidated local typology			
	Local materials and sustainable construction technologies			
Public space	Interconnection of public spaces (into a system of streets, lanes and squares)			
	Diversity in design of buildings and public spaces			
	Aesthetic qualities of open spaces (streets and squares)			
Transport General	Priority to non motorised transport modes (pedestrians, cycling)			
	Integration into the existing transport system			
	Traffic speed regulation and traffic calming			
	Safety of transport (regarding to potential collision points within the traffic system)			
Parking	Concentration of parking spaces in district garages			
	Distribution of parking places			
Pedestrians, cycling	Segregation of the pedestrian from the intensive motorised transport			
	Additional facilities for cyclists (parking places, hire service)			
	Traffic network with direct and shortest path possible (esp. for pedestrians and public transport)			

Rating system: 5 - very good (=most sustainable) / 4 - good / 3 - medium / 2 - bad / 1 - very bad (=least sustainable)

Weight category index: I. – 1,0 / II. – 0,7 / III. – 0,4 * Weight category will be set at the phase of evaluation

Table 5 (continued) Set of qualitative criteria

Sectors	Qualitative criteria	Weight of criteria*	Rating 1-5	Remark
Energy, water, waste	Reduction of the energy demand of buildings (compact buildings etc.)			
	Utilisation of rainwater			
	Infrastructure for waste separation and recycling			
	Technologies for biomass composting			
Economy	Application of information technologies			
	Public-private partnership (established for implementation of the Concepts)			
	Diversity of the local economy			
	Local opportunities for education and lifelong learning			
	Competencies and consciousness of the city management			
	Activity and commitment of non-profit sector (NGO's)			
Social and cultural issues	Involvement of citizens and other players in planning and decision-making process			
	Diversity of housing (for diverse segments of population incl. low-income families)			
	Public safety (measures to improve public safety)			
	Affordability of education, healthcare and other social services			
	Respect to historical heritage and cultural continuity			
	Offer of cultural activities and events			
	Respect to cultural specific needs in housing and other activities			
	User friendly and liveable urban structures			
	Community culture, identity, symbolic and representational values			
Landscape and urban climate	Avoiding impacts on the ecosystem vitality			
	Interpenetrating of nature and city (natural corridors)			
	Adaptation of the structures and street pattern to the needs of passive solar energy			
	Opportunities for recreation and healthy open space activities within the urban tissue			
	Distribution of green areas			
	Integration of water into open spaces			
	Bioclimatic suitability of the site			
	Adaptation of urban structures to main wind direction			
	Noise protection			
Air quality (measures to improve air quality)				

4. Guidelines for Development of the Concepts of Sustainable Model Settlements

The guidelines for elaborating the concepts for sustainable model settlements will be used in the seven cities involved in the project - Bad Ischl (Austria), Győr (Hungary), Tampere (Finland), Tübingen (Germany), Trnava (Slovakia), Umbertide (Italy), Barcelona (Spain).

The core objective of the guidelines is to implement the goals of the Overall Concept in the Concepts for the local setting so that a sustainable settlement will actually be developed and be built. An other challenge is to compare the concepts of the individual cities, in order to make a guide for other cities and municipalities.

4.1 Local Ecocity Concept and Masterplan

The first planning step is to formulate a Local Ecocity Concept. This is a first draft (drawings) of the sustainable structure of the settlement, 'translating' the ideas from the Overall Concept to the local conditions. It is formulated not in great detail, but serves as a basis and starting point to develop the Local Ecocity Masterplan and the Sectoral Concepts of the Technical Report for the specific (building) site.

The Local Ecocity Concept will also serve as a communication vehicle between sectors, in the local policy arena, and in the process of elaboration of the Local Ecocity Masterplan. It can also serve to enrich the methodology of elaborating sustainable master plans at the national or regional levels in the participating countries.

The Local Ecocity Masterplan is merged together with the Sectoral Concepts into the "concepts for sustainable model settlement", which we will call CONCEPT. The development of concepts for sustainable model settlement runs parallel in the participating cities.

4.2 Description of the Planning Process

As the Overall Concept cannot give the local solutions, every project has to create its own individual process design in detail within the given local framework. The guidelines are a help in that process. The Overall Concept delivers strategies and concepts which have to be translated to the local situation to achieve well landed solutions.

4.2.1 Site Analysis

The first step in the process is the analysis of the site. In this phase the challenge is to keep all the local developments comparable within the Ecocity projects. The framework for the analysis is given by the NetzWerkZeug (Messerschmidt 2002).

The analysis should follow the following steps:

1. Analysis of the relations between the wider environs (city, region) and the Ecocity settlement (quarter) site

This is done by drawing a map of the environs with the location of the site as a centrepiece, which covers at least the daily urban system of the future inhabitants of the Ecocity Settlement (ES). Thus the map should cover an area of about 40 x 40 km. Depending on the local circumstances it can be smaller or larger and it is defined by the “Regional Boundary” as described in the criteria catalogue. The regional boundary is determined by the investigated aspects of the settlement e.g. processes, usage, infrastructures, materials, goods, etc. So the map shows the most important functions (i.e. activity places): Where do people work, live, supply their needs, recreate?. Where are urban centres or sub-centres? On the map the relations between the ES and the wider environs with respect to the main activities of its future inhabitants as far as these are outside the ES are shown. Also the main flows of water, energy may be shown.

2. Analysis of the Site for the Sustainable Settlement (quarter or neighbourhood)

The analysis of the site follows in three steps. In the procedure of the analyses maps of the site and its environs are produced, involving all relevant sectoral experts from the beginning of the project.

First the ground (land) is analysed according to the ‘Netzwerkzeug’. The structure of the landscape is mapped and listed, including: existing water flows, special habitats, forests, meadows, valuable landscape elements, historical elements and archaeological places (survey of landscape). The listing is performed with respect to the dichotomy “constraint” (when the element has to be preserved) and “chance” when the element can be useful with respect to the sustainable model settlement.

Secondly the infrastructure is analysed (according to LTP). This means that the networks for transport (lines and nodes) and energy are mapped. The map shows the networks of the footpaths, the cycling network, public transport lines (bus and rail), the local roads, the regional roads and the national/international main roads. Junctions, crossings which function de facto as an entrance point to a specific network are spotted with their intake circle (the area within which network users utilise this entrance point). Railway stations also are spotted. On the maps the capacity of the roads and lines is shown as well as the intensity of use (the flux of the flow) in vehicles/day cq. Persons/day. These data should be based on counts or at least on an expert guess .

The same hierarchical procedure is followed with respect to the energy networks (gas, electricity, with their pump and transformer stations). Beside the “classical” infrastructure, the following structures are of interest: (district) heat networks coupled with power plants, possible large scale customers for new heat networks and maybe new co-generation plants, and possibilities for the use of solar energy (orientation of existing building structures, topography - slopes to the north, the north of high rise buildings are difficult for passive and active use of solar energy) The mapping is done on two scales:

the urban district or the site proper with its direct environment (~2000 x 2000 m) which equals the Area 1 as defined in the criteria catalogue and

the site including the surroundings (the city or other relevant area $\sim 5 \times 5$ km) which equals the Area 2 of the criteria catalogue. This mapping should be done for every sector or issue.

Thirdly the urban structure is analysed. This is done by mapping the areas, which are dominated by different uses such as housing (residential area), mixed use (housing and other), (city)centre, public offices and facilities, industry (business area), attractions and leisure facilities, which attract a lot of people. The urban structure shows the neighbourhoods or quarters, the density and building height, the age of the building stock, important views, prominent spots. These data are plotted in maps. The noise production (emissions from functions and traffic) is plotted as well as the urban climate (mapped temperature isotherms - if available, open space, cold air source areas and corridors), average wind direction).

3. Conclusions of analysis

The conclusions of the site analysis are drawn in co-operation of the sectoral experts and the local (policy) officers, as both groups have to give support to the Local Ecocity Masterplan which is based on these analyses. First the main issues on the regional level with respect to the development of the site are listed. Secondly the main issues of the site itself are listed. The issues are selected on the basis of the constraint / chances listing of the Landscape analyses. Furthermore on the basis of the connectivity by Public Transport and the connectivity by the other transport modes as well as the possible connection of the site to the energy networks. All the mapped issues can be brought into a list of strengths, weaknesses, opportunities and threats (the so called SWOT analysis). All the points listed in this SWOT analyses serve as a framework for the development of the scenarios for development.

4.2.2 Scenarios of Development of the Settlement Structure

This task leads for each community to the production of the first main-part of the concept, which is the Local Ecocity Masterplan: "Plots of the model settlement structures for the selected site (urban planning, master-plan)".

The development of the sustainable settlement structure should take place in an interactive design process based on dialogue and discussion with local sectoral experts and the sectoral working groups. Furthermore there must be a dialogue and close co-operation with respect to the development of the settlement structure with the community committee. The result of this approach will be that the participants in the process support the designed settlement structure.

The work within this task is structured around four main meetings for each of the 6 communities. With this structure the coordination of the work in the five tasks and the sectoral groups is guaranteed.

The *iterative* design process starts off with a diverging phase (meetings 1 and 2) and produces via an optimising and converging phase (meetings 3 and 4) the result: a draft of the Local Ecocity Masterplan.

Designing is emphasised in the diverging phase. Detailing, mathematical calculation and checks based on the criteria catalogue are emphasised in the converging phase.

Meeting 1: the Local Ecocity Concept

- Meeting for developing a first draft of the structure, the Ecocity Concept
- Participants: multidisciplinary planners (landscape, urban, transport, energy,)

The work for the design of the settlement structure should be organised in such a way that the co-operation of urban and city planners, traffic and energy engineers is guaranteed. In this start off meeting the first rough idea of the concept model settlement will be formulated in a Local Ecocity Concept on the basis of the site analyses. Special topics of the discussion are the interactions of the survey of landscape and the design of the urban structure including infrastructure, and constraints, which have to be considered). The tables of principles and objectives for the Ecocity (from the Overall Concept) shall be used as checklist to ensure the consideration of all aspects of sustainability. The page interrelations in the part “modules” of the NetzWerkZeug is useful to consider the impacts of each sector on other sectors. Useful hints are also to be found in “Modules” 5 and 6 of the Guide to the LTP method (Local Transport Performance). It is suggested to organise the work in this design process according to the Local Traffic Performance procedure. Urban planners and traffic experts should work together. This first meeting has a diverging character and is focussing on the design of the best sustainable solution. It might lead to (two or more) plan-variants as there might be more than one ‘best’ solutions, especially with respect to transport solutions .

The first challenge is the design of the neighbourhood based on a pedestrian network. Possible structures can be found on the site of NetzWerkzeug. Urban structure and the structure of the road network are highly interrelated.

The planning of the traffic concept will take place according to the reverse design method as worked out in the Local Traffic Performance approach. The traffic concept must be an integrated concept, with attention for all modes. It is designed in an iterative process with special attention to the following levels numbered by priority.

- Design the connection of the settlement with the wider region on the basis of public transport routes: integration into the network of the community and region (longer distances), localisation of the stops for the site;
- Design the immediate residential and living environment (1 x 1 km) on the basis of the footpath and the street;
- Design the neighbourhood and the relations with the borough environment, the links within the city (4 x 4 km) on basis of the cycling network;
- Design the relations with city, region, country (longer distances) on basis of car-networks and public transport.

Designed parts have to be coordinated and tuned so the levels fit into one integrated concept.

Meeting 2 Community Discussion

- Meeting for discussion of draft in the community (interaction)
- Participants: multidisciplinary planners (landscape, urban, transport, energy), Community committee (participation, implementation)

The Local Ecocity Concept is presented and discussed with the Community Committee. Here the world of the sectoral professionals meets the world of the decision- and policy-makers.

The main question to solve in this meeting is how content and process aspects - especially related to sustainability, can be linked in the complex field of local forces. The discussion in this meeting is focussing on the explaining of the Local Ecocity Concept and integrating the ideas of the community representatives. The foreseen participation is prepared and possibilities for implementation are considered. The meeting takes place shortly after Meeting 1.

Meeting 3 Participation

- Workshop for presentation and discussion of the revised draft
- Participants: multidisciplinary planners (landscape, urban, transport, energy), Community committee, citizens.

The workshop focuses on a strategic vision of development, based on the Local Ecocity Concept and the results of the work of the sectoral experts - the drafts of the design process are presented. With this workshop the participation process is started.

Meeting 4 Completion of masterplan

- Meeting to integrate the results of the workshop (Meeting 3) into one Local Ecocity Masterplan in co-operation of the traffic engineers, spatial designers and city planners.
- Participants: multidisciplinary planners (landscape, urban, transport)

4.2.3 Interaction and Participation

It is one of the greater challenges within the Ecocity projects to facilitate a fruitful dialogue between the theoretical, ambitious and often abstract starting points of the Ecocity concepts with the practical and economic local reality. Interactive and participatory elements need to be integrated as projects means to achieve both the best possible urban design quality and the broadest possible consensus.

Obviously every individual Ecocity model settlement has a unique history, some build on ideas and concepts which have existed since many years while others have been started from scratch very recently. The context varies from brownfield to greenfield development. The setting of key actors, the local planning and the social culture as well as each city's financial resources to co-finance the projects differ a lot from each other.

The chapter 'Interaction and Participation' describes more detailed the ambitious task and character of work, several models how to approach it, the important role of local champions and shows the way to decide how to select the appropriate tool at a certain stage of the development process.

From the broad range of community planning tools available to be applied to the various stages of each individual Ecocity project, we are mentioning the key four as a menu, from which modules for composing the participation processes for the particular projects should be selected:

Community Committee

As a key element for interaction and participation all projects have established the Community Committee which is active from the beginning.

Community Planning Events

Project Managers and the Community Committee need to jointly decide on the number and timing of Community Planning Events (such as community conferences or community planning weekends). These events can be used perfectly to complete phase 1 'Analysis' as well as to instruct the first design in phase 2 'settlement structure'. Once the draft plans are existing (no matter whether they are result of a Community Planning Event or not!) Community Planning Events can be used perfectly at various stages again and again as tools to

- achieve further quality improvements for the urban design, the technical or the social concept
- build up trust between key actors and informal supporters and the political committees
- market the project ideas and approach to people who want to contribute, live or work in the future settlement
- unlock energy and enthusiasm
- turn criticism into constructive dialogue
- create joined-up thinking and joined-up action
- save time and money
- create a consensus vision and identify appropriate mechanisms for its delivery
- provide a fast track learning process for all the participants
- inspire local people and future inhabitants of the settlement to take on new responsibilities
- support community capacity building and local democracy
- satisfy public sector funding demands for community consultation and public participation

The following paragraphs give an exemplary outline of a typical Community Planning Weekend, which need to be adjusted to the circumstances of the specific Ecocity project. There is a major difference in designing such a Planning Weekend in phase 1 before the first plans are existing or after phase 2 and later on with the task to review and improve given plans.

Preparation

The lead-in period for a Community Planning Event can range from a few weeks to several months, depending on the scale and nature of the project. The essential aim is to ensure that the widest possible spectrum of people attend the event itself. Intensive pre-interviews with a broad variety of people representing the key interest groups help both to raise interest in the Community Planning Process and to gain relevant information about the subject.

The Planning Team assembles and receives background briefings from key people. The multi-disciplinary team brings together the collective skills and experience needed to match the particular characteristics of the project. Workshop facilitators are provided, as well as advisers, analysts and often an editorial team to produce the final report. Where particular groups of people are either unable or unwilling to attend the event itself, Focus Groups can be held prior to the Weekend and the results fed back into the process.

Topic workshops

The event itself sets out public sessions with a number of topic based 'Future Workshops' designed to address the main issues which have been identified in advance at the pre-planning stage. E.g. at Community Planning Weekends the workshop facilitators initiate a process which has three phases:

- Problems - stock taking/criticism
- Dreams - imagination/'utopia'
- Solutions - realisation/how to make it happen

The process moves from negative criticism to positive ideas and suggestions and finally to how these can be implemented.

Participants contribute by jotting ideas down on post-it notes which are then grouped to identify key themes. Ideas are discussed as they arise, enabling a constructive dialogue to take place within a fully inclusive process. The process diffuses the potential for aggressive and single issue dissent. Plenary sessions allow to report back on the results for everyone to be kept informed of progress.

Hands-on-planning

'Hands-on planning' tables are groups of participants begin to analyse the findings so far and to develop ideas that have emerged from the workshops in a more physical form, working around plans of the area in different scale. Although all kind of experts, architects, urban designers and other professionals are present to assist and facilitate these sessions, participants are encouraged to work out potential solutions along with other individuals who may, or may not be in agreement. Responsibility is passed to the participants to try and reach consensus amongst themselves. Walkabout groups can also gather more information and feed it back directly into the process.

The result of these 'hands-on planning' sessions is a number of visually stimulating plans which have been designed on a collaborative basis, combining community aspirations with commercial realities and concepts for sustainable development. They are then presented at a plenary session by members of the group, so that everyone attending the event can be aware of the range of ideas and options that are

emerging. Nothing is censored, but a surprising degree of consensus can usually be found.

Way Forward

Towards the end of the Community Planning Event a 'Way Forward' workshop is usually held to discuss how the development process can be taken forward. It is important to find an ongoing role for the energy and sense of common ownership built up over the event.

Vision for the future and/or improvements to the previous plans

The Planning Weekend Team works in private analysing and evaluating the output from the public sessions. The Vision that is created, together with summaries of the workshops, the 'hands-on planning' sessions and recommendations of the way forwards, is presented back to public e.g. in the form of a 'Report Back' slide show, exhibition and/or broadsheet which encapsulates the results.

Community Information Tools

While the Community Committee and Planning Events are used to close the communication gaps from time to time, project managers can use many classical Community Information Tools to underpin the local information policy.

Exhibitions (to spread out existing information) and questionnaires (to gather information from individuals) can support the communication processes at specific stages. Advanced information exchange platforms like websites via Internet have the power to support the transparency planning process and allow information access as well as comments by everyone.

However, none of these information exchange tools can replace a comprehensive face to face interactive and participatory process in the Ecocity projects. Because these projects are so challenging the trust building factor between the people, who are driving them, is so important. You need to feel and experience the others attitude in a direct and personal way if you want to build partnership towards the desired future.

4.2.4 Sectoral Planning

This task leads for each community to the production of the second main part of the city-concept" the "Technical report including sector-specific concepts for transport, examples of object types (plans), energy supply systems, application of information technology, benefits for employment".

In the technical report the results of the Local Ecocity Masterplan are detailed in sector-specific concepts for the model settlements, focussing on an integrated system of public transport and efficient distribution logistics (city-logistics-system, terminal for goods distribution) as well as in the definition of requirements for sectoral sustainable solutions, focussing on the energy supply systems like solar energy and biomass and focussing on the application of information technology. Explanations of the urban structure in the Local Ecocity Masterplan are also included. The work is done on sectoral level. The sectoral results are adapted to

each other in multidisciplinary teamwork. But in the end the sector-specific concepts have to be checked on integrability and sustainability.

Meeting 5

All sectoral drafts are checked for the compatibility of the sectoral solutions, their sustainability and their integrability into the urban structure of the masterplan in an interdisciplinary meeting of the national experts. Results of this task is the complete technical report and if necessary an update of the Local Ecocity Masterplan.

4.2.5 Implementation Strategies

The methodology of the Ecocity project can support the implementation of the Local Ecocity Masterplan and the developed concepts by creating the best conditions for implementation, developing marketing concepts and strategies. The strategy for implementation has to focus on the local conditions with respect to the legislative framework, financing concepts, awareness raising and organising support of investors and civilians.

With respect to planning and the legislative framework there are similarities between some countries and significant differences between others – for example similarities are found in the planning and legislative framework for Slovakia and Hungary, respectively Austria and Germany, while the planning processes for Finland and Italy differs somewhat from the others.

It is necessary to make a comparison concerning the legislation, planning system, planning processes, decision-making, participation and financing possibilities in each country can be carried out. On the basis of this comparison of the Framework for the Ecocity projects, strategies to support the implementation of the CONCEPTS and ideas to finance the implementation shall be developed - WG5 will come forward with creative ideas for each project focussing on the following themes:

Financing the implementation

It is of importance to carry out an investigation concerning EU-funding to finance the implementation and to get support from EU funding instruments like the LIFE programme, the Community Initiative URBAN or LEADER-Projects for regional development. The investigation will differentiate between funding of activities leading to implementation and the actual building of the site.

The possibilities to get funding from the national state, the region or the city and the possibilities of various public-private-partnership concepts have to be investigated as well.

Organisational structures

Ecocity model settlements will obviously need new organisational approaches in the implementation stage. A special working group will develop and discuss possible organisational structures to implement the Local Ecocity Masterplan with respect to their capability to form social, political and financial power. Useful means and dedicated organisational solutions for the different countries will be developed. Experiences with forms and structures in one country will be translated to others, like i.e. urban development corporation, companionship for house

building, “Baugruppen” (small private groups to build their multi-family house, as in example Vauban), Co-operatives (UK), institutions for real estate and property management

Marketing

Strategies to get people interested in moving in the Ecocity model settlements will be developed. It is important to create new jobs in the areas, too, and therefore strategies to attract business and other employers to start their activities in the model urban quarters will be developed as well. The implementation strategy should take the possible synergy from the whole Ecocity project into account. Marketing the Ecocity concepts on a European level can strongly support the implementation on the local level.

The local implementations together might form an international sustainable building exhibition (like Internationale Bauausstellung “IBA Emscherpark” in Germany). The possibilities to cooperate with international organisations for sustainable development and building should be investigated.

After the comparison it is also possible to assess the framework of the projects and make conclusions how to promote Ecocity principles in urban planning and constructing new urban quarters. It is obvious that the means in different countries and in different kind of projects will vary from case to case.

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6. Appendix

6.1 Interrelations Between Sectors Relevant For An Ecocity

The knowledge about the relations between the fields that define the city as an organism is a process of consciousness and the results at this point of the study are a picture of the awareness of the actors involved.

To find out which interrelations are regarded as important a matrix of 10 predefined fields of urban characteristics had been sent to the participants of this Ecocity project (Figure 6).

Figure 6 Matrix to determine the interrelations

Integrated Urban Planning	A	B	C	D	E	F	G	H	I	J
A Settlement structure Open spaces	X									
B Transport system	X	X								
C Energy	X	X	X							
D Water supply Sewage treatment	X	X	X	X						
E Waste	X	X	X	X	X					
F Resources Material flows	X	X	X	X	X	X				
G Mixed Use	X	X	X	X	X	X	X			
H Economy, Work	X	X	X	X	X	X	X	X		
I Social Aspects Population structure	X	X	X	X	X	X	X	X	X	
J Environment	X	X	X	X	X	X	X	X	X	X

Intensity of influence

0 no influence / 1 very little / 2 little / 3 medium / 4 strong / 5 very strong

The sample for the analysis was 38 answers.

Result 1: The average out of all these answers (numbers between 0 and 5) is shown in Figure 7:

Figure 7

Integrated Urban Planning	A	B	C	D	E	F	G	H	I	J
A Settlement structure Open spaces	X	4,4	3,4	2,9	2,2	2,9	4,1	3,2	4,0	4,1
B Transport system	X	X	4,1	1,3	1,9	3,1	3,6	3,7	3,4	4,3
C Energy	X	X	X	2,1	2,6	3,7	2,8	3,4	2,2	4,1
D Water supply Sewage treatment	X	X	X	X	2,7	2,9	1,8	2,5	2,2	4,2
E Waste	X	X	X	X	X	3,7	1,9	3,0	2,5	4,3
F Resources Material flows	X	X	X	X	X	X	2,6	3,7	2,5	3,8
G Mixed Use	X	X	X	X	X	X	X	3,9	3,9	3,3
H Economy, Work	X	X	X	X	X	X	X	X	4,3	3,5
I Social Aspects Population structure	X	X	X	X	X	X	X	X	X	3,4
J Environment	X	X	X	X	X	X	X	X	X	X

Top-priorities are shown with dark background (four and more points), high priorities with lighter background (between 3,0 and 4,0 points), interrelations with less than 3,0 points without background.

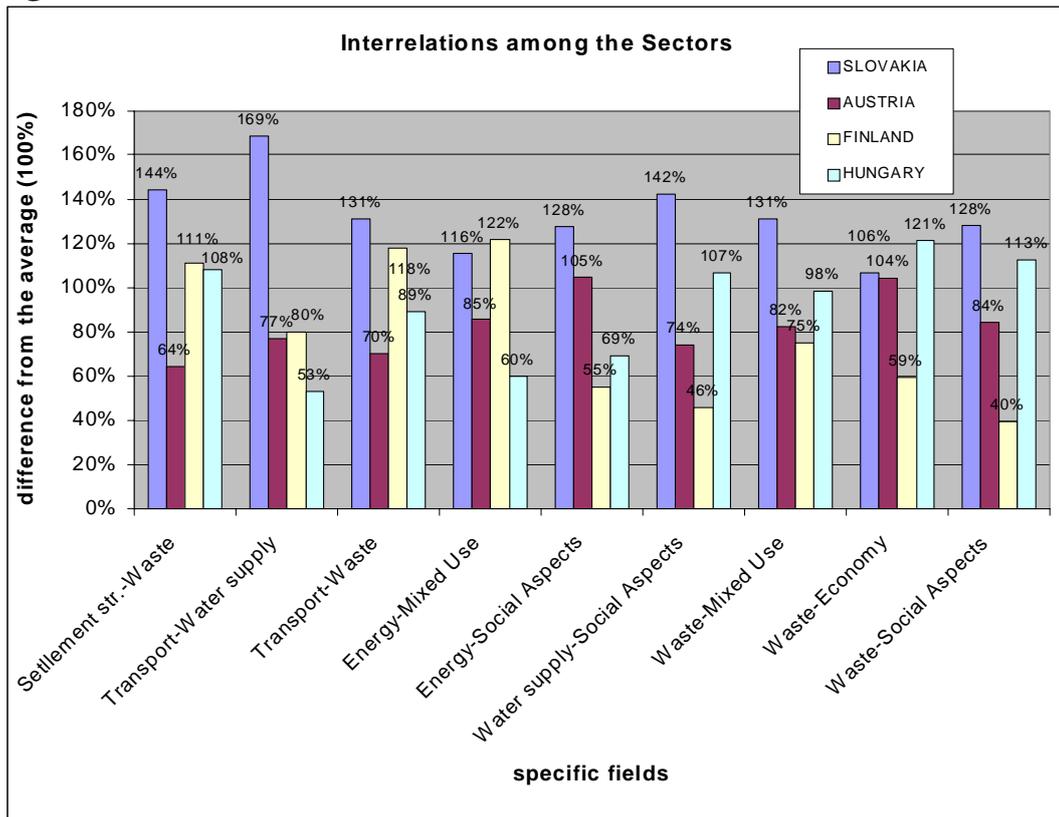
This result can be considered representative (more than 10% identical answers, about 35% answers with equal divergence in both directions, with about 40% divergence below the average and a little less than 15% divergence above the average)

The differences in the results may be explained by the individual view:

- of persons from different countries (with different socio-cultural background),
- of persons with different education in several planning fields and
- of persons with different approach towards sustainability.

Result 2: In Figure 8 the above mentioned possible differences on the national level are shown in the form of a histogram on the example of comparing the most differing answers of representative countries (with more than 6 answers):

Figure 8



Result 3: In Figure 9 in the same way the other above mentioned possible differences are shown on the comparison of the most differing answers of experts in different fields (experts like urban planners, traffic planners, sociologists, etc). Since the main group of participants had been planners they very much determine the average. So the result of wide differences is not only a different sectoral approach but a statistical effect as well.

Figure 9

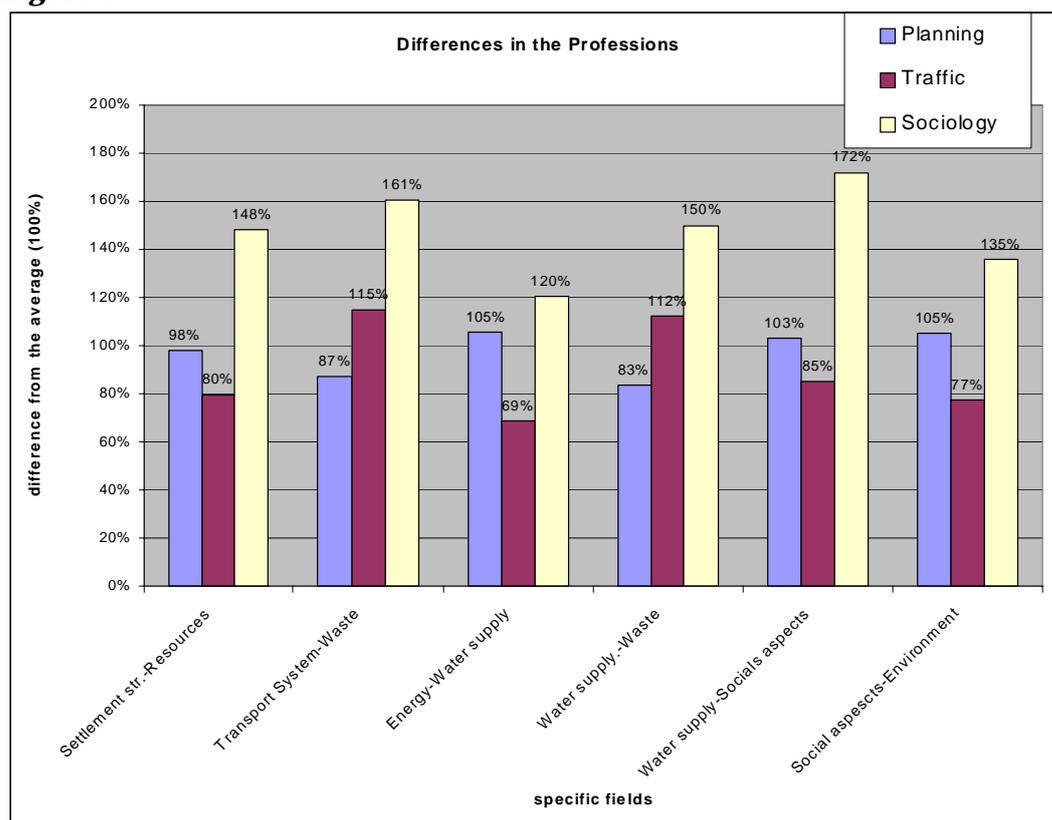


Table 6 New definitions of the terms

1. Settlement structure, Open spaces	Comprehensive Urban Quarter and Open spaces
2. Transport System	All kinds of Transport Systems
3. Energy	Complete range of Energy-flow
4. Water supply, Sewage treatment	Cycle of water
5. Waste	Waste (including pollution, noise etc.)
6. Resources, Material flows	Material flows
7. Mixed use	Mixed use in walking distance
8. Economy, Work	Local Economy, including land costs, taxes, job-opportunities...
9. Social aspects, Population structure	Social aspects including all social facilities, Population structure
10. Environment	Connection to surrounding and landscape, biology, flora, fauna, climate

To deal with the third above mentioned possibility of differences as to different understanding or different approach to Ecocity the working group first proposed a clearer definition of the terms of the ten fields, to avoid major mistakes

System Analysis

The interactions between the different factors in the system of an Ecocity are regarded more closely with the help of the system analysis developed by Frederic Vester. This method serves the evaluation of the whole system, the detection of interlinkages between individual components and the system's limits.

In a first step an expert team collected variables in a brainstorming, which described the system of an ECOCITY as well as possible. The expert team consisted of people from different disciplines who covered as many fields as possible that are relevant in the system of an ECOCITY (e.g. transport, energy, sociology etc.). Afterwards they agreed on the most important twelve variables, including ecological, economic and social aspects.

After the selection of the relevant variables it was necessary to describe them exactly. The definition assure that the team members use the accurate meaning of each variable in the following worksteps.

Subsequently the effect of each variable within the system was described by estimating the interdependencies of all variables (fig. influence matrix). Only direct effects were regarded, evaluating also the strength of the influence regardless of whether it was a positive or negative effect.

Evaluation pattern for the estimation of the strength of the impact

- 0 no direct impact
- 1 slight impact
- 2 medium impact
- 3 strong impact

The result of the influence matrix were two main categories of variables. Each variable in the system influences other variables ("active variable") or is influenced by other variables ("passive variable"). Afterwards both the active (AS) and passive sum (PS) were calculated.

These totals identified the character of every variable as active or reactive (passive), critical or buffering.

Active elements have the biggest influence on other variables, but are least influenced by those – they are ideal for interventions.

Reactive (passive) elements influence all remaining variables the most weakly, but are themselves influenced most strongly (ineffective application of measures).

Critical elements influence the remaining most strongly, but are also highly influenced at the same time (ineffective application of measures).

Buffering elements have a slight influence on others and are themselves influenced most weakly (ineffective application of measures).

The following variables have a **high active sum** (in combination with a low passive sum) – as active variables they are thus ideal for interventions:

- energy efficiency
- environmentally compatible transport system concerning construction and operation
- local supply with goods and services

The following elements have a **high passive sum** (in combination with a low active sum), that means they are the result of various influences:

- quality of life and residential environment
- low emissions

Elements with both **high active and passive sum** (critical elements) are suitable for interventions, whereby you have to pay attention to feedback effects:

- soft use of resources
- sustainable businesses

The roles of the individual elements in the whole system are shown in table 2.

Table 7 Definition of the variables

environmentally compatible transport system	except motorised private transport
low emissions	noise, waste, sewage, waste gas
energy efficiency	house automation, traffic
soft use of resources	input
sustainable businesses	regional small and medium enterprises (SME)
technical infrastructure	supply and disposal, supply lines, traffic for businesses
Ecoefficiency	monetary profit by reduction resource use
socially balanced accessibility to mobility	everybody has an access to mobility
social infrastructure	possibility for communication, interaction, network generating
Quality of life and residential environment	quality of open space, residence, nearby recreation, quality of architecture
local supply with goods and services	supply with goods and services within walking distance
participation and solidarity	public consultation, participatory and consensual decision making

Table 8 Matrix of the indicators

impact on impact of		A	B	C	D	E	F	G	H	I	J	K	L	AS
Indicators		1	2	3	4	5	6	7	8	9	10	11	12	
A environm. compatible transport system	1		3	2	2	1	0	2	1	0	2	0	0	13
B low emissions	2	0		0	0	1	0	0	0	0	3	0	0	4
C energy efficiency	3	3	3		2	1	0	3	0	0	2	0	0	14
D soft use of resources	4	3	2	1		1	0	3	0	0	0	0	0	10
E sustainable businesses	5	0	1	1	1		0	2	0	1	0	2	1	9
F Technical infrastructure	6	0	1	1	1	2		1	0	0	1	0	0	7
G Ecoefficiency	7	0	1	2	2	2	1		0	0	0	0	0	8
H Socially balanced accessibility to mobility	8	2	1	0	1	0	0	0		2	2	2	0	10
I Social infrastructure	9	0	0	0	0	2	0	0	0		2	0	3	7
J Quality of life and residential environment	10	0	0	0	0	1	0	0	0	2		0	0	3
K Local supply with goods and services	11	0	1	1	1	2	0	0	3	2	2		0	12
L Participation and solidarity	12	0	0	0	0	0	0	0	2	2	3	1		8
	PS	9	15	11	14	18	7	18	14	18	27	16	16	

0 no direct impact / 1 slight impact / 2 medium impact / 3 strong impact

6.2 The Shenzhen Declaration on Ecocity Development

(Adopted by the Attendees of the Fifth International Ecocity Conference, Shenzhen, China, August 23, 2002.)

At the start of the 21st century, the cities in which we live must enable people to live in harmony with nature and achieve sustainable development. An ecocity is an ecologically healthy city.

The participants of the Fifth International EcoCity Conference at Shenzhen in China, urge that integrated, holistic ecological perspectives and principles be applied to city planning and management.

People oriented, ecocity development requires the comprehensive understanding of complex interactions between environmental, economic, political and socio-cultural factors based on ecological principles.

Cities, towns and villages should be ecologically designed to enhance the health and quality of life of their inhabitants and maintain the ecosystems on which they depend. This requires careful ecological planning and management and participation of citizen and stakeholder groups into planning and management processes.

Ecocity development is a whole systems approach integrating administration, ecologically efficient industry, people's needs and aspirations, harmonious culture, and landscapes where nature, agriculture and the built environment are functionally integrated.

Ecocity development requires:

1. Ecological security—clean air, and safe, reliable water supplies, food, healthy housing and workplaces, municipal services and protection against disasters for all people.
2. Ecological sanitation—efficient, cost-effective eco-engineering for treating and recycling human excreta, grey water, and all wastes .
3. Ecological industrial metabolism—resource conservation and environmental protection through industrial transition, emphasising materials re-use, life-cycle production, renewable energy, efficient transportation, and meeting human needs.
4. Ecoscape (ecological-landscape) integrity—arrange built structures, open spaces such as parks and plazas, connectors such as streets and bridges, and natural features such as waterways and ridgelines, to maximise accessibility of the city for all citizens while conserving energy and resources and alleviating such problems as automobile accidents, air pollution, hydrological deterioration, heat island effects and global warming.
5. Ecological awareness—help people understand their place in nature, cultural identity, responsibility for the environment, and help them change their consumption behaviour and enhance their ability to contribute to maintaining high quality urban ecosystems.

Key actions needed:

1. Provide safe shelter, water, sanitation, security of tenure and food security for all citizens and with priority to the urban poor in an ecologically sound manner to improve the quality of lives and human health.
2. Build cities for people, not cars. Roll back sprawl development. Minimize the loss of rural land by all effective measures, including regional urban and peri-urban ecological planning.
3. Identify ecologically sensitive areas, define the carrying capacity of regional life-support systems, and identify areas where nature, agriculture and the built environment should be restored.
4. Design cities for energy conservation, renewable energy uses and the reduction, re-use and recycling of materials.
5. Build cities for safe pedestrian and non-motorized transport use with efficient, convenient and low-cost public transportation. End automobile subsidies, increase taxation on vehicle fuels and cars and spend the revenue on ecocity projects and public transportation.
6. Provide strong economic incentives to businesses for ecocity building and rebuilding. Tax activities that work against ecologically healthy development, including those that produce greenhouse gases and other emissions. Develop and enhance government policies that encourage investment in ecocity building.
7. Provide adequate, accessible education and training programs, capacity building and local skills development to increase community participation and awareness of ecocity design and management and on the restoration of the natural environment. Support community initiatives in ecocity building.
8. Create a government agency at each level—city, regional and national—to craft and execute policy to build the ecocity. The agency will coordinate and monitor functions such as transportation, energy, water and land use in holistic planning and management, and facilitate projects and plans.
9. Encourage and initiate international, inter-city and community-to-community cooperation to share experiences, lessons and resources in ecocity development and promote ecocity practice in developing and developed countries.

6.3 The Aalborg Charter on European Sustainable Cities & Towns

As approved by the participants at the European Conference on Sustainable Cities & Towns in Aalborg, Denmark on 27 May 1994

Part I - Consensus Declaration: European Cities & Towns towards Sustainability

1.1 The role of European cities and towns

We, European cities & towns, signatories of this Charter, state that in the course of history, our towns have existed within and outlasted empires, nation states, and regimes and have survived as centres of social life, carriers of our economies, and guardians of culture, heritage and tradition. Along with families and neighbourhoods, towns have been the basic elements of our societies and states. Towns have been the centres of industry, craft, trade, education and government.

We understand that our present urban lifestyle, in particular our patterns of division of labour and functions, land-use, transport, industrial production, agriculture, consumption, and leisure activities, and hence our standard of living, make us essentially responsible for many environmental problems humankind is facing. This is particularly relevant as 80 percent of Europe's population live in urban areas.

We have learnt that present levels of resource consumption in the industrialised countries cannot be achieved by all people currently living, much less by future generations, without destroying the natural capital.

We are convinced that sustainable human life on this globe cannot be achieved without sustainable local communities. Local government is close to where environmental problems are perceived and closest to the citizens and shares responsibility with governments at all levels for the well-being of humankind and nature. Therefore, cities and towns are key players in the process of changing lifestyles, production, consumption and spatial patterns.

1.2 The notion and principles of sustainability

We, cities & towns, understand that the idea of sustainable development helps us to base our standard of living on the carrying capacity of nature. We seek to achieve social justice, sustainable economies, and environmental sustainability. Social justice will necessarily have to be based on economic sustainability and equity, which require environmental sustainability.

Environmental sustainability means maintaining the natural capital. It demands from us that the rate at which we consume renewable material, water and energy resources does not exceed the rate at which the natural systems can replenish them, and that the rate at which we consume non-renewable resources does not exceed the rate at which sustainable renewable resources are replaced. Environmental sustainability also means that the rate of emitted pollutants does not exceed the capacity of the air, water, and soil to absorb and process them.

Furthermore, environmental sustainability entails the maintenance of biodiversity; human health; as well as air, water, and soil qualities at standards sufficient to sustain human life and wellbeing, as well as animal and plant life, for all time.

1.3 Local strategies towards sustainability

We are convinced that the city or town is both the largest unit capable of initially addressing the many urban architectural, social, economic, political, natural resource and environmental imbalances damaging our modern world and the smallest scale at which problems can be meaningfully resolved in an integrated, holistic and sustainable fashion. As each city is different, we have to find our individual ways towards sustainability. We shall integrate the principles of sustainability in all our policies and make the respective strengths of our cities and towns the basis of locally appropriate strategies.

1.4 Sustainability as a creative, local, balance-seeking process

We, cities & towns, recognise that sustainability is neither a vision nor an unchanging state, but a creative, local, balance-seeking process extending into all areas of local decision-making. It provides ongoing feedback in the management of the town or city on which activities are driving the urban ecosystem towards balance and which are driving it away. By building the management of a city around the information collected through such a process, the city is understood to work as an organic whole and the effects of all significant activities are made manifest. Through such a process the city and its citizens may make informed choices. Through a management process rooted in sustainability, decisions may be made which not only represent the interests of current stakeholders, but also of future generations.

1.5 Resolving problems by negotiating outwards

We, cities & towns, recognise that a town or city cannot permit itself to export problems into the larger environment or to the future. Therefore, any problems or imbalances within the city are either brought towards balance at their own level or absorbed by some larger entity at the regional or national level. This is the principle of resolving problems by negotiating outwards. The implementation of this principle will give each city or town great freedom to define the nature of its activities.

1.6 Urban economy towards sustainability

We, cities & towns, understand that the limiting factor for economic development of our cities and towns has become natural capital, such as atmosphere, soil, water and forests. We must therefore invest in this capital. In order of priority this requires investments in conserving the remaining natural capital, such as groundwater stocks, soil, habitats for rare species; encouraging the growth of natural capital by reducing our level of current exploitation, such as of non-renewable energy; investments to relieve pressure on natural capital stocks by expanding cultivated natural capital, (such as parks for inner-city recreation to relieve pressure on natural forests); and increasing the end-use efficiency of products, such as energy-efficient buildings, environmentally friendly urban transport.

1.7 Social equity for urban sustainability

We, cities and towns, are aware that the poor are worst affected by environmental problems (such as noise and air pollution from traffic, lack of amenities, unhealthy housing, lack of open space) and are least able to solve them. Inequitable distribution of wealth both causes unsustainable behaviour and makes it harder to change. We intend to integrate people's basic social needs as well as healthcare, employment and housing programmes with environmental protection. We wish to learn from initial experiences of sustainable lifestyles, so that we can work towards improving the quality of citizens' lifestyles rather than simply maximising consumption.

We will try to create jobs which contribute to the sustainability of the community and thereby reduce unemployment. When seeking to attract or create jobs we will assess the effects of any business opportunity in terms of sustainability in order to encourage the creation of long-term jobs and long-life products in accordance with the principles of sustainability.

1.8 Sustainable land-use patterns

We, cities & towns, recognise the importance of effective land-use and development planning policies by our local authorities which embrace the strategic environmental assessment of all plans. We should take advantage of the scope for providing efficient public transport and energy which higher densities offer, while maintaining the human scale of development. In both undertaking urban renewal programmes in inner urban areas and in planning new suburbs we seek a mix of functions so as to reduce the need for mobility. Notions of equitable regional interdependency should enable us to balance the flows between city and countryside and prevent cities from merely exploiting the resources of surrounding areas.

1.9 Sustainable urban mobility patterns

We, cities & towns, shall strive to improve accessibility and sustain social welfare and urban lifestyles with less transport. We know that it is imperative for a sustainable city to reduce enforced mobility and stop promoting and supporting the unnecessary use of motorised vehicles. We shall give priority to ecologically sound means of transport (in particular walking, cycling, public transport) and make a combination of these means the centre of our planning efforts. Motorised individual means of urban transport ought to have the subsidiary function of facilitating access to local services and maintaining the economic activity of the city.

1.10 Responsibility for the global climate

We, cities & towns, understand that the significant risks posed by global warming to the natural and built environments and to future human generations require a response sufficient to stabilise and then to reduce emissions of greenhouse gases into the atmosphere as soon as possible. It is equally important to protect global biomass resources, such as forests and phytoplankton, which play an essential role in the earth's carbon cycle. The abatement of fossil fuel emissions will require policies and initiatives based on a thorough understanding of the alternatives and of the urban environment as an energy system. The only sustainable alternatives are renewable energy sources.

1.11 Prevention of ecosystems toxification

We, cities & towns, are aware that more and more toxic and harmful substances are released into the air, water, soil, food, and are thereby becoming a growing threat to human health and the ecosystems. We will undertake every effort to see that further pollution is stopped and prevented at source.

1.12 Local self-governance as a pre-condition

We, cities and towns, are confident that we have the strength, the knowledge and the creative potential to develop sustainable ways of living and to design and manage our cities towards sustainability. As democratically elected representatives of our local communities we are ready to take responsibility for the task of reorganising our cities and towns for sustainability. The extent to which cities and towns are able to rise to this challenge depends upon their being given rights to local self-governance, according to the principle of subsidiarity. It is essential that sufficient powers are left at the local level and that local authorities are given a solid financial base.

1.13 Citizens as key actors and the involvement of the community

We, cities & towns pledge to meet the mandate given by Agenda 21, the key document approved at the Earth Summit in Rio de Janeiro, to work with all sectors of our communities - citizens, businesses, interest groups - when developing our Local Agenda 21 plans. We recognise the call in the European Union's Fifth Environmental Action Programme "Towards Sustainability" for the responsibility for the implementation of the programme to be shared among all sectors of the community. Therefore, we will base our work on co-operation between all actors involved. We shall ensure that all citizens and interested groups have access to information and are able to participate in local decision-making processes. We will seek opportunities for education and training for sustainability, not only for the general population, but for both elected representatives and officials in local government.

1.14 Instruments and tools for urban management towards sustainability

We, cities & towns, pledge to use the political and technical instruments and tools available for an ecosystem approach to urban management. We shall take advantage of a wide range of instruments including those for collecting and processing environmental data; environmental planning; regulatory, economic, and communication instruments such as directives, taxes and fees; and mechanisms for awareness raising including public participation. We seek to establish new environmental budgeting systems which allow for the management of our natural resources as economically as our artificial resource, 'money'.

We know that we must base our policy-making and controlling efforts, in particular our environmental monitoring, auditing, impact assessment, accounting, balancing and reporting systems, on different types of indicators, including those of urban environmental quality, urban flows, urban patterns, and, most importantly, indicators of an urban system's sustainability.

We, cities & towns, recognise that a whole range of policies and activities yielding positive ecological consequences have already been successfully applied in many cities through Europe. However, while these instruments are valuable tools for

reducing the pace and pressure of unsustainability, they do not in and of themselves reverse society's unsustainable direction. Still, with this strong existing ecological base, the cities are in an excellent position to take the threshold step of integrating these policies and activities into the governance process for managing local urban economies through a comprehensive sustainability process. In this process we are called on to develop our own strategies, try them out in practice and share our experiences.

Part II - The European Sustainable Cities and Towns Campaign

We, European cities & towns, signatories of this charter, shall move forward together towards sustainability in a process of learning from experience and successful local examples. We shall encourage each other to establish long-term local action plans (Local Agendas 21), thereby strengthening inter-authority co-operation, and relating this process to the European Union's actions in the field of the urban environment.

We hereby initiate The European Sustainable Cities & Towns Campaign to encourage and support cities and towns in working towards sustainability. The initial phase of this Campaign shall be for a two-year period, after which progress shall be assessed at a Second European Conference on Sustainable Cities & Towns to be held in 1996.

We invite every local authority, whether city, town or county and any European network of local authorities to join the Campaign by adopting and signing this Charter.

We request all the major local authority networks in Europe to undertake the co-ordination of the Campaign. A Co-ordinating Committee shall be established of representatives of these networks. Arrangements will be made for those local authorities which are not members of any network.

We foresee the principal activities of the Campaign to be to:

- facilitate mutual support between European cities and towns in the design, development and implementation of policies towards sustainability;
- collect and disseminate information on good examples at the local level;
- promote the principle of sustainability in other local authorities;
- recruit further signatories to the Charter;
- organise an annual "Sustainable City Award";
- formulate policy recommendations to the European Commission;
- provide input to the Sustainable Cities Reports of the Urban Environment Expert Group;
- support local policy-makers in implementing appropriate recommendations and legislation from the European Union;
- edit a Campaign newsletter.

These activities will require the establishment of a Campaign Co-ordination. We shall invite other organisations to actively support the Campaign.

Part III - Engaging in the Local Agenda 21 Processes: Local Action Plans towards Sustainability

We, European cities & towns, signatories of this Charter, pledge by signing this Charter and joining the European Sustainable Cities & Towns Campaign that we will seek to achieve a consensus within our communities on a Local Agenda 21 by the end of 1996. This will meet the mandate established by Chapter 28 of Agenda 21 as agreed at the Earth Summit in Rio in June 1992. By means of our individual local action plans we shall contribute to the implementation of the European Union's Fifth Environmental Action Programme "Towards Sustainability". The Local Agenda 21 processes shall be developed on the basis of Part One of this Charter.

We propose that the process of preparing a local action plan should include the following stages:

- recognition of the existing planning and financial frameworks as well as other plans and programmes;
- the systematic identification, by means of extensive public consultation, of problems and their causes;
- the prioritisation of tasks to address identified problems;
- the creation of a vision for a sustainable community through a participatory process involving all sectors of the community;
- the consideration and assessment of alternative strategic options;
- the establishment of a long-term local action plan towards sustainability which includes measurable targets;
- the programming of the implementation of the plan including the preparation of a timetable and statement of allocation of responsibilities among the partners;
- the establishment of systems and procedures for monitoring and reporting on the implementation of the plan.

We will need to review whether the internal arrangements of our local authorities are appropriate and efficient to allow the development of the Local Agenda 21 processes, including long-term local action plans towards sustainability. Efforts may be needed to improve the capacity of the organisation which will include reviewing the political arrangements, administrative procedures, corporate and inter-disciplinary working, human resources available and inter-authority co-operation including associations and networks.

6.4 Ahwahnee Principles

Preamble:

Existing patterns of urban and suburban development seriously impair our quality of life. The symptoms are: more congestion and air pollution resulting from our increased dependence on automobiles, the loss of precious open space, the need for costly improvements to roads and public services, the inequitable distribution of economic resources, and the loss of a sense of community. By drawing upon the best from the past and the present, we can plan communities that will more successfully serve the needs of those who live and work within them. Such planning should adhere to certain fundamental principles.

Community Principles:

All planning should be in the form of complete and integrated communities containing housing, shops, work places, schools, parks and civic facilities essential to the daily life of the residents.

1. Community size should be designed so that housing, jobs, daily needs and other activities are within easy walking distance of each other.
2. As many activities as possible should be located within easy walking distance of transit stops.
3. A community should contain a diversity of housing types to enable citizens from a wide range of economic levels and age groups to live within its boundaries.
4. Businesses within the community should provide a range of job types for the community's residents.
5. The location and character of the community should be consistent with a larger transit network.
6. The community should have a center focus that combines commercial, civic, cultural and recreational uses.
7. The community should contain an ample supply of specialized open space in the form of squares, greens and parks whose frequent use is encouraged through placement and design.
8. Public spaces should be designed to encourage the attention and presence of people at all hours of the day and night.
9. Each community or cluster of communities should have a well-defined edge, such as agricultural greenbelts or wildlife corridors, permanently protected from development.
10. Streets, pedestrian paths and bike paths should contribute to a system of fully-connected and interesting routes to all destinations. Their design should encourage pedestrian and bicycle use by being small and spatially defined by buildings, trees and lighting; and by discouraging high speed traffic.
11. Wherever possible, the natural terrain, drainage and vegetation of the community should be preserved with superior examples contained within parks or greenbelts.
12. The community design should help conserve resources and minimize waste.

13. Communities should provide for the efficient use of water through the use of natural drainage, drought tolerant landscaping and recycling.
14. The street orientation, the placement of buildings and the use of shading should contribute to the energy efficiency of the community.

Regional Principles:

1. The regional land-use planning structure should be integrated within a larger transportation network built around transit rather than freeways.
2. Regions should be bounded by and provide a continuous system of greenbelt/wildlife corridors to be determined by natural conditions.
3. Regional institutions and services (government, stadiums, museums, etc.) should be located in the urban core.
4. Materials and methods of construction should be specific to the region, exhibiting a continuity of history and culture and compatibility with the climate to encourage the development of local character and community identity.

Implementation Principles:

1. The general plan should be updated to incorporate the above principles.
2. Rather than allowing developer-initiated, piecemeal development, local governments should take charge of the planning process. General plans should designate where new growth, infill or redevelopment will be allowed to occur.
3. Prior to any development, a specific plan should be prepared based on these planning principles.
4. Plans should be developed through an open process and participants in the process should be provided visual models of all planning proposals.

6.5 Charter of the New Urbanism

The Congress for the New Urbanism views disinvestment in central cities, the spread of placeless sprawl, increasing separation by race and income, environmental deterioration, loss of agricultural lands and wilderness, and the erosion of society's built heritage as one interrelated community-building challenge.

We stand for the restoration of existing urban centers and towns within coherent metropolitan regions, the reconfiguration of sprawling suburbs into communities of real neighborhoods and diverse districts, the conservation of natural environments, and the preservation of our built legacy.

We recognize that physical solutions by themselves will not solve social and economic problems, but neither can economic vitality, community stability, and environmental health be sustained without a coherent and supportive physical framework.

We advocate the restructuring of public policy and development practices to support the following principles: neighborhoods should be diverse in use and population; communities should be designed for the pedestrian and transit as well as the car; cities and towns should be shaped by physically defined and universally accessible public spaces and community institutions; urban places should be framed by architecture and landscape design that celebrate local history, climate, ecology, and building practice.

We represent a broad-based citizenry, composed of public and private sector leaders, community activists, and multidisciplinary professionals. We are committed to reestablishing the relationship between the art of building and the making of community, through citizen-based participatory planning and design.

We dedicate ourselves to reclaiming our homes, blocks, streets, parks, neighborhoods, districts, towns, cities, regions, and environment.

We assert the following principles to guide public policy, development practice, urban planning, and design:

The region: Metropolis, city, and town

1. Metropolitan regions are finite places with geographic boundaries derived from topography, watersheds, coastlines, farmlands, regional parks, and river basins. The metropolis is made of multiple centers that are cities, towns, and villages, each with its own identifiable center and edges.
2. The metropolitan region is a fundamental economic unit of the contemporary world. Governmental cooperation, public policy, physical planning, and economic strategies must reflect this new reality.
3. The metropolis has a necessary and fragile relationship to its agrarian hinterland and natural landscapes. The relationship is environmental, economic, and cultural. Farmland and nature are as important to the metropolis as the garden is to the house.
4. Development patterns should not blur or eradicate the edges of the metropolis. Infill development within existing urban areas conserves environmental resources, economic investment, and social fabric, while

- reclaiming marginal and abandoned areas. Metropolitan regions should develop strategies to encourage such infill development over peripheral expansion.
5. Where appropriate, new development contiguous to urban boundaries should be organized as neighborhoods and districts, and be integrated with the existing urban pattern. Noncontiguous development should be organized as towns and villages with their own urban edges, and planned for a jobs/housing balance, not as bedroom suburbs.
 6. The development and redevelopment of towns and cities should respect historical patterns, precedents, and boundaries.
 7. Cities and towns should bring into proximity a broad spectrum of public and private uses to support a regional economy that benefits people of all incomes. Affordable housing should be distributed throughout the region to match job opportunities and to avoid concentrations of poverty.
 8. The physical organization of the region should be supported by a framework of transportation alternatives. Transit, pedestrian, and bicycle systems should maximize access and mobility throughout the region while reducing dependence upon the automobile.
 9. Revenues and resources can be shared more cooperatively among the municipalities and centers within regions to avoid destructive competition for tax base and to promote rational coordination of transportation, recreation, public services, housing, and community institutions.

The neighborhood, the district, and the corridor

1. The neighborhood, the district, and the corridor are the essential elements of development and redevelopment in the metropolis. They form identifiable areas that encourage citizens to take responsibility for their maintenance and evolution.
2. Neighborhoods should be compact, pedestrian-friendly, and mixed-use. Districts generally emphasize a special single use, and should follow the principles of neighborhood design when possible. Corridors are regional connectors of neighborhoods and districts; they range from boulevards and rail lines to rivers and parkways.
3. Many activities of daily living should occur within walking distance, allowing independence to those who do not drive, especially the elderly and the young. Interconnected networks of streets should be designed to encourage walking, reduce the number and length of automobile trips, and conserve energy.
4. Within neighborhoods, a broad range of housing types and price levels can bring people of diverse ages, races, and incomes into daily interaction, strengthening the personal and civic bonds essential to an authentic community.
5. Transit corridors, when properly planned and coordinated, can help organize metropolitan structure and revitalize urban centers. In contrast, highway corridors should not displace investment from existing centers.
6. Appropriate building densities and land uses should be within walking distance of transit stops, permitting public transit to become a viable alternative to the automobile.
7. Concentrations of civic, institutional, and commercial activity should be embedded in neighborhoods and districts, not isolated in remote, single-use

complexes. Schools should be sized and located to enable children to walk or bicycle to them.

8. The economic health and harmonious evolution of neighborhoods, districts, and corridors can be improved through graphic urban design codes that serve as predictable guides for change.
9. A range of parks, from tot-lots and village greens to ballfields and community gardens, should be distributed within neighborhoods. Conservation areas and open lands should be used to define and connect different neighborhoods and districts.

The block, the street, and the building

1. A primary task of all urban architecture and landscape design is the physical definition of streets and public spaces as places of shared use.
2. Individual architectural projects should be seamlessly linked to their surroundings. This issue transcends style.
3. The revitalization of urban places depends on safety and security. The design of streets and buildings should reinforce safe environments, but not at the expense of accessibility and openness.
4. In the contemporary metropolis, development must adequately accommodate automobiles. It should do so in ways that respect the pedestrian and the form of public space.
5. Streets and squares should be safe, comfortable, and interesting to the pedestrian. Properly configured, they encourage walking and enable neighbors to know each other and protect their communities.
6. Architecture and landscape design should grow from local climate, topography, history, and building practice.
7. Civic buildings and public gathering places require important sites to reinforce community identity and the culture of democracy. They deserve distinctive form, because their role is different from that of other buildings and places that constitute the fabric of the city.
8. All buildings should provide their inhabitants with a clear sense of location, weather and time. Natural methods of heating and cooling can be more resource-efficient than mechanical systems.
9. Preservation and renewal of historic buildings, districts, and landscapes affirm the continuity and evolution of urban society.

6.6 Sustainable Urban Development in the European Union: A Framework for Action

(shortened)

Goal I. Strengthening economic prosperity and employment in towns and cities

Policy objectives

- Strengthen the role of towns and cities as centres of regional economic growth, productivity and employment, through explicit integrated urban programming; support a polycentric, balanced urban system and inter-urban co-operation.
- Promote a diverse, flexible and competitive urban economy, with particular emphasis on human capital, innovation, entrepreneurship and SME development including tourism; supporting factors for this are efficient transport, communications and planning systems, a good natural and physical environment, good environmental performance of enterprises, good quality of life in social and cultural terms and an attractive urban ambience.
- Underpin the development of knowledge and experience as regards the economic performance of urban areas, including the underlying conditions for this performance, the impact of Community policies and the good urban management practices.

Action

1. Explicit urban programming for Structural Fund support
2. A stronger urban dimension in employment policies
3. Support for “European knowledge centres”
4. Promotion of inter-urban co-operation
5. Promotion of attractive urban transport
6. Development of know-how and exchange of experience on urban economic performance

Goal II. Promoting equality, social inclusion and regeneration in urban areas

Policy objectives

- Extend pathways to employability and integration, in particular for the hard core of the long-term unemployed, young drop-outs, lone parent families and ethnic or racial minorities and others who are economically or socially excluded.
- Provide adequate, accessible and reasonably priced basic services, especially in relation to employment, education and training, health, energy, transport and communications, policing and justice with a view to preventing as well as remedying problems of exclusion.

- Enhance economic development and employment especially through business start-ups, provision of suitable infrastructure and advisory and other support services for existing businesses and community enterprises.
- Improve the physical environment, reduce pollution and develop natural landscapes in urban areas and neighbourhoods in difficulty.
- Prevent urban crime including juvenile delinquency and increase security.
- Strengthen local capacities to respond to the specific needs and potential of communities in deprived urban areas and neighbourhoods in an integrated way.

Action

1. Co-operation against discrimination and social exclusion
2. Structural Fund support to area-based action for urban regeneration
3. Second chance schools
4. Development of know-how and exchange of experience on discrimination, exclusion and urban regeneration

Goal III. Protecting and improving the urban environment: towards local and global sustainability

Policy objectives

- Improve ambient air quality in urban areas, the reliability and quality of drinking water supplies, the protection and management of surface and ground waters; reduce at source the quantity of waste requiring final disposal and reduce environmental noise.
- Protect and improve the built environment and cultural heritage, and promote biodiversity and green space within urban areas.
- Promote resource efficient settlement patterns that minimise land-take and urban sprawl.
- Minimise the environmental impacts of transport through aiming at a less transport-intensive path of economic development and by encouraging the use of more environmentally sustainable transport modes.
- Improve environmental performance of enterprises by promoting good environmental management in all sectors.
- Achieve measurable and significant reductions of greenhouse gas emissions in urban areas, especially through the rational use of energy, the increased use of renewable energy sources and combined heat and power and the reduction of waste.
- Minimise and manage environmental risks in urban areas.
- Promote more holistic, integrated and environmentally sustainable approaches to the management of urban areas; within functional urban areas, foster eco-systems-based development approaches that recognise the mutual dependence between town and country, thus improving linkage between urban centres and their rural surroundings.

Action

1. Better implementation of existing environmental legislation at urban level
2. Further legislation concerning waste, air quality, water and noise
3. Strengthening pollution control and clean-up in towns and cities
4. Action 14: Contributing to a reduction of the environmental impact of urban transport
5. Sustainable urban energy management
6. Climate protection
7. Extending Eco-Labeling and the Eco-Management and Audit Scheme (EMAS)
8. EU Structural Fund support for protecting and improving the urban environment
9. Development of know-how and exchange of experience on the urban environment

Goal IV. Contributing to good urban governance and local empowerment

Policy objectives

- Increase information for local authorities and other urban actors, including citizens, on EU policies and build dialogue with them in the formulation of EU policies.
- Involve towns and cities more fully in the implementation of EU policies.
- Promote policy integration and synergy between and within all levels of government within functional urban areas.
- Support local capacity-building so as to increase the quality and effectiveness of urban governance, including exchange of good practice between cities, transnational co-operation and networks.
- Promote innovative approaches to the extension of local democracy, participation and empowerment and to partnership-building involving the private sector, communities and residents.
- Improve collection and use of comparative information on urban conditions across Europe, the diagnosis of urban problems and the identification of effective policy solutions, enabling actors at all government levels to tailor their policies to local needs and to monitor and assess the performance of their policies in terms of quantitative and qualitative outcomes on the ground.

Action

1. Awareness-raising, exchange of experience and capacity building for sustainable urban development
2. Innovative urban development strategies
3. Increasing safety by promoting prevention in the field of urban crime
4. Improving comparative information on urban conditions
5. Contribution to the Member States' "Urban Exchange Initiative"