# Ecocity

## Book II

## How To Make It Happen


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## Book II
## How To Make It Happen

## Deliverable of the Project

**ECOCITY 'Urban Development towards Appropriate Structures for Sustainable Transport' (2002 - 2005)**

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# Contents

# 1 Introduction

## 1.1 The purpose of this book

This book is based on the project ECOCITY – Urban Development towards Appropriate Structures for Sustainable Transport. It was written as a contribution to the ongoing efforts towards reversing the trends of suburbanisation and urban sprawl, and is intended to give practical support to planners and decision-makers working for sustainable urban development patterns.

The main aim of the ECOCITY project was the integrated and implementation-oriented planning of seven model urban quarters in seven European countries (see Section 1.4). During this process, priority was given to creating a framework for sustainable transportation patterns by designing structures convenient for pedestrians, cyclists, public transport and efficient distribution logistics while also finding sustainable solutions in the sectors of energy, material flows and socio-economy. The work was carried out in interdisciplinary planning teams, involving experts in these sectors right from the beginning. A strong emphasis was also placed on community participation.

The following sections of this chapter present the main ECOCITY objectives and the vision that set the planning direction for all seven ECOCITY quarters, and it briefly introduces the planning areas. Section 1.5 explains how this book can help planners in their work, while the following chapters convert the experience gained in the ECOCITY project into practical advice for planners and decision-makers.

This book is one of a pair that results from the ECOCITY project. Readers with a particular interest in the project process and in the concepts for the seven ECOCITY sites are referred to 'ECOCITY Book I – A better place to live'.

## 1.2 Sustainability and the ECOCITY objectives

The concept of sustainability in itself is not new. Many cultures over the course of human history have recognised the need for harmony between the environment, society and economy. What is relatively new is an articulation of these ideas in the context of a global industrial and information society. Progress on furthering the concept of sustainable development has been so rapid and widespread since the 1980s though, that the term sustainability – as well as the concept – is now often treated as mainstream; some argue that it has already been embedded in our economic and social activities.

Reflecting on a well known definition of sustainable development, it is clear that some sustainability strategies are no more than lip service, some only take us a small step along the way and only some really mean a significant step in the right direction: "Sustainable development is development which meets the needs of the present without compromising the ability of future generations to meet their own needs." [WCED, 1987; p.4][1]. This goal has not yet been achieved.

Overall, sustainable development is a process rather than a final destination. With some exceptions, it is not possible to turn unsustainable structures that have developed over decades and even centuries into sustainable structures over the course of a few years. This is particularly true in the case of urban areas with their long-lasting infrastructure and tightly interconnected systems. Thus, the fact that we are not 'there' yet is only partly due to a lack of effort or readiness for change. It can in part also be attributed

[1] This definition was formulated by the World Commission on Environment and Development (WCED), led by the Norwegian Prime Minister Gro Harlem Brundtland, in 1987.

to the need for time to achieve real change. But it is essential to stop the further 'production' of unsustainable structures and to ensure that future urban development heads in a sustainable direction. ECOCITY planning is a contribution to this process – a contribution that aims to help save some time by building on the knowledge and experience gained by others in similar situations.
The conference on Strategies for Sustainable Cities in The Hague (1999) agreed that quality of life, public health, environmental concerns, social cohesion, principles and values should become integrated elements of all European and national policies that have an impact on cities and towns. At the appropriate scale, whether on the local, national or European level, these should be developed through urban visions "that consider and integrate economic, social and environmental forces" [2] (author's emphasis). These three 'force fields' (see Figure 1.1) are sometimes also called dimensions and are considered to be the primary aspects of the general term sustainability.

[2] http://www.bremen-initiative.de/lib/background/the_hague_statement.pdf [accessed 14.3.2005].

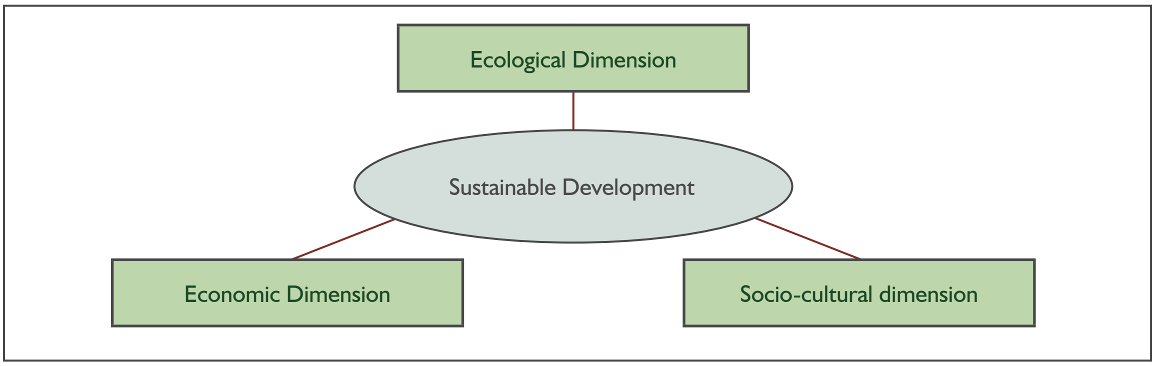



Figure 1.1: Sustainable development supported by integration of ecological, economic and socio-cultural dimensions

***The overall ECOCITY objectives***

The main goals for sustainability in the context of urban development are:

- minimising use of land, energy and materials
- minimising the impairment of the natural environment.

These goals have been extended by additional sector-focused ones to produce a list of 'Overall ECOCITY Goals' (see Figure 1.2):

It should be noted that minimising something in this context does not mean reaching 0% (for example of energy consumption or costs), but reaching an optimal minimum, that is, balanced with the other objectives. The same principle applies to maximisation. The terms 'minimise' and 'maximise' are used instead of 'optimise' to provide information about the orientation of the objective.

These objectives are in accordance with those of the European Union for the development of sustainable settlements and for the improvement of urban environments, which are specifically intended to support a polycentric, balanced urban system and to promote resource-efficient settlement patterns that minimise land-take and urban sprawl [Commission of the European Communities, 1998]. The European Commission also recognises "urban transport systems [as] critical elements of the urban fabric. They ensure that people have access to goods, services, employment and recreation opportunities, that freight circulates efficiently and they enable local economies to flourish. […] However, if the high density of buildings is the first defining characteristic of towns and cities, then high volumes of traffic is now the second. Traffic has significant impacts on the environment and on the health of urban citizens, as well as on the overall quality of life in towns. Rising congestion levels are hampering mobility, with increasing costs for the economy." [Commission of the European Communities, 2004, p.12]. These concerns are also reflected in the overall ECOCITY objectives (to minimise transport demand, to minimise impairment of the environment and human health, and realise a diversified, crisis-resistant and innovative local economy).

When looking to convert these objectives into concepts for sustainable settlements, it is important to work in co-operation with the respective local community. The basic working principles are to integrate the ecological, social and economic aspects of sustainability in all sectors and to take an integrated approach which means considering multiple cross-sector interrelations when defining solutions (see for example Section 4.3).

**Ecological Dimensions**

- Minimise demand for land (particularly for greenfield sites)
- Minimise primary material and primary energy consumption
- Optimise interaction with municipal and regional material flows
- Minimise impairment of the natural environment
- Maximise respect for natural context
- Minimise transport demand

**Socio-Cultural Dimensions**

- Satisfy basic needs and realise structures for human care
- Minimise impairment of human health
- Maximise mental wellbeing and community feeling
- Maximise respect for (anthropogenic) context
- Create a framework for good governance
- Maximise awareness of sustainable development

**Economic Dimensions**

- Realise a diversified, crisis-resistant, innovative local economy
- Minimise total life cycle costs (maximise productivity)

Figure 1.2
Overall ECOCITY goals

## 1.3 The ECOCITY vision

The overall ECOCITY objectives give a first indication of the issues that need to be considered in the different planning sectors. However, they are still relatively abstract. To develop a common image of the sort of settlement that ECOCITY planning should lead to, it is necessary to agree on a common vision. For an ECOCITY, this vision consists of a combination of different features, which, in interaction with each other, combine to form a sustainable settlement (see ECOCITY Book I, Section 2.2 ).


Figure 1.3
Vision of an ECOCITY

Transport – i.e. movement of people, goods and information – is in most cases a means to an end. But in this function, transport is the lifeblood of every human settlement. The settlement cannot function entirely without any form of movement and the modes chosen for these movements are very closely related to the patterns of land use. Thus, one principal aim of ECOCITY planning is to develop sustainable settlement patterns that favour and support sustainable transport. This is expressed by the fact that the ECOCITY vision centres around the feature of a 'city of short distances'.

Distances are related to density and land-use patterns. An ECOCITY is characterised by an appropriate, qualified density, thus also reducing the costs for transport infrastructure, energy, information and water supply systems, and the sewage system. It also features a balanced mix of land uses (residential,

employment, educational, administrative and leisure uses, distribution and supply, green spaces and recreational areas), in which provision and distribution is in accordance with the needs of both the proposed settlement and its surrounding region. Special emphasis should be placed on the balance of housing and a flexible, adaptable economic infrastructure, thus creating employment close to homes.
Efficient energy supply and consumption, the utilisation of renewable energy sources and sustainable material flows (soils, water, waste, etc.) also have to be provided for when designing ECOCITIES. Open and green spaces should be designed in harmony with existing landscape, climate and ecological systems and also take account of the social needs of their users. The diverse – and changing – needs of different demographic groups also have to be considered in the provision of housing and social infrastructure.
In order to realise such a vision, experts from the sectors of urban and transport planning, energy and socio-economy have to work together with the local decision-makers and stakeholders (see also Chapter 4 on Planning Techniques).

## 1.4 The ECOCITY case studies

The main work of the ECOCITY project consisted of the planning of seven model settlements in Austria, Spain, Hungary, Finland, Slovakia, Germany and Italy. The following table provides some basic information on these projects: the type of site (greenfield, brownfield, etc.), the size of the ECOCITY planning area, the gross floor area of the planned ECOCITY developments and the number of people who can live in the different ECOCITIES. Users of the sites – employees, pupils and students for example – are not included in these numbers.

Table 1.1: Location and key characteristics of the ECOCITY model settlements

**ECOCITY-Project**


Locations and key characteristics

| | |
|---|---|
| **Bad Ischl,** Austria<br>*Greenfield*<br>ECOCITY area: 24.6 ha<br>total gross floor area: 162 856 m²<br>new inhabitants: 2 100 | **Barcelona 'Trinitat Nova',** Spain<br>*Urban regeneration*<br>ECOCITY area: 6.4 ha<br>total gross floor area: 100 929 m²<br>new inhabitants: 1 792 |
| **Győr,** Hungary<br>*Brownfield*<br>ECOCITY area: 83.1 ha<br>total gross floor area: 871 948 m²<br>new inhabitants: 11 650 | **Tampere,** Finland<br>*Greenfield*<br>ECOCITY area: 1 205 ha<br>total gross floor area: 383 300 m²<br>new inhabitants: 13 400 |
| **Trnava,** Slovakia<br>*Brownfield, regeneration of old town*<br>ECOCITY area: 72 ha<br>total gross floor area: 820 000 m²<br>new inhabitants: 2 928 | **Tübingen,** Germany<br>*Green- and brownfield, urban densification*<br>ECOCITY area: 24.1 ha<br>total gross floor area: 241 000 m²<br>new inhabitants: 3 300 |
| **Umbertide,** Italy<br>*Green- and brownfield*<br>ECOCITY area: 24.1 ha<br>total gross floor area: 63 346 m²<br>new inhabitants: 1 353 | |

As this book is intended as a practical guide for planning ECOCITIES and not as a report on the ECOCITY project, the individual model settlements will not be described in more detail at this point. However, the ECOCITY Book 1 – A better place to live, in which all seven model settlements are described, is recommended for further reference to those who would like to see the result of the practical application of the ECOCITY principles.

## 1.5 How to use this book

The guiding tenet of sustainable development – or planning for sustainability – has become so widely used (even if not sufficiently often realised) that the huge benefits to be gained from getting it right are sometimes lost sight of in the routine of trying to get around perceived and real obstacles encountered along the way. CHAPTER 2 provides a reminder of the concrete benefits of ECOCITY planning and ECOCITY neighbourhoods for municipalities, communities and individuals –- and by reverse conclusion also shows what the risks of getting it wrong can be. Thus, if the ECOCITY planning process is likened to a journey, the ECOCITY vision and CHAPTER 2 aim to help planners and decision-makers to agree on the general direction of travel and on the overall destination.
CHAPTER 3 contains some general as well as sector-specific guidelines provided as aids for structuring ECOCITY planning. For the ECOCITY journey, these guidelines help to plan the general route. They relate, for example, to flows in an ECOCITY (of energy, materials, etc.) and to the use of resources, but also to choosing settlement locations or planning transport provisions at the neighbourhood level.
However, to complete the journey, more detailed information is needed. This can be found in CHAPTER 4 on planning techniques (e.g. for integrated planning approaches) and CHAPTER 5. This chapter introduces planning tools such as checklists of concrete, ECOCITY compatible measures for each element of urban planning (context, urban structure, transport, material flows and socio-economy) as well as for some aspects of the planning process (such as community involvement and implementation). Chapter 5 also contains a table showing how the more concrete objectives for ECOCITY planning are interrelated at the level of urban structure and transport.

# 2 ECOCITY Benefits and Experiences

The development of an ECOCITY is a complex process, which involves many actors: politicians and administrators (from national, regional and local authorities), community based organisations and businesses (e.g. NGOs, enterprises), experts for planning and implementation (e.g. architects, developers) and citizens/residents (people living in the direct neighbourhood of the planned ECOCITY and possibly its future inhabitants).

In the final analysis, all the actors involved – individuals, groups and institutions – can be seen to have benefited, with advantages ranging from personal convenience to global sustainability. But in order to realise these benefits, challenges have to be overcome, which are related to the complexity and overall size of an ECOCITY development as well as the tendency to perpetuate a familiar current state even if its problems are well known. To realise an ECOCITY it is thus necessary to convince the actors involved of the expected benefits and to strengthen success factors so that they outweigh the obstacles (see 2.2.2).

## 2.1 Benefits[3)]

The actors that stand to benefit from an ECOCITY fall into four categories: the public sector (the municipalities and society as a whole), private businesses (including planners) and the residents (as individuals), as well as the (natural) environment as the most important non-human "counterpart".

Many of an ECOCITY's benefits can be separated into two rather different categories: liveability and costs. Most benefits concerning liveability can be experienced right after completion of construction, while the timescale for financial or cost benefits varies – savings in infrastructure investments are more immediate, savings in operating costs are medium to long term and savings in eventual decommissioning or deconstruction are long term. Overall, ECOCITIES are also less costly in terms of repairing negative impacts on human health and the environment due to the inbuilt, precautionary protection measures.

The following gives an overview of the most important benefits to be gained by those who decide to 'go for it'.

### 2.1.1 Benefits related to liveability

Community liveability refers to the environmental and social quality of an area as perceived by residents, employees, customers and visitors.

An ECOCITY offers reduced air and noise pollution and a lower risk of injuries by traffic accidents. There is more space for people in an attractive, quiet, safe and healthy environment (car-free streets and squares, a great variety of green spaces), promoting a slower-paced, more relaxed, healthier and thus more sustainable lifestyle. This allows more personal interaction with neighbours, also resulting in the presence of more people in public areas during the day and at night and thus creating a greater sense of community and possibly resulting in lower crime rates.

[3)] This section is based on the following sources:

- Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions, Towards a thematic strategy on the urban environment, Annex 2: A European Vision for Sustainable Cities, Sustainable Urban Management, Transport, Construction and Design
- Welcome to Car free City!, http://www.carfreecity.us/home.html
- Benefits of new urbanism, http://www.newurbanism.org/pages/416429/index.htm
- Todd Litman (2005), Rail Transit In America, A Comprehensive Evaluation of Benefits, Victoria Transport Policy Institute, Victoria, BC, CANADA, http://www.vtpi.org/railben.pdf

Living in close proximity to various facilities in mixed-use neighbourhoods means shorter routes to public transport stops, to jobs or to school, for shopping, recreation, etc., thus saving time and energy. Varied green areas (an important factor for residents' satisfaction), integrated into compact settlements as well as surrounding them are easily accessible and solar architecture provides convenient temperatures and good levels of daylight for high indoor comfort. A balanced social mix and social services and facilities for all groups of residents foster their well-being.

These benefits can be experienced by all people, but they are of additional importance for some individual groups: ECOCITY patterns privilege **non-drivers** (who are disadvantaged by car-dependent transport and land use patterns), increasing their mobility and accessibility options. An internal pathway system free of private cars and barriers but with sufficient social control combined with short distances, creates an attractive and safe environment for **children** (to play safely outdoors and travel on their own) as well as for the mobility of **senior citizens** and the **handicapped**.

Many features of an ECOCITY also contribute to promoting individual health: building materials include fewer harmful substances and better air quality reduces the risk of exhaust-related respiratory ailments, while more walking or cycling is an effective way of increasing physical activity among otherwise sedentary people.

Quality of life is an increasing consideration in enhancing a **municipality's** attractiveness to citizens and investors as well as for (eco-)tourism. Thus all these liveability benefits of an ECOCITY become an important marketing factor. In addition, the following effects can be expected:

- Liveable urban patterns, including high-quality public spaces, and more involvement of the inhabitants in their design increase people's identification with the municipality.
- The standard of accommodation in adjacent built up areas is increased due to improved transport connections and the availability of (supply) facilities in an ECOCITY.
- ECOCITY patterns are also favourable for meeting the challenges of demographic and socio-economic changes (e.g. small sized households, increased share of senior citizens).

For the **global society** an ECOCITY reduces the risk of conflicts related to limited petroleum resources by avoiding dependence on petroleum.

### 2.1.2 Benefits related to costs

In many categories the costs of an ECOCITY are lower than in conventional urban development:

ECOCITIES have lower **investment** costs

- for infrastructure (streets, sewers, water pipes etc.) because of compact development and
- for parking facilities due to reduced car dependence and thus a lower level of motorisation.

ECOCITIES also feature lower **operating and usage** costs

- for heating and lighting, because of more compact building structures as well as due to solar gains and high insulation and
- for transportation due to minimised trip lengths (short distances) and the resulting higher share of walking and cycling trips as well as an efficient and well-used public transport system.

ECOCITIES create lower **life-cycle** costs due to

- the creation of less energy-intensive buildings and the generation of energy from renewable resources (this can mean higher investment but then results in significantly lower operating costs),
- the use of more durable materials (which may also increase up-front investment costs but require less maintenance and/or repair or replacement) and
- the use of materials that are re-usable or recyclable.

ECOCITIES furthermore create less **cost for the general economy**, as they result in

- less environmental damage and harmful emissions and thus reduced negative side effects (e.g. damage to human and environmental health, flooding, depletion of natural resources) and
- (in the long term) lower insurance costs due to low crime rates and better general health of population.

However, these latter effects will be less pronounced in just a single ECOCITY development, as they generally manifest themselves above the local scale.

For a **municipality**, additional inhabitants and businesses (of a new ECOCITY neighbourhood) increase the tax base and more compact developments make more efficient use of land in this respect. Also the more a city commits itself to public transport infrastructure, the less the transport system will cost overall. Conversely, the more a city is built around car dependence, the more of its wealth is wasted on just getting around [Newman et al., 2001].

**Business** also benefits from lower household spending on transport as the money saved can be spent on other purchases. Also, providing liveable public spaces means the local retail trade can benefit from resulting increased sales due to increased pedestrian traffic – an effect often encountered in pedestrian precincts even in non-ECOCITIES.

For **developers** the risk of balanced mixed-use projects is lower than in mono-functional residential or commercial developments. Better utilisation of land area (more square meters for sale or rent) due to higher density allows lower prices for space, which enhances attractiveness to a larger group of (potential) residents and businesses.

### 2.1.3 Benefits for the (natural) environment

Besides the human actors there is another, more passive actor that is influenced by and reacts to human interventions – the natural environment. It benefits from an ECOCITY especially in two major elements of sustainability – the rates of **resource use** and the rate of **emissions**:

- Less **land demand** and sealed-up area due to compact dense urban patterns (avoiding urban sprawl) allows the preservation of larger self-contained undisturbed natural green areas and agricultural lands – available both for human use and also as habitats for other living organisms and for natural processes (such as the water cycle and carbon-fixing in green plants).
- Saving **energy** due to minimised and more efficient motorised transport as well as solar architecture and low energy housing results in decreased consumption of fossil fuels (and decreased environmental damage in oil-producing regions).
- This contributes to climate protection through reduced $CO_2$ (and other gaseous) **emissions** as well as improved local and regional air quality due to fewer exhaust emissions.

Due to knock-on effects, the various benefits do not generally affect just one group of actors. Ultimately and when ECOCITIES become implemented on a larger scale, residents for example also benefit from the advantages to the community (e.g. lower public costs allow lower taxes), to business (e.g. more economical operation of public transport allows lower costs for passengers) and to the environment (an intact environment provides the basis for a healthy and enjoyable life).

| General recapitulation |
| --- |
| An ECOCITY provides a better quality of life for almost all inhabitants and helps to sustain it in future. This quality need not be more expensive than conventional developments - especially if life-cycle costs are taken into account, but to reach it requires the setting of appropriate priorities. |

### 2.1.4 The importance of thinking about transport

The contribution of the different sectors relevant to urban development (e.g. transport, energy, urban planning) to the benefits of an ECOCITY differs. But many of the benefits can be realised, if one aims for Transit Oriented Development (TOD) structures, the key elements of which reinforce one another:

- A linear polycentric development of an ECOCITY with higher urban densities increases the passenger potential for public transport. Thus enforcing a beginning axial development by concentrating new construction in appropriate sites along such axes can for example promote an upgrade from bus provision to more long term creation of (local) rail transit, which generally provides better service quality and thus attracts more passengers than a bus system.
- A rail route acts as a catalyst for such linear poly-centric development with more compact patterns thus constituting an attractive alternative to car oriented development.

To direct urban development towards such ECOCITY patterns is a very effective method of moving away from car dependence. The resulting benefits are: more liveable space for people, reduced air and noise pollution, reduced dependence on limited, non-renewable and increasingly expensive energy resources, etc.

Table 2.1 shows more specifically, which benefits to the four groups of 'actors' identified above can be gained through appropriate patterns for public transport and pedestrians.

Table 2.1
Transport related benefits for different actors in an ECOCITY

| | the public sector | private businesses | residents | the (natural) environment |
|---|---|---|---|---|
| **Appropriate patterns for public transport (linear polycentric structure)** | less need to subsidise operating costs | increased cost recovery for the operating company due to higher passenger potential | attractive service levels of public transport with short intervals and wide coverage | low energy consumption and pollution |
| **Appropriate patterns for pedestrians (compact high density, mixed use structure)** | less spent on infrastructure and utilities per capita than typical suburban development | more customers in the nearby catchment area, greater 'footfall' around shops | good accessibility of necessary facilities, liveable environment | less land demand, low energy consumption and pollution |

## 2.2 Experiences from planning an ECOCITY

The various typical aspects of an ECOCITY planning process (such as interdisciplinary co-operation and community involvement) can provide important experiences and realisations for all those involved – including obstacles as well as means of avoiding or overcoming them. These are discussed in the following (concrete planning techniques and tools to be employed along the way are provided in Chapters 4 and 5). However, the planning process is not an end in itself – the most important aspect of it is, that sustainable and liveable urban patterns are realised as a result. Only then can the above-mentioned benefits be achieved.

### 2.2.1 Obstacles and success factors

Planning and implementation of sustainable urban development are influenced by different positive and negative factors. Whether success factors or obstacles prevail depends to a great extent on the local situation and how the local actors deal with strengthening success factors and working to overcome obstacles. In order to realise an ECOCITY project, the existence of success factors outweighing the obstacles is essential. As this point has been discussed in detail in chapter 5 of Book I, only a summary of the experiences gained during the ECOCITY planning processes is presented at this point. Success factors and obstacles experienced are listed in Table 2.2, which also shows their connection to common problems. However, it should be noted, that strengthening the success factors alone will not in every case be sufficient to overcome related obstacles. It might also be necessary to work at overcoming these 'at source'.

Table 2.2:
Obstacles and success factors for the realisation of an ECOCITY

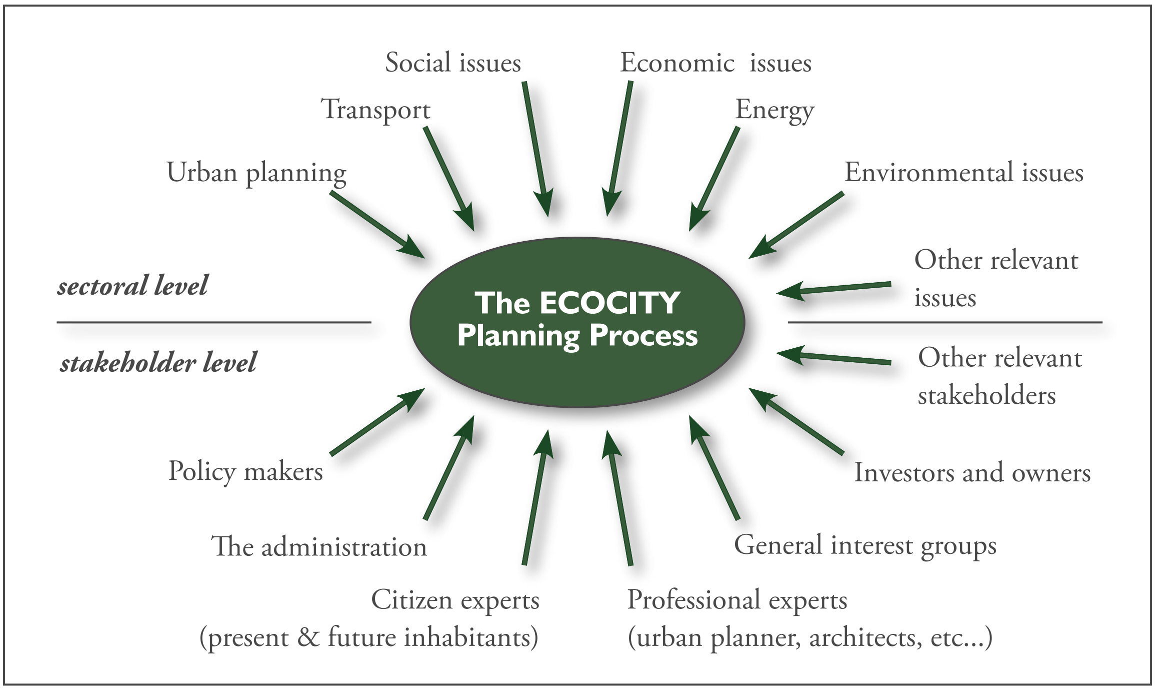
| Problems & Challenges | Obstacles | Success Factors |
|---|---|---|
| Dependency on sites of sufficient size in appropriate locations | Non-availability of suitable land due to lack of administrative instruments and/or non-cooperation of land owners | • Suitable sites in public ownership (municipality)<br>• Owner is initiator or enthusiast |
| Necessity of a minimum size of the first implementation phase | Insufficient demand potential to attract investors / entrepreneurs for services due to insufficient demand for local dwellings and thus too few potential inhabitants | • Contractual agreements with service providers and developers before the start<br>• Concentrating dwelling demand of a larger region at the suitable sites |
| Potential limitations set by surrounding (infra-)structures and environments | ECOCITY needs to be embedded in the existing infrastructure (e.g. for transport), which may compromise its sustainable development | • Consideration of the surroundings and inclusion in planning, initiating local and regional improvements necessary for the effective operation of an ECOCITY |
| Complexity of the project requires agreement of many stakeholders on political, economic, technical, social, strategic and personal levels | Inadequate political support (fear of losing influence), and resistance from citizens | • Holistic integrated planning<br>• Dedication of visionary, committed and ambitious key actors (politicians, developers, etc.)<br>• Formation of win-win-win-coalitions<br>• Involvement of citizens and other stakeholders in the decision-making process from start- to implementation phase |
| Demand for ecological awareness, often requiring rethinking (e.g. questioning conventional behaviour) | Need for and/or the concept of sustainable development is not (fully) understood.<br>Misuse of the terms ECOCITY, sustainable ... | • Awareness of environmental problems and the existence of social capital<br>• The environment and the surroundings are considered worthy of protection |
| The economic framework favours the status quo. | • Sole focus on economic gains in the short-term<br>• Fear of higher (investment) costs | • Investment subsidies for particular elements (e.g. solar power related equipment)<br>• Increased attractiveness to investors and citizens due to enhanced liveability |
| Delayed visibility of benefits | Improvements on conventional solutions become increasingly clear only in the medium to long term. | • Use of scenarios of different alternatives and sectoral good practice examples to support the recognition of benefits |

### 2.2.2 Planning as a learning process

As there is still insufficient experience of translating ECOCITY theories and concepts into practice, learning how to convert general theories into local solutions during the planning process is an important success factor.

To enable such a learning process, planning needs to be integrated on two levels: the relevant sectors (sectoral level) and the actors and stakeholders to be involved (stakeholder level). Co-operation is necessary on both levels – in a multidisciplinary planning team as well as among all stakeholders (see Figure 2.1) – to find feasible technological and organisational solutions in the process of adapting general principles and concepts for a specific local case.

Figure 2.1
The holistic planning process




**Co-operation in a multidisciplinary team**

The complex process of urban development requires an integrated planning approach to be successful. This is especially true if this process is intended to lead towards an ECOCITY. An integrated planning approach not only requires an interdisciplinary planning team but it is also necessary for all the sectoral experts involved to posses or develop an interdisciplinary awareness. This will enable the experts to consider the systemic links and thus harmonise solutions for their particular sectors with those for the other sectors. An ECOCITY should be understood as a single integrated system (holistic approach) and not as a combination or result of many sectoral developments planned in isolation.

Co-operative and interactive forms of working have the capacity to broaden horizons, to generate innovative ideas and to help concepts and detailed plans significantly improve in quality – everyone is simultaneously learning from and providing resources (knowledge, experience) for others.

Furthermore, solutions can be improved by involving external experts (such as academic or professional consultants), who can provide new perspectives and convincing arguments to support the new project.

**Stakeholder co-operation**

Consensus-oriented meetings, which bring together different groups of experts and stakeholders, are useful for improving communication, disseminating information, raising awareness and thus establishing a shared understanding of various project issues. Developing visions, defining objectives and discussing potential solutions together furthermore facilitates an enhanced acceptance of a project. Existing local constraints are often accepted (perhaps subconsciously) and not questioned because they are seen as a part of the local 'setting'. However, such habits can be broken when people from different backgrounds and with different expertise are working face to face, discussing different proposals of concepts or measures and their practical consequences.

From the co-operation in such meetings, a team spirit amongst local actors (alliances) can arise, which helps to avoid or overcome potential barriers arising later on in the process. To formalise this co-operation, a committee should be constituted (see Community Committee, Section 4.5.1).

Visualisation has proven to be a major communication tool for working together on the basis of shared aims, objectives and attitudes. To convert the thoughts and words of all involved into pictures (sketches, drawings, renderings, collages, etc.) and plans (master plans, sectoral plans, detailed plans) helps to make the solutions developed clearer and more easily imaginable for everyone. For example, reading that there will be a dense network of pedestrian paths or that buildings will have a solar orientation is not the same as seeing what that could actually look like.

**Learning from examples**

During the state-of-the-art analysis of the ECOCITY project, no paradigm example for an ECOCITY settlement could be found, but there is a variety of projects that include many of the relevant elements. To have a look at such good practice examples can facilitate the development of particular solutions during the planning process and also support the argumentation in the stakeholder discussions.

# 3 Guidelines

ECOCITY planning can be carried out for new urban quarters or for the adaptation of existing structures. It is easier to realise exemplary solutions in new developments because there are fewer existing constraints. However, considering the extent of existing urban areas, the main challenges of the future will lie in adapting these so that they become ECOCITIES.

In both cases, though, the different steps of ECOCITY planning can be compared to a journey: the vision helps everyone to agree on a common destination. The guidelines are a large-scale map to help plan the general route and to decide whether to go by boat, train, car or plane. But to find the actual place one wants to reach, a more detailed map is needed. This chapter will introduce the *guidelines* for planning an ECOCITY.

These guidelines relate firstly to sustainable urban planning in general, and secondly to planning for urban structure, transport, energy and material flows, and socio-economic factors at the level of urban quarters. By providing a checklist of points to remember during the conceptual stage of the ECOCITY planning process, the guidelines will help planners to move from the more abstract level of visions and objectives to structured thinking and working processes. However, since guidelines are '*an indication or outline of policy or conduct*'[4] they are not sufficient for converting visions into actual plans. For this purpose, the tools and techniques introduced in the following chapters will be needed.

[4] Merriam-Webster Online dictionary, http://www.m-w.com [accessed 25.11.2004]

## 3.1 General strategies for planning towards urban sustainability

A number of different strategies have been developed for a sustainable planning approach. It is not possible or useful to present all of them in this book. The selection included here reflects those that we found both useful and sufficient during the ECOCITY planning process. References and links to further reading can be found on page 76.

### 3.1.1 Flows, boundaries and the Eco-Device Model

Urban planning always deals with units that are made up of smaller units – such as buildings, streets or blocks – and that are also part of a wider system consisting of quarters, cities, metropolitan areas, agglomerations, regions and countries. Any level of this system can be planned for individually, but, from a sustainable planning perspective, such considerations must always include *at least* the connections to the next levels above and below, as none of these spatial units can ever be single, self-contained entities. They must function together as parts of a wider network to achieve overall sustainability.

All elements of the urban system require and create input, output, and flows of goods, services, information, water, air and energy. These flows, as well as human movement (induced by people's needs and desires) and economic activity, almost always cross the boundaries between the various units of spatial organisation. For example, goods move from country to country, energy moves from region to region or people move from city to city. The boundaries, though, are rarely clearly definable as lines (other than in an administrative sense) but are much more zones of transition. One of the aims of sustainable planning is to keep the number of such boundaries that are crossed by the various human induced flows and activities to a (practicable) minimum (see also Section 3.2.2) while at the same time maximising people's quality of life[5]. This is related to the ECOCITY vision of the *city as network of urban quarters* and the *city integrated into the surrounding region* (see Chapter 1 of this book).

[5] Among other things, the ECOCITY Concept realizes the necessity of "Comprehensive and co-operative Planning", declared by XXI World Road Congress, Committee C10 Urban Area; http//www.piarc.org [accessed 10.12.2004].

An illustration of the concept of minimising transfers across boundaries is the *city as a power station of renewable energies*. Here, biomass is harvested from urban farms or in the peri-urban area and converted to energy in district power plants. This is an alternative to generating energy in large regional power plants, which are powered by non-renewable fuels transported over large distances. Another example is the *city of short distances*, in which a mix of land uses is created, allowing people to fulfil their daily and recreational needs without having to travel long distances. But there are also practicable minimum levels for localising activities: solar energy and heat exchange, for example, can usefully be employed for individual housing units. Energy from biomass or wind, though, can generally be harvested more efficiently at larger units of organisation and transferred down or across the spatial hierarchy.
A useful concept for approaching sustainable planning is the Eco-Device Model of van Leeuwen [1973]. It shows the individual planning unit or system (e.g. a city, neighbourhood or building) as a box with inward and outward flows (see Figure 3.1a), which consist of materials, energy and water for example. The different planning levels can be represented by one box sitting inside the next bigger one like a Russian doll. So far, this is in accordance with the traditional planning approach. However, to achieve sustainability, it is important to go further and to also take responsibility for the processes happening inside each box. The aim must be to achieve some 'resistance' to incoming flows as well as 'retention' of outgoing movements. The guiding principle is to keep things out and to keep things in rather than to flush them through (see Figure 3.1b).

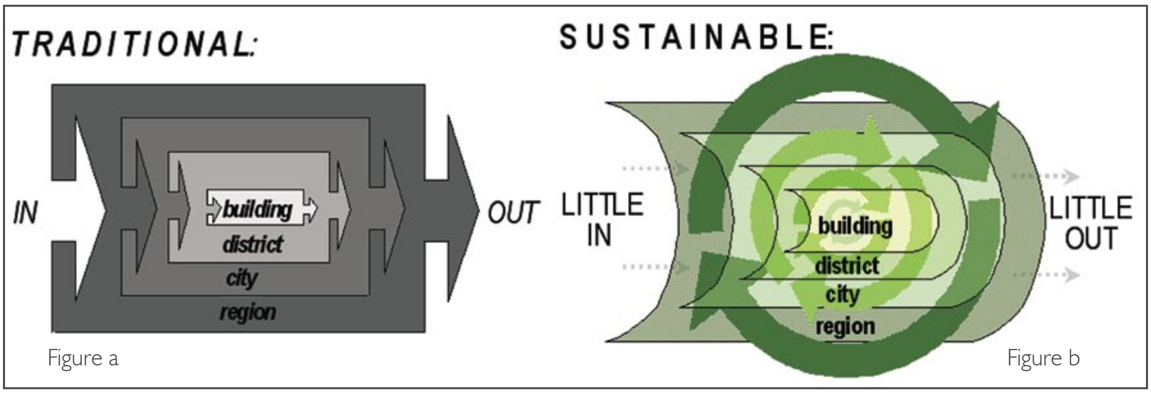



**Figure 3.1:** Flows in traditional planning (a) and in the Eco-Device Model of sustainable planning (b; adapted from v. Leeuwen, 1973, in v. Timmeren et al.).

In the 'real' world it will never be possible to keep materials, water or energy cycles always and completely within one spatial unit. But the Eco-Device Model shows what sustainable planning as a process should work towards.

Transportation is not one of the spatial units of the Eco-Device Model. Instead, it is the factor that enables most of the movement[6] of materials and people into, out of and within these systems. It is thus represented by the arrows in Figure 3.1. Reducing flows will therefore also result in reducing the need for transport.

[6] This includes pipelines and cables – though some of the movement of energy and water also occurs according to the laws of physics and through biological processes.

Three points have to be remembered when working with the Eco-Device Model:

1. Not all of the effects of flows have to be negative – it depends on the system and on the processes inside it. For example, if a house carries photovoltaic cells on its roof and some of the electricity generated but not needed locally is fed into the main grid, this can be considered a positive effect.
2. It is not possible for most systems to completely avoid any inputs or outputs – especially since planning also has to deal with structures and patterns that already exist and does not start from scratch. The guiding principle should be to find the source and sink of these flows at the next practicable level. So, for example, a building should receive its energy from a source no further than a district heating plant (if it cannot be independent of external inputs) and a city should receive its fruit and vegetables primarily from the surrounding region.
3. Not all of the negative effects of these flows are equally problematic and it is generally not possible to solve all potential problems all of the time. The more problematic an effect would be, the more effort should be made to avoid it. This decision has to be taken on a case-by-case basis but should always be aiming for the best possible solution from the point of view of environmental and human health.

### 3.1.2 The Three Step Strategy

Bearing in mind the three points outlined in the previous section, the following Three Step Strategy helps to prioritise the measures that should be taken according to their effectiveness in achieving sustainability [Duijvestein, 1994]. The strategy can be used for all types of flows (for example energy, water or building materials) that go through a system (building, district, or city). But it can also be applied to transport planning (see section 3.3.2) and the use of land for example.
The priorities are as follows:

step 1: Prevent unnecessary use and prevent waste. *If you cannot do that, go to*
step 2: Use sustainable resources and re-use waste. *If you cannot do that, go to*
step 3: Use finite resources wisely and treat waste wisely.

By applying this strategy it can be seen that it is better to insulate a building well (step 1) than to install a high-efficiency heater (step 3) in a badly insulated building. It is also better to re-use demolition rubble, for example in street construction, (step 2) than to crush it and put it in a well managed land-fill site (step 3). To achieve a sustainable concept for any sector, measures concerning all three steps will be necessary and should be integrated into one optimised system.

An overall weakness of this strategy is that it suggests linear flows. In reality, though, some of these flows are already cyclical – such as the cycling of water in the Earth's systems of the atmosphere, soil and water bodies, and the oceans. In these cycles, our human systems are only a small step on the way – although this step often has huge effects (pollution, desertification and salination through over-use, etc.). The aim should be to close more of the cycles that humans have an effect on and to make them as short in time and space as possible.

### 3.1.3 Community involvement

Community involvement or participation is an essential part of ECOCITY planning and decision making processes because it enables citizens '*to become actively and genuinely involved in defining issues of concern to them, in making decisions about factors that affect their lives, in formulating and implementing policies, in planning, developing and delivering services and in taking action to achieve change.*' [World Health Organisation 2002, p10]. It not only provides opportunities for people to better understand policies and projects but it also increases the people's sense of ownership and thus also commitment – and it must go beyond a mere provision of information or gathering of opinions through consultation (see also Chapter 4, Section 4.5). Thus, the culmination of involvement is for those who act at the grass-roots level in the ECOCITY to also have the right to be involved in decision-making concerning the formation and running of the city. This kind of involvement goes beyond traditional representative democracy and it depends very much on the willingness and interest of all parties involved. Generally, community involvement should bring together all those involved in the planning process as well as those affected by the project (citizens, stakeholders, interest groups) and – if possible – the intended users and inhabitants. The different levels of community involvement that can be achieved are shown in the pyramid in Figure 3, which was developed for the ECOCITY evaluation scheme (see Chapter 5, Section 5.2.4).

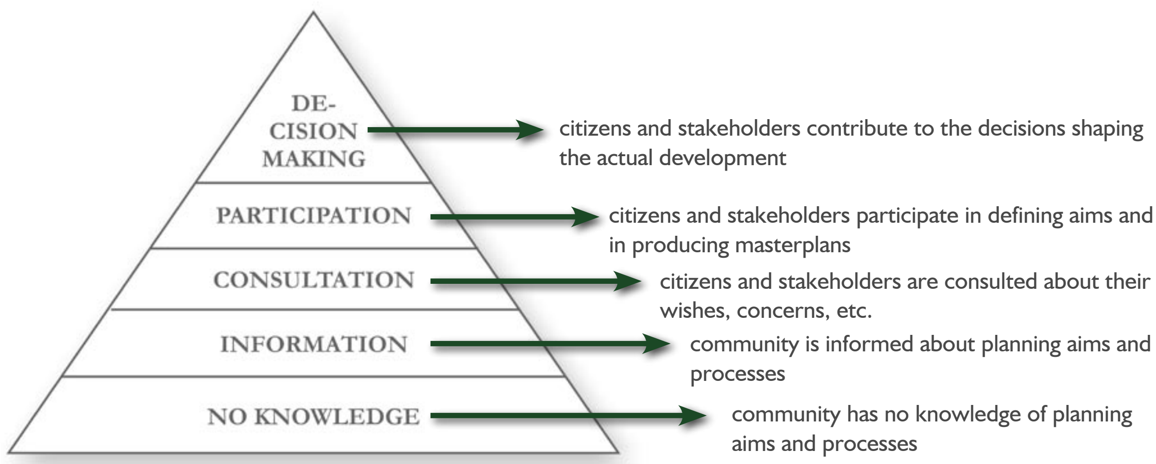



Figure 3.2: The community involvement pyramid

The traditions for involving the community in local decision-making are very different across Europe. Depending on the project in question, people's concerns and interests will also vary. However, efforts should always be made to initiate community involvement as early as possible and to involve all the relevant groups and individuals at an appropriate level. This process is often complex and also implies some risks (e.g. costs, increased timescales). For organising and moderating community involvement it is therefore best to employ experts – as is the case in any other planning sector. They will also be able to recommend the right level of involvement for different types of projects. This will be different for planning a new cycle path compared to planning a new urban neighbourhood, for example.

## 3.2 Guidelines for ECOCITY planning at the level of urban quarters

Some guiding principles are relevant to ECOCITY planning at all levels and in all sectors:
- Planning processes and outcomes should provide a balance between fixed results and the possibility to adapt to changing demands (keeping land free for future internal development, e.g. public transport corridors).
- Flexible planning strategies should allow learning from the experience of completed phases for the following phases of planning.
- Planning results should be submitted to continuous monitoring and feedback processes based on checklists or indicators, correcting the course whenever necessary.

The following sections will present more specific guidelines for sectoral planning at the level of urban quarters (though many are also relevant for planning at other spatial levels). However, the sectoral subdivision should not detract from the need for interdisciplinary processes and planning teams.

The ECOCITY Checklist of Objectives and Measures (Section 5.2.1) contains more detailed information on the kinds of steps which need to be taken in order to fulfill the requirements of the guidelines presented hereafter. The list should thus be used in close association with the following texts.

### 3.2.1 Urban structure

The ECOCITY planning process focuses on the interactions of urban structures and functions with the transport system. From the perspective of urban structure, these interactions depend on factors such as location, size, density and mix of uses of the ECOCITY development. These factors determine the distances people have to cover to travel from their home to school, work, shops leisure facilities and for other purposes, thereby influencing accessibility.

Quality of life also depends to a great extent on these aspects of urban structure – smaller-scale, multifunctional areas are more stimulating and pleasant places and are generally easier to 'read' and feel safer than large mono-functional developments with little direct connections to other parts of a city. While quality of life and easily accessible urban and social facilities are necessary for ECOCITY inhabitants to fulfil their needs and have to be maximised, resource consumption through transport and other activities must be minimised. Urban structure must make a significant contribution to achieving this balance.

The core strategy for location and design of new developments should therefore include:
- *locating* developments in such a way that they are suitable for an efficient and attractive public transport system and provide short distances to other parts of the city (brownfield sites should be preferred);
- creating *qualified high densities* and limiting *size of settlement units,*
- providing an *attractive mix of uses* and
- paying attention to *urban ecology and climate*.

Relevant guidelines for these aspects are provided in the following. These are complemented by a list of further guidelines relevant to all aspects of urban structure in ECOCITY planning.

**The location of ECOCITY developments**

Specific attention in ECOCITY planning is paid to the spatial level of quarters and neighbourhoods. At this level, local planning regulations, land-use and zoning plans can influence the location of new developments, reduce the rate of use of greenfield land and bring the brownfield areas in the settlements back into use. According to the Three Step Strategy presented in Section 3.1.2 the following priority list should be followed when deciding between different possible development sites:

**1.** Prefer re-use, renovation and retrofitting of favourably located existing structures.

*If you cannot do this*

**2.** Re-use favourably located brownfields for re-urbanisation.

*And only if you cannot do this*

**3.** Utilise favourably located greenfield areas for urbanisation.

For a location to be considered favourable, it has to fulfil the following requirements:

- The site should either already be integrated into existing high quality public transport systems (rail, metro, tram, high-frequency bus services) or it should be easy to alter or extend existing systems to connect the site to the network. Important public transport stops (e.g. rail or metro stations) must be within walking or cycling distance for everyone living and working in the new development.
- If basic everyday facilities are not available within the development (e.g. schools, shops for daily needs, health care, recreational areas), they must be accessible within easy walking or cycling distance.
- The site should be located at no more than convenient cycling distance from higher-level city or district centres and should be integrated into attractive, direct and complete networks for non-motorised transport modes.

These guidelines are relevant both when choosing sites for new developments and also when deciding on the restructuring of shrinking cities, which is increasingly becoming an issue in many parts of Europe. Local planning regulations and land-use plans should also direct urban development according to these guidelines.

**Qualified high densities and size**

Density and size determine the number of residents and users (employees, students, customers) of a development. The issue is highly important in urban planning, not just to reduce land consumption but also to provide critical mass for a wide range of facilities in the settlement (see **mix of uses** below) and to allow for more sustainable transport systems. Therefore it is necessary to optimise the density of settlements with regard to the potentially contradictory requirements of transportation (higher density of origins and destinations), solar architecture (depending on the climate: either avoiding shading between buildings or using it for passive cooling) and quality of life issues (e.g. open spaces for climatic and social functions and personal comfort). Balancing these demands leads to what is called **qualified high densities**.

Urban density is defined as *floor to area ratio of buildings* (i.e. the total floor area of built structures in relation to the area of the plot they are built on) and *building coverage to plot size ratio* (i.e. how much of a plot or the planning area is covered by built structures). In an ECOCITY it is important to create space-saving urban structures, to allow for a balanced mix of uses including a good variety of ECOCITY appropriate business and trade facilities (i.e. businesses which do not create unacceptable emissions and which preferably adhere to sustainable business practices) and to provide high quality public spaces and green areas.  It is difficult to provide fixed values for these units as the appropriate density that should be obtained depends on the location of the development (city edge or city centre; densities of surrounding areas; transit situation) and also on the actual mix of uses planned (because a good mix of uses can in turn allow higher densities). Thus the following qualified densities are intended only to provide a general idea – local conditions can dictate divergence from these values:

- floor/area-ratio (or floor/space-index): 0.8 – 3.0
- building coverage to plot size ratio (or share of built up area): 0.35 – 0.7.

The resulting schemes can generally be characterised as low to medium rise with high densities and 100 - 250 inhabitants/hectare. Note: users of the area (employees, students, customers, etc.) are counted additionally to the inhabitants.

But even for higher densities, a minimum development size of about 300m x 300m (9-10 ha) is recommended to allow new ECOCITY developments to obtain a 'critical mass' of number of users and inhabitants for public transport and mix of uses. If, however, the development is integrated into existing structures which can provide some of the necessary functions and uses nearby, smaller sizes are also possible. The challenge in these cases is to combine an ECOCITY structure with existing structures. On the other hand, for larger developments it must be ensured that all residents and users can reach important facilities within a radius of about 500 m from their origin. Greater developments must therefore be structured into smaller neighbourhood units of appropriate size and grouped around district centres.

**Mix of uses**

The mixing of different land-uses (living, working, education, retail, leisure, administration, social and health services) in a settlement – and also in its individual quarters and neighbourhoods – makes a positive contribution to the sustainability of communities. Improving the land-use mix, especially in mainly residential and commercial areas, leads to a greater quality of life, to more sustainable lifestyles and to a decreased transport demand – thus also reducing the use of private cars. **Mixed use** of space brings vitality back to many parts of the city, which become more attractive and lively and thus safer to live and work in.

For a functional optimisation of the urban structure it is necessary to obtain:

- **a fine-meshed mix of uses:** combining living, retail and/or office use at the level of floors, buildings and blocks;
- **a wide-meshed balance of all different uses in settlements:** combining residential, education and employment functions with leisure-time facilities at the level of urban neighbourhoods and quarters, and integrating a range of services and jobs without creating single-use zones for retail, businesses or housing;
- **optimal accessibility to all facilities by locating them at suitable sites:** organising activities around public transport nodes (rail, bus and underground stations), around urban centres, local hubs and public spaces; providing good accessibility for supply and disposal services while minimising distances.

Both the fine-meshed (at the building level) and wide-meshed models of mixed-use structure (at the urban quarter level) have to be applied. The following ratios of functions (allocation of floor areas of the development) are recommended:

- housing between 30% - 80% of floor area,
- work between 20% - 70% of floor area.

The variations are so large because there is no single ideal value for describing an optimal mix of uses. It depends on the context of the ECOCITY development (i.e. the facilities and structures that already exist), on its size and on the type of uses – a small manufacturing business for example, needs more floor space per employee than an office. The types of facilities that generally need to be accessible to people are detailed in Section 3.2.4 on socio-economic issues. The actual facilities that should be provided in the ECOCITY development again depend on the setting of the development and existing facilities within walking or cycling distance. Uses should also be compatible in size and type with the surrounding structures and uses: a noisy leisure facility should not be built right next to residential units, a bar should not be next to a school and uses with high levels of emissions (noise, pollution) should not be built in inappropriate locations. A further principle is: facilities should not be provided in an ECOCITY if similar ones of sufficient capacity and quality are nearby, and preference should be given to facilities that can be of added value to surrounding areas as well.

One important element of achieving a sustainable mix of uses is the existence of regional and municipal land-use management mechanisms. This goes beyond the often very general statements made in land-use and zoning plans. Such a unit, department or body must have responsibility for co-ordinating all processes and measures in planning and implementation that are related to creating mixed-use structures. It should also provide an information system on real estate (plots as well as dwellings and commercial units) as well as jobs available in the communities of the region.

**Urban ecology and climate**

Just like rural areas, urban areas are part of wider ecological systems and provide habitats not just for humans but also for plants and animals. Thus, urban planning must also consider the creation and conservation of such habitats and the requirements of species which might live in them. Open spaces and green areas are important for people's physical and mental well-being. The inclusion of such areas in urban contexts can also reduce the need of the inhabitants to 'get out' for recreational purposes – thus reducing transport demand. Furthermore, people's daily routines and comfort levels in urban areas are influenced by climate patterns (e.g. seasonal temperature changes, prevailing winds) and weather events (strong sun light, rain, snow, etc.). But built structures also influence the urban microclimate e.g. through providing shading, trapping and reflecting heat or funnelling winds. Open spaces and green areas with plants and water features contribute to ameliorating the urban climate by providing seasonal shading, giving wind shelter, regulating moisture levels and trapping dust. They also help in the management of rain water. Green areas can furthermore enhance the aesthetic quality of urban environments through providing texture, colours, smells and movement.

Consequently, green areas and open spaces are just as important for a high-quality urban environment as buildings and the infrastructure for motorised modes of transport.

The following functions of open and green spaces should be incorporated in ECOCITY planning:

- providing recreational spaces for people;
- regulating air temperature, humidity and quality (e.g. through water evaporation, by trapping dust and pollutants, absorption of $CO_2$ and production of $O_2$);
- helping in the management of surface and ground water (stopping excessive run-off of rain water, allowing percolation of water into the soil);
- providing habitat networks for plants and animals (this requires the right mixture of habitats and plant species and an adequate amount of well-distributed green spaces connected by corridors within the urban tissue);
- using elements of urban ecology such as energy, bioclimatic or rainwater concepts as a link between urban structure and building design;
- fostering people's conscious perception of natural processes and features by offering the possibility for sensual perception of the urban organism (natural light and colours, sounds and smells in the urban environment).

These functions can be fulfilled through combining features such as gardens; parks and pocket parks; street-trees and avenues; green roofs, green facades and vertical gardens and formal, semi-formal and natural water features. Green areas need to be planned in accordance with the local climate and urban microclimates in order to reduce to a minimum the need for expensive care and maintenance.

Further guidelines for planning the urban structure of an ECOCITY are:

- Spatial and functional characteristics of new urban structures should be derived from the existing urban and regional environment to create continuity. Factors to be considered include:
  - landscape and topography,
  - climate and microclimate,
  - existing buildings and streetscapes,
  - existing transport infrastructure,
  - visual and spatial connections to adjacent areas,
  - solar orientation and
  - the needs and preferences of (future) inhabitants (if these are known).
- Urban elements should – where possible – fulfil several functions in order to achieve synergetic effects (i.e. water elements as attractive design in public spaces and as a part of the rainwater management system).
- Housing should follow the criteria of liveability, economic efficiency and diversity serving different needs of different groups of population, including social housing.
- Streets and squares should respect the human scale, they should provide interconnected structures of open spaces, which are liveable, accessible, legible, safe and comfortable and which themselves provide access to other infrastructure.
- All measures should be considered in the context of the actual planning areas, and not decided on the basis of standardised solutions (i.e. be creative and produce tailor-made plans specific to the site in question).

### 3.2.2 Transport

In October 1999, the EU Joint Expert Group on Transport and Environment adopted the following definition of a sustainable transport system. It

- *"allows the basic access needs and development of individuals, companies and societies to be met safely and in a manner consistent with human and ecosystem health, and promotes equity within and between generations;*
- *is affordable, operates efficiently, offers choice of transport mode, and supports a vibrant economy, and regional development;*
- *limits emissions and waste within the planet's ability to absorb them, uses renewable resources at or below their rates of generation, and, uses non-renewable resources at or below the rates of development of renewable substitutes and minimises the use of land and the generation of noise."*

Planning transport systems in accordance with the basic principles of the Eco-Device Model (see Section 3.1.1) can make important contributions to resource saving but the important social functions of the transport system – namely providing accessibility – must also be considered. The goal should be *to improve accessibility while reducing transport demand.*

**The sustainable transport egg of personal travel**

The pattern of people's activities is related to both space and time. So the structure of activity *locations* forces them to use transport and influences the mode they choose. The travel activities performed are an outcome of a coupling of features of the land-use system and features of the transport system. Thus possible measures on the transport and on the spatial side can be given a ranking of preference: preference should be given first to all those measures which diminish the need for transport, then to those measures which result in travel by slow modes, thirdly to those measures which support public transport and mass-transit, and lastly to those which necessarily result in car transport. This is an extension of the Three Step Strategy presented in Section 3.1.2.

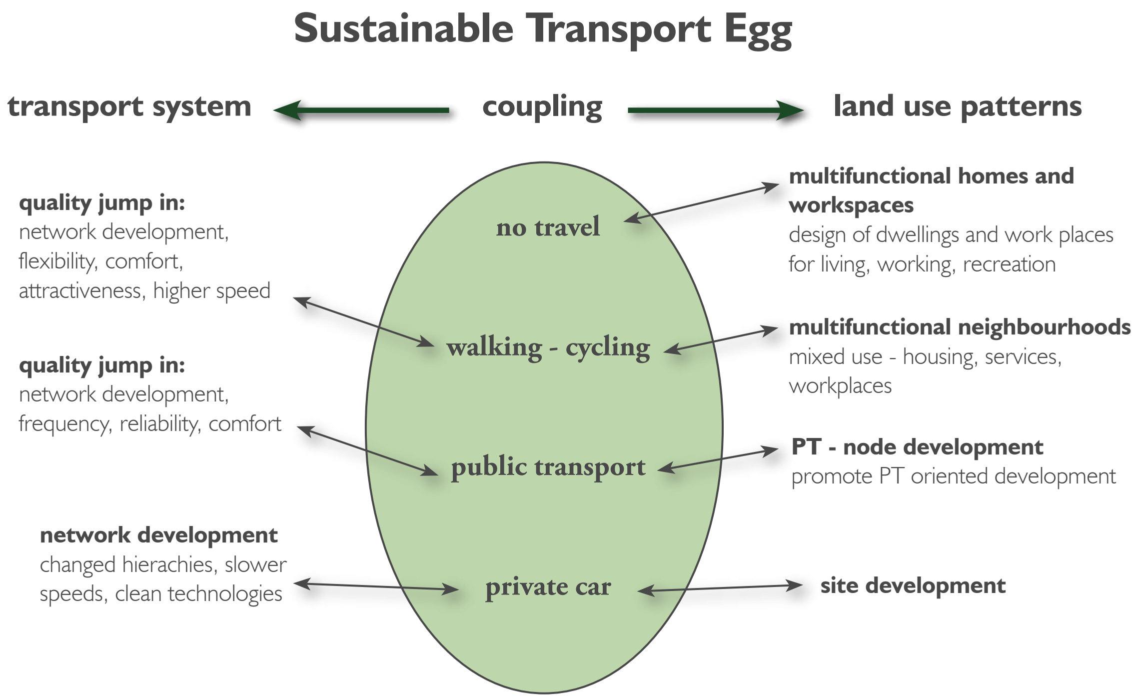



Figure 3.3: The Sustainable Transport Egg Concept [UvA, SenterNovem, 2002]

The egg shape also indicates that most travel should take place on foot, by bike and by public transport. It should be possible to fulfil most – but rarely all – daily needs within ones dwelling environment and without motorised travel. Only a minor proportion of travelling should be done in the private car.

A major change in this planning concept is the reverse sequence, in which transport modes are considered in the planning process. The traditional approach generally starts by considering the requirements for travel by car followed by freight traffic and public transport. Pedestrians and cyclists mostly received the left-over resources. Sustainable transport planning has to turn this sequence upside down, starting with considering the needs and potentials of the slow modes and then moving down the 'egg' hierarchy.

When thinking about public transport, it is also important to consider the specific strengths of different public transport modes[7) ] (in addition to selecting the right location for urban development, see 3.2.1 Urban Structure) in order to achieve the best results:

- Rail is best suited to serving corridors where destinations are concentrated and tends to attract a higher modal share within a given area.
- Buses are more flexible in route planning and choice, and much less expensive in infrastructure. They are thus more appropriate for connecting dispersed origins and/or destinations.

Thus buses are more suitable for certain types of settlement structure, including the misdeveloped structure of sprawl, and they can cover larger but less dense areas than rail. However, their attractiveness and efficiency, as well as competitiveness with cars, decreases rapidly the more dispersed settlement structures are. The ideal alternative to car-oriented development is thus the concentration of buildings in corridors served mainly by rail (as Transit Oriented Development), with buses completing the system by providing the connections to more dispersed structures around these corridors.

[7)] See also Todd Litman (2005), Rail Transit In America, A Comprehensive Evaluation of Benefits, Victoria Transport Policy Institute, Victoria, BC, CANADA, http://www.vtpi.org/railben.pdf

**Transport planning at the neighbourhood level**

For the planning of ECOCITY neighbourhoods, a variety of concepts are available for reducing travel by private car. These concepts require a range of principle decisions on car parking, car access and even car ownership. Traffic calming has become well known in the last three decades, while, though relatively new, areas with reduced car traffic and car-free areas are increasingly implemented and are becoming more and more popular. It is sometimes possible to move from one traffic concept to the next most sustainable one in incremental steps. But especially when planning new ECOCITY quarters, the car-free option should always be considered the most desirable. Such neighbourhoods do not just contribute to reduced car use by offering attractive alternatives and greater quality of life but they also foster reduced levels of car-ownership – and thus higher demand for public transport trips and lower demand on space for car parking.

However, it is important to be aware that when reducing the accessibility for the car, the alternatives should be of maximum quality. Otherwise transport poverty and reduced accessibility can occur and the plans will attract severe criticism.

**Overall, ECOCITY transport planning should achieve the following:**

- integrated concepts operating with push and pull factors (e.g. improvement of public transport, restrictions for motor traffic, road tolls for lorries, subsidies for rail transport)
- integration of transport modes from the point of view of the user (convenient interchange between non-motorised and/or public transport modes, good information provision, etc.)
- shift to environmentally compatible modes through hard (infrastructure) and soft measures (information, public transport mobility packages, incentives for new residents or employees, etc.)
- encouraging companies to adopt employer travel plans[8)]

[8)] Programmes designed and implemented by individual organisations to encourage and support employees' travel awareness and reduce individual motorised travel to work through strengthening alternatives.

Table 3.1: Neighbourhood transport concepts (adapted from TU Delft, 1994)

| | |
|---|---|
| CAR FREE AREAS<br> | • greatly reduced ratio of parking spaces per housing unit (around 20% of the usual provision) as well as per workplace and for users of various facilities (e.g. retail)<br>• reduced car ownership levels of residents by voluntary agreement<br>• motorised traffic limited to delivery and emergency services<br>• general priority for pedestrians and cyclists on the streets<br>• parking spaces located at the edges of or outside the quarter<br>• neighbourhood services (e.g. delivery services and/ pick-up boxes for parcels and deliveries) |
| CAR REDUCED AREAS<br> | • reduced ratio of parking spaces per housing unit (around 60% of the usual provision)<br>• only residents and other authorised users allowed to drive in/through the area<br>• no or little through traffic (reduced speed, residential streets, no through roads)<br>• spatially concentrated parking spaces<br>• possible inclusion of neighbourhood services (e.g. delivery services and pick-up boxes) |
| TRAFFIC CALMED AREAS<br> | • standard ratio of parking spaces per housing unit (100% of the usual provision)<br>• accessible for cars but unattractive to through traffic due to traffic calming (reduced speed, ramps, no direct through roads) |

### 3.2.3 Energy and material flows

Energy flow is an essential aspect of the sustainability of built structures and transport systems and the consumption of energy can be influenced to a large extent through planning. The same is true for material flows in the construction and deconstruction phases (movement of soil and selection of building materials) of a project. However, the consumption of energy for household appliances as well as the amounts of water used, the resulting wastewater and waste produced depend more on the behaviour of future inhabitants and users (questions of industrial production are excluded here).

Apart from making a more sustainable use of resources, the minimisation of material flows also reduces unfavourable side effects such as dust, noise and pollution from transportation as well as accident risk and vehicle load in the local transport network. Thus, the use and/or movement of energy and materials should be planned according to the Three Step Strategy (Section 3.1.2 – see also Table 3.2), the guidelines presented hereafter and the measures presented in Section 5.2.1.

Table 3.2: Summary of the Three Step Strategy for energy and material flows

| | Step 1 | Step 2 | Step 3 |
|---|---|---|---|
| Energy | Minimise the energy demand of the built urban structure and minimise energy losses of buildings. | Replace limited (fossil) resources for use in heating and electricity supply with renewable energy sources while minimising environmental impacts. | Maximise the efficiency of non-renewable energy sources and minimise its impact on the environment. |
| Water | Minimise the use of water, especially drinking water. | Where appropriate and possible use alternatives to drinking water (e.g. rain water). | Treat wastewater so that it can be recirculated into the water cycle without negative impacts. |
| Waste | Minimise the production of waste. | Re-use or recycle waste. | Treat residual waste in a environmentally compatible manner. |
| Soils, excavation material | Minimise the need for excavation. | Re-use excavated material on site. | Minimise movement of excavated material off site. |
| Building materials | Minimise demand for building materials. | Give preferences to environmentally friendly and sustainable produced materials. | Use non-renewable materials wisely (allowing re-use and recycling). |

**Planning for energy generation, distribution and use**

The EU as a whole already uses more energy than it can produce from renewable and non-renewable energy sources found or harvested within its own borders. That means it is a net importer of 'energy' and the import rate as well as the rate of use are constantly increasing. At the same time, the EU Kyoto commitments require a 8% reduction in $CO_2$ production relative to 1990 levels in order to attempt to stabilise climate change [UNITED NATIONS, 1998]. Thus although the share of energy harvested from renewable resources is constantly rising, it is still becoming increasingly necessary to find ways of reducing energy use and $CO_2$ production. Generally, the energy system should have the minimum possible negative impact on outdoor and indoor environments and on people and their health. In what follows, the focus lies on energy use for heating, lighting and cooling in residential and commercial buildings because the high share of the total energy use of these structures offers great potential for reduction of energy use (and $CO_2$ emission)[9].

[9] See also Chapter 2 of the ECOCITY Book I.

Along with sustainable transport, solar architecture is the second major concern influencing urban structure. Both planning issues are closely connected, as the transport related requirement of short distances must be balanced with the types of structures which make optimal use of solar energy and natural daylight (see also Section 3.2.1. on qualified high densities). The urban structure is also influenced by the requirements of outdoor bioclimatic comfort, e.g. cold/fresh air corridors (see section 5.1.3. on Energetic and Bio-climatic Simulation Tools [10)]). The most important measures for optimising the energy demand created by the urban structure and its elements are presented in Section 5.2.1.4.

[10)] Urban Comfort, ECOCITY Book 1, section 2.4.2. Objectives for urban structure.

On the building level, a very low heat demand is nowadays achieved by the Passive House Design (especially for moderate and cold climates). This combines best insulation, air-tightness and high quality glazing with a ventilation system with a highly efficient air heat exchanger to maintain a comfortable interior climate without active heating and cooling systems [11)].

[11)] More information: Passivhaus Institut, Wolfgang Feist, Darmstadt, http://www.passiv.de

In addition, existing energy generation and supply systems as well as individual buildings should be analysed and where possible upgraded to save energy and rely on renewable energy sources. These renewable sources should be chosen and combined depending on their local availability. The use of fossil energy resources should be the last option for applications and used only if energy saving and renewable options are not sufficient.

**Water management**

The utilisation of water in households and industry (for cooling and process water) is part of the global water cycle, but the available quantity of water suitable for drinking is limited and unevenly distributed. Thus the sources need to be protected rigorously and used efficiently – especially in areas with dry climates.

Water management concepts, based on an investigation of the natural water cycles of the area (precipitation, surface water and ground water), should include:

- measures to minimise the overall quantity of water extracted from the water cycle for human utilisation (water supply) and thus the connected production of wastewater;
- wastewater treatment measures that prevent negative environmental and health impacts when the water is recirculated into the water cycle, as well as
- measures to minimise the change in the natural water cycle, keeping the rate of infiltration of rainwater into the ground water bodies and the rate of run off from the area as it was before construction, while also providing rainwater for human utilisation (rainwater management).

*Reusing wastewater*

Domestic wastewater can be divided into two categories according to the degree of pollution: black water coming from toilets and grey water from kitchen, laundry, bath and shower. The usual system of discharging it completely (or of only discharging the black water) to sewers and purifying it in municipal treatment plants meets many environmental requirements – at least in areas where there is no shortage of usable water.

In such areas (but also elsewhere), grey water can be collected and treated separately on site (with or without heat recovery), and reused for purposes which do not require water of drinkable quality (e.g. toilets, gardening).

*Rainwater management*

Infiltration of rainwater into the ground (as opposed to run-off into the closed municipal drainage system) can be fostered through green areas, permeable surfaces e.g. for parts of pathways, as well as specialised drainage systems (e.g. open drainage ditches with vegetation and natural drainage patterns achieved by renaturation of creeks). The retention of rainwater on site can be improved by means of green roofs or retention ponds (which, in combination with natural surface water, are important elements for attractive green and open space and also contribute to flood protection). Rainwater, collected in reservoirs, can also be used for the same purposes as grey water.

**Waste collection and treatment**

The first priority is to prevent waste. This requires a careful design of products for high durability, and easy repair – measures largely outside the scope of ECOCITY planners. As a second step, waste should be re-used or recycled. This requires the perception of 'waste' as a valuable resource – an attitude that should be fostered in ECOCITIES. The focus in ECOCITIES should thus lie on optimising the re-use or recycling of waste by providing the necessary infrastructure (see also Section 5.2.1.4). The non-recyclable fractions of waste – which should be small – should be pre-treated to minimise the demand for landfill and possible negative environmental impacts (in some countries this is already required by law). For all categories of waste, transport demand should be optimised between minimising distance (e.g. by enabling re-use on site or nearby) and maximising economies of scale for treatment facilities.

**Soils/ excavation materials**

This type of flow concerns mostly the construction phase, but it generates the movement of large volumes of material. Thus the need for soil movement should be minimised by reducing subterranean built space (cellars etc.) while providing space for necessary uses (e.g. heat storage, shelter for emergency). A quantitative and qualitative analysis of the material that will nevertheless be excavated should also be carried out to determine possibilities for re-use and treatment requirements, identifying the different types of soil (topsoil, base material) material useable for refilling and landscaping, material useable in concrete (aggregates), possible contaminations, etc. Materials for which no use can be found on site should be re-used as nearby as possible.

**Building materials**

Building materials must fulfil the basic requirements concerning e.g. strength, thermal conductivity, workability, etc. But for an ECOCITY, materials should also:

- make a low demand on non-renewable energy and other non-renewable resources in production;
- create high indoor comfort and include no substances harmful to humans or the environment in production or use and
- be sourced as locally as possible to minimise transport demand.

### 3.2.4 Socio-economic issues

The general, fundamental idea of urban sustainability is to create liveable cities of health, safety and well-being with a profile of a city as an "attractive, unique and competitive place". An ECOCITY should thus provide a high-quality environment for more sustainable living, working and transport patterns. To fulfil this goal, the following socio-economic issues must be considered.

**Social infrastructure and social mix**

An ECOCITY has to provide not only a general mix of uses but also a good social infrastructure – although the provision does not necessarily have to happen within the development if it is possible to use (and/or expand, improve) good quality facilities in nearby quarters. The following list can serve as a guideline – though requirements will vary with the nature and size of the project.

Some examples include:
- kindergarten and elementary schools within walking distance,
  all other schools within walking/cycling distance or max. 30 min. by public transport;
- facilities for the elderly (day care, residential facilities) accessible by public transport;
- a reasonable variety of possibilities for self-organized leisure and recreation activities (playgrounds, open public multi-purpose areas and sports fields, parks, pubs) within walking distance;
- a reasonable variety of places of worship, cinema, theatre, fitness centre within 30 min. by public transport;
- health centre, general practitioners, pharmacies etc. within walking distance or easily reached by public transport;
- public meeting facilities (e.g. community hall) where groups can meet and work together (e.g. parents' meetings, association of unemployed, meeting place for the aged etc.) within walking distance and
- day-to-day facilities such as news agents, bakery, supermarket, grocery store within walking distance, other retail facilities easily accessible by public transport.

The facilities provided should be attractive to different social groups (age, income, ethnic origin) that are expected in the development. Additionally, if the planning area plays a role in the cultural heritage, this aspect must be protected. The aim here is to sustain cultural continuity and identity arising from the unique features of the area and the values it has in the social and emotional lives of (local) people. Public participation processes can also help to establish ways of dealing with cultural heritage according to the degree of identification of people with the features in question.

Another important social objective is to achieve a good ***social mix*** through the integration of different groups of the population according to categories such as age, family size, income base and ethnic origin. Not all of this can be achieved through planning alone, but an important foundation can be laid by providing different types of accommodation and commercial units at a variety of prices (see also Section 5.2.1.5).
- The size of the flats should vary from one-room-apartments to apartments with five bedrooms (or more, according to local and regional demand).
- Some variation (as mentioned above) in the square metre prices for dwellings (and also commercial units) is necessary.

As well as attracting different groups of people, a diverse housing market also gives people with changing requirements the possibility to move within the area (rather than moving away to find somewhere bigger, smaller, cheaper, etc.) thus contributing to social stability. It will furthermore help to prevent social exclusion.

**Economic infrastructure and employment opportunities**
The economic infrastructure in an ECOCITY development has to be viable in itself (as in any other development) – units must be attractive, flexible, easily reached, well equipped, in an attractive price range and suitable for different sectoral uses. In addition, the following guidelines should be followed (where possible at the planning stage):
- The mix of trades should provide an appropriate number of jobs.
- The need for motorised commuting trips should be reduced by creating job opportunities within walking or cycling distance from dwellings.

- The mixture of employment opportunities should correspond to the qualification structure of the intended inhabitants of the development.
- The business units should be clustered throughout the development to achieve the feeling of a mixed area (e.g. day and night time use) and a balance between housing and working environments.
- The trades and businesses should be able to fit in with the general objectives of the ECOCITY (e.g. reduction of pollution, noise and use of non-renewable resources).

**Economic viability of the development**

Sustainability also implies economic viability and this requirement thus applies to ECOCITY developments, too. However, in such developments it is usual to find comparatively high construction costs, which then result in reduced – sometimes much reduced – running and maintenance costs. This is due for example to high standards of insulation and use of modern energy technologies resulting in lower energy requirements and use of renewable (cheaper) fuels. The use of long-life building materials also contributes to this phenomenon. Furthermore, creating socially diverse quarters with a good mix of uses and a high quality of life leads to less empty units, potentially higher rent and prices, and thus better returns on investment. However, these prices must not be subject to speculation as this would counteract the efforts towards creating a good social mix. The economic concepts for ECOCITY developments should thus be based on total cost models.

To achieve economic sustainability it is generally helpful to involve a plurality of investors right from the start. Some of these investors might join the project for purely economic reasons (big companies as well as private persons), others might want to build their own home or business unit. Potential investors are thus owner-inhabitants, real-estate companies and professional developers.

A public-private partnership (PPP) is one of the tools available for implementing ECOCITIES, with different partners from the public and the private sectors working together. Co-operation of all sectors on ECOCITY projects makes it possible to divide the risks among partners, to attain the public, social and societal goals with reduced funding from public sources, and to raise the return on investment on related private investments. Urban planners and other decision-makers must ensure that adequate organization structures (e.g. project oriented working groups and committees) for the mutual exchange of the ideas among the public and private actors are put in place at an early stage. The dynamics of the PPPs must moreover be closely linked to the participation processes and community involvement. PPPs can create great synergies for both sectors as well as the community – but they also carry severe risks (e.g. much increased costs and low or no returns for the public sector, longer planning phases and delayed returns for the private sector). Thus it is important to look at what has worked or failed in other, similar projects.

Overall, it must always be borne in mind that the profitability of a development should not be measured only from the point of view of direct investments and returns. Creating an environment with healthier citizens, less accidents and pollution, lower crime rates, higher employment levels, etc. brings substantial benefits for the public purse, even if these are not always easy to quantify.

# 4 ECOCITY Planning Techniques

In order to achieve urban development projects with integrated sustainable solutions across all sectors, ECOCITY Guidelines (see Chapter 3) and Objectives (see Section 5.2.1) have to be woven together with local requirements. This is a complex task, which is why many projects tend to achieve only good sectoral solutions, (e.g. high-quality energy concepts) but the development of holistic concepts is rare. Overcoming this problem is not only a technological challenge, but foremost a challenge of design process and appropriate planning procedures.

How does one involve the right professionals and the right local (civil and political) agents and how does one communicate the collaborative design task? These questions force everyone involved in ECOCITY projects to focus on three tasks from their own particular perspective:

- the integration of sectors (e.g. urban and transport planning)
- the integration of participating agents and stakeholders, bringing together politicians and the local community
- tailoring the plan to local requirements and circumstances

Every project has to define its individual design process to fit with the given local framework., but the ECOCITY experience showed that having the opportunity to choose between and combine various appropriate Planning Techniques – as presented in this chapter – was very important. The techniques presented in the following sections are not an exhaustive list – that would go far beyond the scope of this book – rather they introduce the reader to those approaches that were found useful and sufficient during the ECOCITY project. These techniques were further supported by a variety of specific planning tools (see Chapter 5) to enhance the quality of the planning process as well as its results.

## 4.1 ECOCITY basics

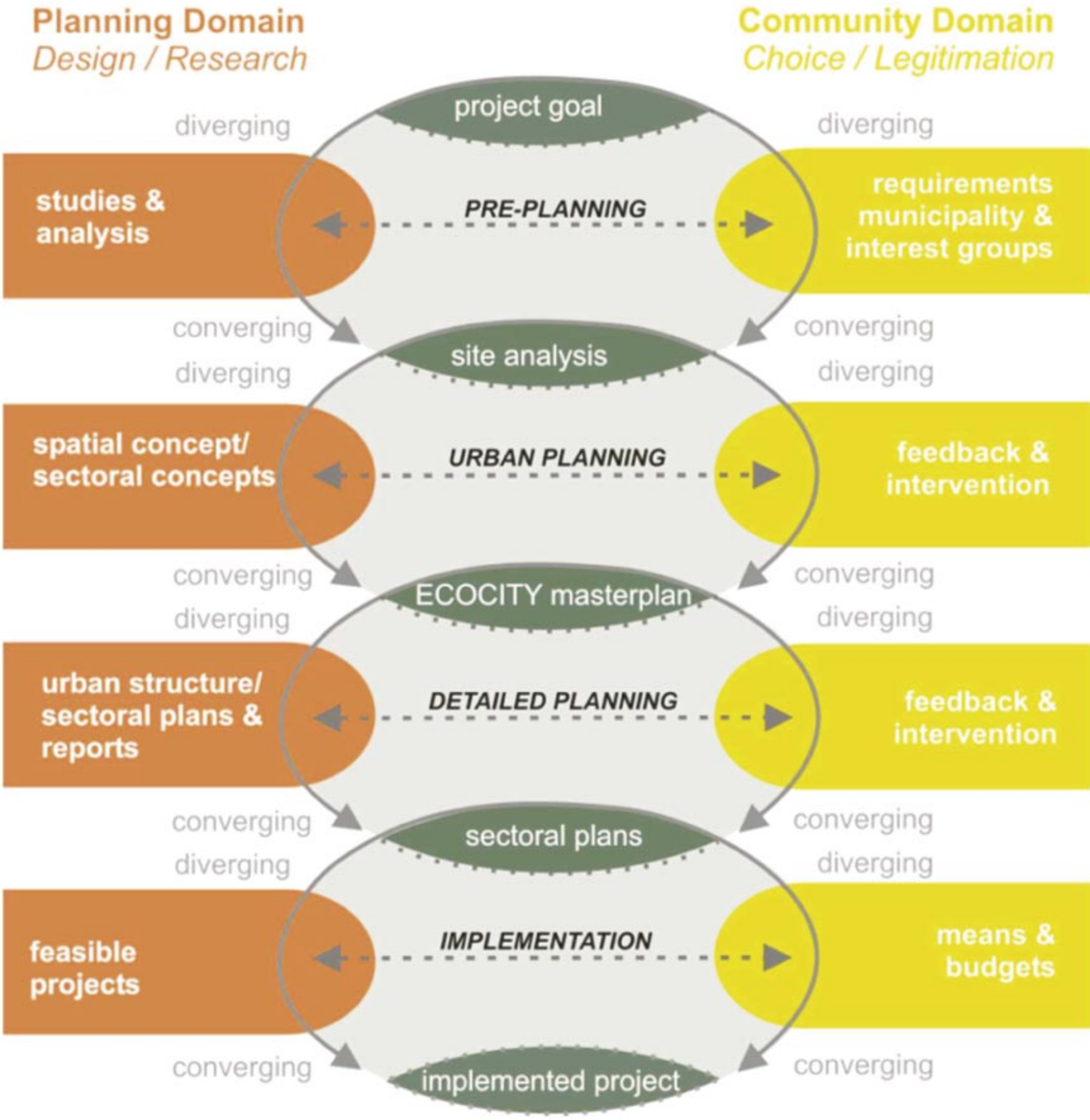
The planning process has to be tailor-made for every project. But the following basic rules should always be applied to produce a plan for sustainable development:

- the plan is a collaborative design task for all planning sectors (see Section 4.2.1. on Environmental Maximisation Method, Section 4.3 on integrated planning techniques and also Section 5.1.1 on the Local Transport Performance tool)
- the plan needs conscious decisions by the public and politicians (see Section 4.2.2 on European Awareness Scenario Workshops and Section 4.5 on participation techniques)
- all aspects of the plan are interconnected and require an approach focussing on optimisation (see Section 4.4 on optimisation techniques, and Section 5.1.2 on the Netz*Werk*Zeug tool)

These rules apply to all planning phases and form the basis for the procedural concept described below.

The process scheme (Figure 4.1) shows a series of steps for urban planning processes on the scale of a city neighbourhood and with a particular focus on the master planning stage. It is not meant as a timetable, but shows the main focal aspects of different planning stages and their results. Terminology and approach often differ between the Planning Domain (composed of municipal planner as well as the external planners and experts – left side of scheme) and the Community Domain (politicians and interest groups – right side of scheme). These domains have to be integrated during the planning phases and their views and needs reflected in the planning results (central column of the scheme).

Figure 4.1:
ECOCITY Process Scheme




*Pre-planning*

The overall process starts with a common project goal. This is followed by the required studies and analyses. The site-analysis should consider both the wider environs and the region (especially with respect to transport aspects and supply of goods and services) as well as the local site (especially focussing on landscape, urban climate and connections to surrounding areas). Generally, one should include all relevant sectors of sustainable planning such as urban structure, transport, energy and material flows (including water and waste), socio-economy and urban climate. Specific requirements of different interest groups from the Community Domain should already be considered at this stage.

*Urban Planning*

During the urban planning phase, using the site-analysis results as input, the Planning Domain develops initial spatial concepts in accordance with the ECOCITY sustainability objectives (Basic Concepts). Then the planners discuss these initial concepts with the Community Domain, which provides feedback with respect to the manifold local requirements. This process results in a common ECOCITY masterplan.

*Detailed Planning*
During the phase of detailed planning, different development scenarios and sectoral reports are drawn up on a more concrete level. Because of the different terminology of the two domains involved, workshops and meetings need a specific approach. Care must be taken that the sectoral planning issues are transferred to the Community Domain in an appropriate and transparent way. Feedback and intervention through participation should not be the icing on the cake but must be seen as an essential and thus integral part of the planning process. The concepts (e.g. for urban structure, transport or energy) will be optimised (some probably discarded, others woven together), via several planning steps that integrate the different sectors. This stage begins with a masterplan and ends with detailed and integrated sectoral plans.

*Implementation*
The implementation phase begins with discussions and decisions on the measures to be taken in accordance with the Masterplan. This results in an implementation programme, which must be achievable within the available budgets of time, money and other resources. Thus this step determines the way and sequence in which the plans will be realised. Monitoring during work in progress is important to check that the results correspond to the agreed plan. This stage of the project development culminates in completed architectural and infrastructure projects.

The ECOCITY experience showed that the approach outlined above delivers public and political support for the plans, widens the scope, offers a long-term perspective and helps orientate the focus towards sustainable urban planning.

It should also be noted that these planning phases rarely happen in a completely linear sequence[12)]. There should always be the possibility for feedback between the different planning steps – for example if the detailed planning shows that some ideas in the basic concepts cannot be realised according to ECOCITY objectives or if the discussions in the implementation phase show, that some of the ideas in the Masterplan have to be adapted. Furthermore, the use, maintenance and monitoring of the completed infrastructure will also show the possible need for adaptation or change during the life cycle of the project.

[12)] see also Book I, Section 3.1 Urban development as a cyclical process

In addition to specific planning techniques (this chapter) and tools (Chapter 5), external consultancy can make a major contribution to enhancing the quality of urban planning projects (see Section 4.6).

## 4.2 Other Basic Techniques

Some existing approaches provided the basis for the ECOCITY Planning Techniques. The most important of these techniques are described in the following. The Environmental Maximisation Method (4.2.1) focuses on sectoral integration while the European Awareness Scenario Workshop (EASW) Methodology (4.2.2) is a participation technique with a special emphasis on raising awareness for urban sustainability.

### 4.2.1 Environmental Maximisation Method

This is a planning technique which supports the integration of spatial and environmental quality and promotes the sectoral interactions within a multidisciplinary planning team. The first step is *creating an inventory,* which means ‘stock taking’ of the site and the programme of requirements from an environmental perspective. In the second step – *maximisation* – all environmentally relevant issues (such as energy, ecology, water and transport) are examined. The goal is to find out what the consequences of the most environmentally sustainable solutions for each sector are. In the following step – *optimisation* – the individual results of the *maximisation* steps are integrated into an "Environmental Design", i.e. a design that combines all sectoral solutions into an environmentally optimal concept. In the last step, *integration*, this design will then be integrated into a masterplan considering additional aspects such as policies and strategies, costs, budgets and markets. This step usually requires the most compromises, but the technique demands that certain environmental standards are always adhered to.

*The Environmental Maximisation Method has been developed by Kees Duijvestein [2004] of the Dutch practice BOOM, Delft. Additional information can be found on the website www.boomdelft.nl*

### 4.2.2 European Awareness Scenario Workshops (EASW) Methodology

EASW is a participation methodology, based on assumptions about the future, which aims towards a common vision and common priorities. The workshop consists of a two-day meeting of 50-60 invited participants, which should be a good cross-section of the local population. The participants are drawn from four or five different interest groups: *decision-makers, technological experts, the private sector, citizens and civic associations*. On each day, participative work is organised in introductory plenary sessions, small discussion groups monitored by a facilitator, and plenary presentations of group results. The first day is devoted to creating a common vision of the future, including negative and positive aspects. The second day is based on the common framework defined in the first session and – through the work on thematic working groups – defines steps for an action plan which works towards the positive visions and avoids or solves the negative ones. The workshop concludes with a ranking of the suggested ideas. In a concluding meeting, the results are presented to the local authorities, the public and the media. A detailed report on the process and the results is fed back to the participants and the general public.

*The EASW methodology has been developed by the European Commission 'Innovation' projects. It is largely based on the previous experience of the Danish Board of Technology of 'Urban Sustainability' and other successfully implemented European participation methods. Additional information can be found on the R+D European Commission Server CORDIS http://cordis.europa.eu/easw/home.html*

## 4.3 Integrated Planning Techniques

Integrated planning[14] is of special importance to achieve the overall ECOCITY objectives in comprehensive projects. The ECOCITY approach is based on a comprehensive understanding of urban areas that deals with many aspects of sustainability and requires the integration of ecological, social and economic issues with the classical aspects of urban planning. Thus a high level of integration of the sectoral concepts and strengthening of the interrelations is necessary in order to achieve synergetic effects which make a project a comprehensive whole – and thus more than the elaboration of good, individual sectoral solutions. Next to the expectation of better planning results, such an approach contributes to high planning efficiency and flexibility because it enables e.g. fast reactions to changing demands (such as in the housing market, from investors or through new technologies). Delays and unnecessary work efforts can thus be minimised.

[13] Despite frequent references to 'integrated planning' in related literature, on the internet and in project descriptions, no concrete definition for such a process could be found for the field of urban planning. However, Kohler & Russel (2004) and Späte (no date) for example, refer to complex architectural processes for sustainable buildings. These were adapted for urban planning processes by JEA.

### 4.3.1 Multidisciplinary Planning Team

Sustainability can be defined from many different perspectives and in ECOCITY planning, these should all be considered. Thus, a *multidisciplinary planning team* is an important precondition for the input of relevant know-how into the planning process to enable the production of high quality sectoral concepts. This requires a team to be assembled that represents all relevant disciplines for sustainable planning (including e.g. transport, energy, water and urban climate experts) as well as the relevant municipal institutions. This team should be made up of internal and external planners and experts, representatives of different departments of the city administration and public utility services as well as additional local experts. But the number of planning partners and the mode of their integration must also be suitable to the complexity of the project and manageable with reasonable demands on project management resources. The goal is to involve all partners from the start because basic decisions affecting all sectoral concepts are made at the beginning of the projects and opportunities to influence the process decrease as time progresses. Information exchange should be frequent so as to ensure a continuous development of all sectoral solutions and their integration into the overall concept. The services and tasks that have to be performed by each partner should be defined in a specification sheet with project goals which every partner has to agree on at the start of the project. But the process should also be open to adaptation as new requirements are identified or introduced from outside the project.

### 4.3.2 Iterative Process

An iterative planning process is necessary for the integration and co-operation of the partners of the planning team. The idea is to strive for a step-by-step enhancement of the quality of the project with repeated planning loops involving all partners of the planning team and leading to a series of planning steps for both the masterplan and sectoral concepts. This requires a conversational process and interactive communication preferably with project workshops (hands-on with sketching, drawing and writing), but also meetings (presentations, discussion). The stages of parallel work in different groups must be continuously coordinated through high-quality project management, which organises communication and information exchange and ensures decision-making by all actors on an equal footing (avoiding for example a dominance of urban planners). The use of computer supported collaborative working (cscw) tools such as communication platforms on the internet, video-conferencing and net meetings, whiteboard sketching and application-sharing of cad-software via internet (especially if the co-operation with remote partners is required) can support an effective work process. Furthermore, particular attention should be paid to creating a good working atmosphere since a team set-up with good competencies but, for example, interpersonal conflicts, can have negative effects on workflow and decision-making.

### 4.3.3 Bottom-up Design

Planning, and in particular transport planning, is normally carried out from the larger scale down to the micro scale. This is an appropriate work sequence for site analyses, for example, since factors such as the position of the settlement in the region influence the demand for mobility. The larger scale context must be considered for transport relations with the city, region and country in networks for motorised individual transport and for public transport.

But for the design of settlements and the task of developing living city quarters, a reverse strategy concerning the scale should be taken into account as well. A so-called bottom-up design, starting from the micro scale and moving up to the regional scale, focuses on measures for walking and cycling as well as for liveable surroundings with attractive public spaces at an early stage of the planning process. This approach of starting with the slow modes of transport is an essential design technique in order to focus on sustainable mobility on the level of the residential and working environment, the neighbourhood and the borough (see also Section 5.1.1 on the *Local Transport Performance tool*). Thus the site analyses works downwards or inwards in terms of scale and mode, while the design should move mostly in the opposite direction.

## 4.4 Optimisation Techniques

As stated earlier, the high complexity of sustainable urban development often results in completed projects with a specific sectoral focus, that deal with only a few aspects of sustainability (e.g. transport or water management or energy). The application of optimisation techniques is helpful in facing the challenge of dealing with more than one aspect of sustainanbility at a time and for handling the system's immanent complexity. Since it is very difficult to optimise large complex structures, it is useful first to break them down into smaller, more manageable systems and then to integrate these elements into an overall urban system later on [Roos, H., 1997]. This procedure – first reducing complexity and then recreating it later on – forms the basis of all optimisation techniques described. They promote a transparent planning process, ensure that all relevant aspects are dealt with, and support a high degree of integration of the sectoral concepts with the overall concept in a step-by-step process.

The ECOCITY approach is a *diverging-converging* technique including the development of scenarios as well as integrated planning and participation techniques. Every stage of the design process starts off with a diverging phase (different scenarios for different sectors) and produces results (e.g. the basic concept or the masterplan) via optimisation and a converging phase. Designing is emphasised during the diverging phase, while detailing, concrete measures, financial calculation, evaluation and checks dominate the converging phase.

### 4.4.1 Overlaying-Technique

The idea is to first develop concepts for the individual sectoral cycles of sustainable urban development (such as transport, energy and water) independently from one another and from the urban plan in order to define optimal solutions. All components from this sectoral input can then be integrated with the urban design objectives into a functioning 'metabolism' [Battle, G., + McCarthy, C., 2001]. Working with layers in graphic and cad-software can support the development of a complex and multi-layered masterplan very effectively. With this approach, the environmentally relevant parameters – such as urban climate systems and noise emissions, ground and surface water hazards or habitat networks – can be projected onto the study area and superimposed by overlaying the individual structures [Daab, K., 1996]. This approach also helps to clarify interactions between the developed structures, e.g. the distribution of centralised community parking garages, public transport stops and the allocation of uses and densities around these.

Thus a variety of different scenarios can be generated. But due to the connections and interrelations between the structures that are created by different sectors, the various solutions for the different sectors will need to be mutually adapted during the converging phase. This is to balance possible contradictory requirements such as between the need for compact south-oriented building structures as well as for air exchange corridors, or between high density building layouts and the provision of green open spaces.

Therefore priorities will need to be defined and compromises found in a rational and transparent procedure (see also Section 5.1.2 on *NetzWerkZeug tool*).

### 4.4.2 Planning with Scenarios

Planning with scenarios is useful to explore room for manoeuvre, to broaden the range of possible solutions and to investigate and discuss the qualities related to these different solutions [Albers G., 1996]. This will support a transparent decision-making process. The goal should be to seek comprehensive scenarios, which integrate diverse sectoral concepts based on different socio-economic settings and not only to create variations related to the urban structure [Müller-Ibold, K. 1997] (such as alternative layouts of blocks and building typologies) or of only one sector (such as the investigation of alternative access strategies for motorised traffic).

At the beginning of the process, broad scenarios (e.g. a layout of land-uses, major open space patterns or important transport lines) should be used to develop the basic concept. Following this, detailed and concrete scenarios, (showing e.g. building configurations and related energy supply strategies, transport networks and infrastructure or the integration of rain water management systems with the public spaces) should be drawn up for the development of the masterplans. The design strategy should be closely linked to the participation process since the scenarios and variations can support the debate of the planning project by the people involved. The qualities intended should be visualised through plans, perspective views or reference images in order to make them recognisable also for people who are not regularly involved in the planning of projects.

## 4.5 Participation Techniques

It is one of the greater challenges of planning for sustainability to facilitate a fruitful exchange between the theoretical, ambitious and often abstract starting points of the concepts and the practical, political and economic local realities. Interactive and participatory elements need to be integrated into the planning process as projects aim to achieve both the best possible sustainable urban design quality and the broadest possible consensus.

Obviously every individual urban development project has a unique history and context, with its particular set of key actors, its local planning and social culture as well as its own financial framework. Almost every project has to define its individual design process within the given local frameworks in order to select the appropriate approach at each stage of the development process. From the broad range of available community planning techniques which can be employed at the various stages of planning projects, the key ones are mentioned as a menu from which modules for composing the participation processes for particular projects should be selected. The final composition will depend on local variables such as the complexity and size of the project.

In general, an exchange of information and opinions through a consultation process is considered a minimum requirement for planning an ECOCITY – rather than top-down and one-way information flows. But the goal is comprehensive community participation including actual influence on the planning process or even direct influence on decision-making (see Figure 3.2).

### 4.5.1 Community Committee

It is recommended that a Community Committee, active from the beginning of the planning process, is established. This is a key element for interaction and participation. The committee should consist of key planners from the municipality and other key representatives of the following groups: the local administration, external planners and experts, the political parties and members of the city council, Local Agenda 21 participants and other important interest groups and stakeholders such as residents' and traders' associations. The goal is both to connect local interest groups with the planning project and to discuss the design of the participation process. Project Managers and the Community Committee need to jointly decide on the number and timing of Community Planning Events.

### 4.5.2 Community Planning Events

Community Planning Events (such as Community Conferences or Community Planning Weekends) can be used at the beginning of the project to instruct the first design phase for the development of the basic concept (see also Section 4.1) since the community's views on what is considered the best solution (or possible solutions) are available from the beginning. But Community Planning Events can also be used at further stages of the planning process. They can be used to achieve quality improvements for the urban design or the various technical and/or social concepts; to build up trust between key actors, informal supporters and the political committees; to create a consensus of vision and identify appropriate mechanisms for its delivery and to market the project ideas and approach to people who want to contribute to, live or work in the future settlement. Furthermore, such events can unlock energy and enthusiasm, turn criticism into constructive dialogue, promote interdisciplinary thinking and action, provide a fast-track learning process for all the participants and save time and money.

A sample outline of a typical Community Planning Event (which would need to be adjusted to the circumstances of the specific planning project) runs as follows [Wates, N., 1996 and v. Zadow, A., 1997]:

The ***lead-in and preparation 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 to both raise interest in the Community Planning Process and to gain information about issues of concern.

The multi-disciplinary planning team brings together the collective skills and experience needed to match the particular characteristics of the project. It receives and assembles ***background briefings*** from key people and it also provides (or recruits) workshop facilitators as well as advisers, analysts and often also an editorial team to produce the final report about the event. If particular groups of people are either unable or unwilling to attend the event itself, focus groups can be held prior to the event and the results fed back into the process.

The ***event itself*** is set out as public sessions with a number of issue-based 'future workshops' designed to address the main sectoral issues which have been identified during the pre-planning stage. At the event itself, the workshop facilitators then initiate a process which has three phases:

- problems: stock taking, criticisms
- dreams: imagination, 'utopia'
- solutions: realisation, how to make it happen

Thus the process moves from negative criticism to positive ideas and suggestions, and finally to practical proposals on how these can be implemented. 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 reporting back on the results so everyone is kept informed of the progress.

At '*hands-on planning*' tables, mixed groups of participants begin to analyse the findings and develop ideas that have emerged from the workshops in a more physical form, working on plans of the area at different scales. Although all kinds of sectoral experts and professionals are present to assist in these sessions, the emphasis is on 'non-professional' participants working out potential solutions with other non-professionals, who may or may not be in agreement. Responsibility is passed to the participants to try and reach consensus among themselves. Walkabout groups can also gather more information from other tables and feed it back directly into the process.

The intended result of '*hands-on planning*' sessions are 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. These 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.

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 during the event.

The Planning Event Team later analyses and evaluates 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 forward, is presented back to the participants and general public e.g. in the form of a '*Report Back*' slide show, exhibition and/or printed or on-line document.

### 4.5.3 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 disseminate existing information from inside the planning process) and questionnaires (to gather information from individuals) can support the planning and design processes at specific stages. Advanced information exchange platforms via the internet like project websites have the power to enhance the transparency of the planning process and allow access to information as well as comments from everyone.

However, none of these information exchange tools can replace a comprehensive face-to-face interactive and participatory process during the project planning. Because sustainable planning projects are so challenging, building up trust between the people who are driving and influencing them is especially important. The others' attitudes need to be felt and experienced if partnerships are to be built that will work successfully towards the desired future.

## 4.6 ECOCITY Consultancy Strategy

Consultancy by external experts can increase the quality of planning projects by integrating additional sectoral knowledge and/or process-oriented expertise in the local process. Within the ECOCITY project a consultancy strategy based on two consecutive steps has been developed:

- a self assessment of the plans using the ECOCITY Self Assessment List (see Section 5.2.3)
- an ECOCITY Quality Workshop organised by a Quality Support Group composed of the relevant sectoral experts from outside the project

The self-assessment has to be executed by the local project group and judges the local plan according to questions provided in the ECOCITY Self Assessment List. It is most usefully carried out after a masterplan has been drafted but before any final community participation events. Thus any proposals for improvement worked out during an ECOCITY Quality Workshop can be integrated into the final plan, that is presented to and discussed with the community.

The Quality Support Group should be a multi-sectoral group of experts from the fields of sustainable urban planning, transport planning, energy and interactive group dynamics/community participation with a broad planning experience. These experts can be recruited locally (e.g. from planning and urban design companies or research institutes and universities) but their experience should range beyond the local context and circumstances to planning projects from elsewhere, ideally even other (European) countries.

The goal of the ECOCITY consultancy strategy is to facilitate:

- a holistic and multi-sectoral approach
- communication between professionals on the basis of the ECOCITY checklist of Objectives and Measures (see Section 5.2.1) and the ECOCITY Self-Assessment (see Section 5.2.3)
- international exchange of experience and knowledge

The Quality Workshop aims to help overcome problems and weaknesses identified during the self assessment and focuses on realistic improvements to the project plans. Achieving this optimisation requires a broad understanding of the interrelations between the individual sectors to be generated in order to provide a holistic approach. The workshop should consist of three steps:

- drawing conclusions from the self assessment analysis in relation to ECOCITY objectives,
- generating *diverging* ideas for optimisation and improvement and then
- *converging* these ideas into concrete plan-changes.

In the Quality Workshop all (local) sector specialists and especially transport-planners and urban planners should work together. The workshops can also be used as a starting point for the implementation process, which is another reason why all responsible local planners and stakeholders should be encouraged to join in. The specific agenda of the workshop is tailor-made according to the project, the team and the results of the self-assessment. The issues most frequently addressed in the Quality Workshops during the ECOCITY project were:

- integration of ecological guidelines and concepts into urban planning
- integration of sustainable transport and urban planning
- exchange of experience on subjects like material flows and energy saving
- sequencing and timetabling of the development in combination with the financing of the plans

Working together with external experts in this way generally helps to achieve a boost in the "ECOCITY quality" of the plans. Moreover, the wider circles of stakeholders in the local projects can often be convinced of the feasibility of the optimisation steps. This is a very important starting point for the implementation of the project and comes as a result of the integrative and holistic approach of the quality workshop.

# 5 ECOCITY Planning Tools

## 5.1 Tools used by the ECOCITY project

The following tools can be used as elements of the techniques described in Chapter 4. Since only an introduction can be provided in the space available here, readers are referred to further sources and contacts for more details (see references in the margins and the Recommended Reading Section on page 76.

### 5.1.1 Local Transport Performance

Local Transport Performance (LTP)[14)] is a tool to facilitate cooperation between town planners, urban designers and traffic engineers during the planning process. It helps them to make joint and structured choices about urban and transport designs, and to determine the impact and consider the effects of their decisions on the quality of the built environment. The LTP approach can be used for any urban development or renewal project (e.g. for the layout of new residential areas).

[14)] LTP was developed by the ECOCITY partner NOVEM. A digital version is available in English Language and can be ordered from NOVEM (contact: g.huismans@senternovem.nl).

LTP focuses primarily on the choice of mode of transport, i.e. a modal shift away from the car to more sustainable transport modes. The strategy is to base the design process on the perceptions of pedestrians, cyclists and users of public transport (see also Ch 4.3.3 on bottom-up design).

The approach centres on workshops, of which two or three will normally be enough to become familiar with LTP. A simple mathematical model is used during the workshops to support the design process and the choice between several versions of a plan (based on their effects on sustainable mobility and the quality of the built environment).

As usual in an iterative process, new design options can lead to a change in the intentions and principles for the area covered by the plan. New mathematical analyses can send the designers back to the drawing board. New intentions can lead to new design challenges. There may also be an interaction between the different steps in the planning process and the spatial levels of scale. For example, if it is not possible to develop an acceptable design at the street level it may be necessary to reconsider the basic principles at the neighbourhood level.

The LTP approach supports municipal decision-making regarding locations for new development and renewal projects. It is intended for everyone involved with spatial planning at a local level and concerned with the integration of urban design and traffic. Therefore, the planning team should include officials from several municipal departments (planning, traffic and transport, the environment, etc.). Project developers, transport operators, businesses, civic organisations and residents may also be part of the planning team (see also Ch 4.5 on participation).

### 5.1.2 NetzWerkZeug

The Netz*Werk*Zeug (NetWorkTool)[15] is an internet-based planning and information tool for sustainable urban development. It is based on a study of the interrelation between sustainability and urban development, and consists of modules divided by topic such as energy, transport, water/wastewater and urban climate, which are useful for translating the general demand of sustainability into actions on the planning level of a city district. These modules provide principles, criteria and concrete measures for topics such as public transport, mixed use, active and passive use of solar energy, wastewater treatment, air exchange corridors. Relevant dimensions are also dealt with. A special focus lies on interrelations between the modules (e.g. anaerobic waste water treatment to generate biogas for energy supply), which are presented through hyperlinks and interactive graphics (similar to Figure 5.3, page 66).

[15] The tool was developed by Rolf Messerschmidt of the ECOCITY partner Joachim Eble Architektur. It is available on the internet on the website www.netzwerkzeug.de – most parts are in English.

Netz*Werk*Zeug also provides a design tool that supports the consideration of ecological/social aspects with urban planning issues in an integrated and multidisciplinary process. The design tool suggests a planning strategy that helps to develop structures graphically, incorporating the measures and dimensions that are recommended by the modules divided by topic, e.g. sizes of photovoltaic panels (energy module), catchment areas for public transport services (transport module) or habitat networks (landscape module). These structures are then projected onto the study area in order to determine their spatial distribution. In a next step, the different elements are developed further individually and then the results are combined into different concepts for e.g. energy or transport and are finally evaluated. Overlaying those concepts which have received a positive evaluation helps generate a variety of different scenarios (see also Ch 4.4.1) which focus for example on high quality transport or energy concepts. The interrelations between the sectoral concepts illustrated through overlaying usually produces feedback that affects the individual concepts, but it does not change the basic criteria of sustainability in this iterative planning process. The scenarios resulting from different combinations of concepts offer a selection of possible solutions. They are presented as a sustainability masterplan that includes the important rules for the sustainable urban development of the planning area.

### 5.1.3 Energetic and bioclimatic calculation and simulation tools

The application of computer aided tools is useful to support the planning of energy-efficient urban structures and building-layouts as well as to achieve bioclimatic conditions favourable for people‘s health and well-being. With such tools, not only the indoor bioclimatic and energetic performance of buildings regarding heating, cooling, natural day-lighting and ventilation can be analysed during the planning phase, but also the interrelation between urban form and building structures can be considered.

A broad range of such tools is available, from spreadsheet calculations to sophisticated - and costly - specialists‘ software. A basic approach is the optimisation of the compactness and solar orientation of the urban structure using a spreadsheet analysis, e.g. with Microsoft Excel©. The orientation to the sun can be assessed by calculating the gross floor area of buildings facing to south or to southwest / southeast (with a reduction factor for this deviation) and by considering the shading effects of buildings with a clouding factor. The result is the average ratio of the gross floor area of those buildings with orientation to the sun, in relation to the entire gross floor area of the planning area. The same methodology can be used for the calculation of the surface to volume ratios of all buildings in order to assess the compactness of the urban structure.[16]

[16] This method was developed and applied for the evaluation of the ECOCITY case studies by ECOCITY partner eboek. Tuebingen. For more information see the evaluation section on www.ecocityprojects.net

The next step would be the application of simple and easy to handle energy-planning software at the urban scale. An example for this is the German software SOLCITY, which is available for free[17]. Such software supports the optimisation of the solar orientation of building structures and the heights of and distances between buildings for passive solar gains. Also, the compactness of building structures can be evaluated and improved with low-cost software tools like AVplan[18]. For the application in complex conditions such as high-density structures with varied geometries and for achieving more precise results, high-end simulation tools are recommended. They also consider complex shapes of roofs, the positioning of trees and inclinations of settlement locations. GOSOL[19], for example, can help to reduce the energy consumption of residential houses by between 5% and 20% . The energy savings, that can be achieved with these tools often go hand in hand with comparable or even lower construction costs for buildings compared to conventional scenarios.

17) SOLCITY – Städtebau und Gebäudeausrichtung; designed by and available from Wortmann & Scheerer, Bochum; www.wortmann-scheerer.de

18) AVplan – www.gosol.de

19) GOSOL – www.gosol.de

However, for controlling very complex urban configurations, for a precise examination of the urban comfort of outdoor spaces and for simulating special natural and mechanical ventilation systems in buildings as well as their relation to the urban structure, the above-mentioned tools are insufficient. For that purpose, Computational Fluid Dynamics (CFD) simulation systems (e.g. Fluent[20], Phoenics[21] and Ansys[22]), can be applied by specialist planners, consultants or research institutes (see also Figure 5.1). They can be used for the assessment of the urban and building form in order to control and improve the energetic performance and urban comfort at different scales:

20) Fluent – www.fluent.com

21) Phoenics by CHAM – www.cham.co.uk

22) Ansys – www.ansys.com

- ***at the urban level:*** to optimise the course and the speed of the wind under different climatic, seasonal and topographic conditions; to prescribe protection measures from cold winds such as the location of buildings and protection elements (e.g. trees, screens, etc.); to optimise the wind penetration into building schemes during the warm seasons; etc.

- ***at the building level:*** to improve the inside air circulation; to realize buildings and architectural components with high energetic quality performances for passive cooling, natural ventilation systems and for passive solar gains.

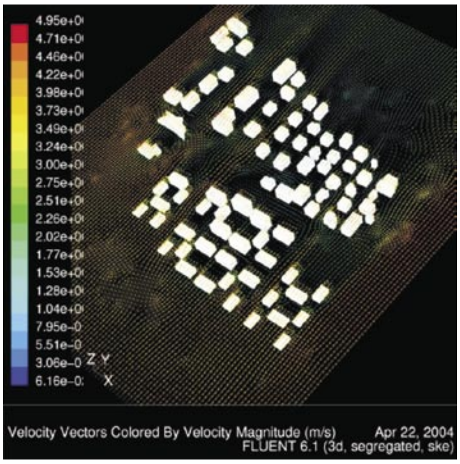



Figure 5.1: Computational fluid dynamic (CFD) simulation of wind speeds (ECOCITY settlement Umbertide, Italy)

## 5.2 Tools developed during the ECOCITY project

The procedural concept and planning techniques described in Chapter 4 provide an outline for the planning process. The following sections provide more detailed information on the specific approaches required for ECOCITY planning which were developed during the project, such as:

- the integration of objectives and measures, i.e. identifying measures which help to fulfil the ECOCITY objectives (see Ch 5.2.1)
- the identification of interrelated objectives to enable the creation of synergies as well as decisions on priorities (see Ch 5.2.2)
- a Self Assessment List to help establish the degree to which ECOCITY requirements are being fulfilled (see Ch 5.2.3) and
- an introduction to the ECOCITY evaluation scheme (see Ch 5.2.4).

Figure 5.2 shows the phases of the ECOCITY process (see also Figure 4.1) during which these tools should usefully be applied.


Figure 5.2: Timing of application of the ECOCITY Tools

### 5.2.1 ECOCITY-Checklist of Objectives and Measures

There are five elements which are relevant in planning an ECOCITY: the regional and urban context and the four sectors of urban development: urban structure, transport, energy and material flows, and socio-economy. The following lists link the ECOCITY objectives for these five elements of planning (see also ECOCITY Book I, Ch 2) to measures which can help to achieve them. For each objective, interrelations with objectives for other issues are also presented (>> *related issues*) since joined-up, intersectoral planning is one of the main requirements of the ECOCITY approach[23]. Table 5.1 illustrates the principle of the presentation.

[23] Note: to keep the lists manageable, interrelations within the various urban planning issues are not presented specifically.

Table 5.1: Structure of the ECOCITY-Checklist of Objectives and Measures

| URBAN PLANNING ISSUE |
| --- |
| **> objective** |
| >> *related issues* |
| • Measures |

The ECOCITY-Checklist can be applied

- to set project targets during the pre-planning phase of an urban planning project,
- to provide an input of possible measures during the planning phases,
- to evaluate the planning results – such as masterplans and sectoral concepts – at specified intermittent milestones or at the end of the planning process and
- to ensure the fulfilment of the objectives during implementation.

### 5.2.1.1 Regional and urban context

## NATURAL ENVIRONMENT

**> strive for the protection of the surrounding landscape and its natural elements**

*>> see also: land demand, landscape/green, urban comfort, individual motorised travel, energy, water, waste, economy*

- Consider the boundaries of the city as a zone for exchange between the city and surroundings (water cycle, vegetation, wildlife, recreation) and create conditions for the penetration of the surrounding landscape into the city.
- Establish sound measures to avoid unplanned future extensions of settlements.
- Strive for a recreation of landscape/natural habitats in areas with a declining population or industry ("shrinking cities").
- Preserve bio-diversity and habitats in the surrounding landscape.
- Minimise the impact of harmful substances on vegetation, wildlife and water systems.
- Preserve or re-establish green corridors on the regional and municipal scale as open-space connections.

**> strive for the protection of the surrounding landscape and its natural elements**

*>> see also: land demand, landscape/green, urban comfort, slow modes/public transport, energy, social issues, economy*

- Offer recreational areas in the surrounding landscape with attractive connections from the urban area to help people relate to the natural environment and to offer opportunities for weekend recreation close to residential areas.
- Develop and foster sustainable regional agriculture (e.g. organise direct marketing of regional food), forestry and tourism, also maintaining the cultural landscape.
- Use surplus biomass from regional agriculture and forestry for energy generation.

**> plan in accordance with the climatic, topographical and geological setting**

*>> see also: land demand, public space, landscape/green, urban comfort, slow modes/public transport, transport of goods, energy, water, building materials, costs*

- Use (and preserve) landscape and topographic elements that are important for the urban climate (e.g. groves and forests as cold air sources, lakes as climatic balancing elements, valleys and mountain sides as air exchange corridors) and avoid barriers in air exchange corridors.
- Keep industry and unavoidable sources of air pollution out of areas and corridors which are important for the urban climate and consider the main wind directions when expanding settlement areas.
- Consider the local climatic conditions for the design of public spaces (wind protection, roofs as rain protection, exposure to the sun, shadowing elements) and for building design (shape, materials, energy concept, etc.).
- Take the local topography into account for the transport systems (e.g. for walking and cycling pathways), for energy-efficiency (e.g. by avoiding settlements on shadowy northern inclinations) and for water systems (e.g. rainwater management on the surface).
- Plan with the geological conditions (soil, groundwater, etc.) e.g. for urban greenery, rainwater management and constructing buildings.

## BUILT ENVIRONMENT

**> strive for a polycentric, compact and transit-oriented urban structure**

*>> see also: land demand, land use, public space, landscape/green, urban comfort, slow modes/public transport, individual motorised travel, transport of goods, energy, social issues, costs*

- Strive for a polycentric structure of the city with good accessibility of basic facilities and of the city centre as the main provider of higher-order infrastructures and working places.
- Organise the city as a network of mixed-use urban quarters with individual characteristics and identities.
- Concentrate urban development at sites with a high potential for public transport, locating new settlements (and new buildings in existing settlements) along (potential) axes of public transport (Transit Oriented Development), and avoid developments that disturb open-space patterns between these axes (green fingers).
- Integrate new and existing developments into public transport and communication networks on the local, metropolitan, regional, national and global scale.
- Strive for land management on the regional and local scale.
- Structure prices and subsidies to achieve changes in development patterns and the transportation system (e.g. building subsidies, road pricing, PT fares etc. differentiated according to location and time).

**> consider concentration and decentralisation for supply and disposal systems**

*>> see also: land demand, public space, landscape/green, urban comfort, buildings, transport of goods, energy, water, waste, building materials, economy, costs*

- Consider the decentralised concentration of energy supply systems such as district heating networks (rather than either huge community heating systems on the scale of entire cities or quarters or very small individual systems).
- Maximise the share of renewable energy sources on the regional and local level (e.g. wind power stations or biomass cogeneration power plants from regional sources).
- Strive for the decentralisation of wastewater treatment on the site (wastewater wetland facilities) or in buildings (grey water purification plants).
- Consider biogas generation from wastewater (black water) for the operation of co-generation or heat plants on site.
- Offer possibilities for composting and re-using organic waste on site.

**>promote use, re-use and revitalisation of the cultural heritage**

*>> see also: land demand, land use, public space, landscape/green, urban comfort, buildings, energy, building materials, social issues, economy, costs*

- Respect the cultural heritage of the region regarding the historical urban grain (e.g. phases of growth and development, hierarchy and design of street network, texture of building lots, land-use patterns).
- Refer to the regional and local building typologies (also regarding protection from sun, wind, rain, snow, etc.), regional culture for living, aesthetics based on local craft skills, etc. and strive to maintain and re-use existing elements such as buildings, open-space elements and infrastructure (also as a contribution to a *genius loci* based on the continuity of the urban cultural heritage).

### 5.2.1.2 Urban structure

## DEMAND FOR LAND

**> increase re-use of land and built structures to reduce demand for land and new buildings**

*>> see also: natural environment, built environment, slow modes / public transport, energy, building materials, social issues, economy, costs*

- Strive for a compact city using all possibilities for internal development e.g. in gaps between blocks or buildings (but avoiding overcrowding and ensuring adequate green spaces).
- Prioritise the reuse of existing sites (brown field developments) in suitable locations.
- Minimise the share of vacant dwellings, buildings and plots through municipal management (e.g. register of available plots/properties within the city, activities for inner city developments).

**> develop structures of qualified high density**

*>> see also: natural environment, built environment, slow modes / public transport, individual motorised travel, transport of goods, energy, water, waste, building materials, social issues, economy, costs*

- Aim at qualified high density to reduce land consumption and to promote a high social density as well as to promote viability and cost effectiveness of public transport, community heating systems and provision of basic facilities.
- Consider issues which limit density such as passive and active use of solar energy, good day-lighting conditions, sufficient open spaces, surfaces for water management, air exchange corridors.
- Concentrate the highest development densities around public transport stops.
- Use compact and multi-storey building typologies for residential housing and commercial uses.
- Consider increasing density by minimising land-demand for motorised traffic and parking.

## LAND USE

**> organise a balance of residential, employment and educational uses as well as supply (of goods and services), and social and recreational facilities**

*>> see also: built environment, slow modes / public transport, individual motorised travel, transport of goods, energy, social issues, economy, costs*

- Provide a balanced ratio of residential housing and working places.
- Provide a balanced ratio of residential housing and commercial units (especially retail for daily needs) as well as cultural, educational and social facilities (e.g. kindergarten, primary, secondary schools, general practitioners, pubs restaurants).
- On new sites, include facilities attracting inhabitants of the entire community as focal points (community building).
- Maintain and strengthen existing mix of uses while adding new uses into existing mono-functional areas.
- Ensure that these facilities are distributed well to enable short travel distances (on foot, by bike or by public transport) within the neighbourhood or the city.

**> enable fine-meshed, mixed-use structures at building, block or neighbourhood level**

*>> see also: built environment, slow modes / public transport, individual motorised travel, transport of goods, energy, social issues, economy, costs*

- Strive for variability and flexibility of urban and building structures to facilitate changes of use over time.
- Optimise the locations for mixed-use at building level (e.g. with commercial uses on the lower floors, residential uses higher up) or at block level (with commercial buildings on the northern edge of blocks or with west or east orientation).
- Create differentiated areas with different meshes of mixed structures and different ratios of uses.

## PUBLIC SPACE

**> provide attractive and liveable public space for everyday life, including considerations of legibility and connectivity**

*>> see also: natural environment, built environment, slow modes / public transport, individual motorised travel, transport of goods, energy, water, waste, building materials, social issues, economy, costs*

- Plan for sufficient public space (squares, convivial streetscapes, green areas) close to living and working environments.
- Strive for multi-functionality (avoid mono-functionality) and a strong identity of public spaces.
- Create varying urban fabrics of open spaces, building typologies and landscape elements for vivid neighbourhoods with a distinctive *genius loci*.
- Plan a hierarchical system of public spaces (squares, parks, streetscapes) that is interconnected through pedestrian networks and provides changing attractions along spatial sequences; avoid architectural barriers.
- Create opportunities for communication and encounter by designing open spaces to enable sufficient quantity and quality of possible social contacts in (high density) neighbourhood areas (e.g. in neighbourhood centres).
- Orientate buildings towards public spaces (windows, entrances, attractive ground floor facades, which front appropriate uses).
- Provide open–space elements and architecture of high aesthetic quality (water design, surfaces in streets and squares, facades, street furniture, etc.), enabling a variety of sensory experiences, also for children.
- Minimise the share of road space provided solely for motor vehicles and the disturbance of public spaces by motorised traffic (bearing in mind especially safety and noise issues).

## LANDSCAPE / GREEN SPACES

**> integrate natural elements and cycles into the urban tissue**

*>> see also: natural environment, built environment, slow modes / public transport, energy, water, waste, social issues*

- Create and conserve habitats for urban wildlife (animals and plants) and habitat networks (use linear elements to connect open spaces, avoid barriers, create stepping-stone habitats, consider ecological bridges), including green corridors into the surrounding landscape.

- Maximise soft landscaping areas for planting (at ground level as well as on facades and roofs).
- Create, maintain or recultivate/restore green and water elements within the city (trees, hedges, grassland, planting areas and containers, watercourses, fountains, etc.), especially those of bioclimatic importance.
- Maintain the natural embankments and shore areas of surface waters (ponds, lakes, streams or rivers), where necessary restore them.
- Minimise sealed surfaces (footprints of buildings, treatment of pavements, parking spaces, etc.).
- Strive for a balanced hierarchy of public, semi-public and private green spaces, providing opportunities for gardening for the inhabitants, considering also city farms in appropriate locations.
- Offer accessible areas to provide children with personal experience of and conscious perception of the natural environment.

## URBAN COMFORT

**> strive for a high daily, seasonal and annual outdoor comfort**

*>> see also: natural environment, built environment, slow modes / public transport, individual motorised travel, transport of goods, energy, water, waste, building materials, social issues, economy*

- Consider the exposure of public spaces to bioclimatic conditions (light, wind, sun, rain, snow, etc.) to permit the use of public spaces throughout the day and the seasons.
- Develop the geometry of quarters and neighbourhoods according to the requirements of urban ventilation (choose climatically favourable layouts and materials for green spaces, blocks and buildings).
- Plan for and use water surfaces (e.g. as part of a rainwater management systems) to improve urban comfort and to contribute to natural ventilation on the block or building level.
- Increase the absorption capacity of urban land for rainwater (and the filtering capacity for emissions) by planting and maintaining trees and other vegetation, constructing green roofs and facades and by leaving ground unsealed where appropriate.
- Reduce the impact of infrastructure for mobile telecommunications, electricity supply, electric railway systems and other technical devices on people's health and well-being (avoiding their exposure to electromagnetic radiation by keeping sufficient distances and using screening materials and structures).

**> minimise noise and air pollution**

*>> see also: natural environment, built environment, slow modes / public transport, individual motorised travel, transport of goods, economy*

- Avoid noise emissions at source by taking active measures to reduce emissions from traffic, commercial uses, leisure and sports activities.
- Improve the air quality by reducing gaseous and particulate emissions from traffic, commercial and industrial units, power stations and household heating systems at source.
- Control imissions through passive measures (sufficient distances, protective walls/ embankments, shelterbelt plantings, layout of blocks, buildings and floors).
- Minimise the impact of construction works on urban comfort.

## BUILDINGS

**> maximise indoor comfort and resource conservation throughout the lifecycle of buildings**

*>> see also: built environment, energy, water, waste, building materials, costs*

- Maintain and re-use existing buildings for existing uses or convert them for new uses and promote their refurbishment (especially regarding energy demand and supply).
- Strive for low-energy or passive-house standard in terms of construction and heating, ventilation and air-conditioning (HVAC) equipment (building services).
- Use building materials which are 'healthy' in production, construction, use and demolition.
- Maximise the durability, detachability and the recyclability of materials and structures.
- Allow for reverse-engineering, e.g. to enable later installation of HVAC equipment (building services).
- Reduce maintenance requirements of buildings.

**> plan flexible, communicative and accessible buildings**

*>> see also: built environment, slow modes / public transport, energy, water, building materials, social issues, economy, costs*

- Use flexible building designs to facilitate change of use over time (e.g. from residential to commercial) as well as transformation and adaptation of internal spaces by the user.
- Strive for the close connections of buildings to public spaces and for active frontages (facades, allocation of uses and entrances), avoiding architectural barriers to accessibility (lay-out of buildings causing detours, steps, etc.).
- Strive for communicative buildings with innovative ideas for living.
- Seek new housing concepts for senior citizens including mixed generation housing concepts ('young and old' projects).
- Consider that buildings are suitable for mixed-use structures (e.g. for commercial uses on the lower floors, residential uses higher up).

### 5.2.1.3 Transport

## SLOW MODES/PUBLIC TRANSPORT

**> minimise distances (in time and space) between activities to reduce travel demand**

*>> see also: built environment, land demand, land use, public space, landscape/green, urban comfort, buildings, social issues*

- Design pedestrian-oriented urban structures with short distances (see density, mixed use) also situating buildings so that they allow the planning of pedestrian networks without long detours (also avoiding main traffic arteries, which are difficult to cross, within a neighbourhood).
- Integrate all important destinations (shops, schools, major employment locations) within mixed use neighbourhoods and/or close to public transport stops and ensure good connections to external destinations.
- Create high quality open spaces and structures (squares, parks, streetscapes, etc.) close to residential areas to reduce demand for leisure travel.

**> give priority to pedestrian and cycle paths as the main network for internal neighbourhood traffic**

*>> see also: natural environment, built environment, land demand, land use, public space, landscape/ green, urban comfort, buildings, building materials, social issues, costs*

- Interconnect pedestrian and cycle paths to a dense network, which is as far as possible independent from major routes for motorised travel but not so isolated as to create security problems.
- Integrate public spaces and streetscapes of high spatial quality and changing public activities into the network for non-motorised modes (for attractive walking/cycling and for social control).
- Plan for an attractive cycling network that allows speedy circulation also beyond the neighbourhood scale.
- Eliminate danger and disturbances from motorised traffic.
- Provide barrier-free accessibility to transport networks and buildings for everyone – including the handicapped and those with prams, pushchairs or carts to transport goods.
- Provide attractive supporting infrastructure for pedestrians – with e.g. continuous weather protection (arcades, passages, roofed pavements) along the main routes as well as benches/ seats - and for cyclists (parking and storage facilities for bikes, weather protection, etc.).

**> give priority to public transport for the connections beyond the neighbourhood level**

*>> see also: built environment, land demand, land use, public space, urban comfort, buildings, energy, social issues, costs*

- Integrate well-aligned public transport lines and corridors (close to people and allowing rapid connections) into the urban structure and design the structure of a new neighbourhood around the (optimised) routes of public transport.
- Develop an integrated system of public transport (demand-responsive transport services, bus, light rail, heavy rail) to provide connections both within the municipalities and in regional networks and provide bike & ride / kiss & ride facilities at stops and interchanges.
- Optimise distances between public transport stops to maximise rider catchments and provide central stops in the centre of new neighbourhoods.
- Allocate stops to uses and vice versa in such a way that the majority of important public facilities are situated near the stops.

**> provide mobility management measures to support modal shift to environmentally compatible modes**

*>> see also: land use, urban comfort, slow modes/public transport, social issues, costs*

- Establish mobility centres providing comprehensive and easily accessible information on local public transport and railway including schedules and inter-modal travel options (mobility help-desk, internet platform) and offering comprehensive services for diverse transport demands (e.g. sale of public transport tickets; reservation for demand responsive transport; bicycle station for parking, repair, hire, etc.; car-sharing and hire systems, ride-share agency).
- Provide real-time information on timetables for passengers at stations, in vehicles and on the internet (arrivals, departures, connections and schedule changes) from a control station.
- Target new households with tailored advice on mobility alternatives, possibly including introductory offers on public transport season tickets, car clubs, etc.
- Offer „mobility packages“, e.g. including car sharing offers, public transport information, reduced cost season ticket, low cost home delivery services, discounts on taxi services, etc.
- Organise awareness-raising-campaigns and provide advice for larger institutions (e.g. businesses, schools, etc.) on sustainable organisation of mobility of both employees and customers, as well as the use of their own vehicle fleet.

## INDIVIDUAL MOTORISED TRAVEL

**> reduce volume and speed of individual motorised traffic**

*>> see also: natural environment, built environment, land use, public space, landscape/green, urban comfort, buildings, energy, building materials, social issues, economy, costs*

- Reduce the speed of motorised traffic by using traffic calming measures and appropriate regulations.
- Strive for a differentiated shape and hierarchy of the road network (lane width, speeds, etc.) with lower levels of the hierarchy not dominated by motorised traffic (e.g. home zones, bicycle streets) and with minimum through traffic.
- Plan car-free or car-reduced areas of sufficient size to allow all the advantages of living and moving without a car to be experienced.
- Minimise land consumption for motorised traffic (length and width of streets, areas for parking).
- Promote efficient use of cars (e.g. through car-sharing or an agency for ride-sharing).
- Restrict access to particular areas for non-public motorised traffic (e.g. to city or neighbourhood centres).

**> support the reduction of motorised traffic through parking management**

*>> see also: land demand, land use, public space, urban comfort, social issues, economy, costs*

- Reduce the provision of parking spaces (i.e. the required ratio of parking space per dwelling or work space), especially in central areas with good public transport access; develop car-reduced and car-free areas.
- Manage demand for parking through parking charges in central areas to reduce car traffic there.
- Minimise parking spaces in public areas to reduce the impact of private cars on the quality of public spaces and reduce overall land consumption for remaining parking places (multi-storey parking, mechanical systems).
- Concentrate parking spaces in collective car parks and district parking garages within an acceptable distance to dwellings and not directly at the front door or even inside residential buildings (locating district parking lots at least the same average distances away as public transit stops).

## TRANSPORT OF GOODS

**> develop a neighbourhood logistics and delivery concept to minimise the need for individual load carrying by car**

*>> see also: land demand, land use, urban comfort, energy, social issues, economy, costs*

- Organise a neighbourhood logistics system (neighbourhood logistics / distribution centre, shopping boxes, etc.) including co-ordinated goods delivery to private households (also for products ordered via e-commerce); using alternatively fuelled vehicles (e.g. electricity from renewable sources or hydrogen).
- Integrate locations for waste collection and storage facilities (containers, etc.) in the urban and building structure to ensure efficient access for collection vehicles.
- Locate facilities generating demand for goods transportation at sites allowing short distances for city logistics.
- Use information system technologies to optimise routes of delivery, waste collection and (construction) material transport.

| > plan efficient construction logistics |
|---|
| *>> see also: urban comfort, waste, building materials* |
| • Promote the use of local materials to minimise construction traffic.<br>• Plan the re-use of excavation materials on-site as far as possible.<br>• Organise necessary construction traffic (removal, delivery, distribution) in an effective way. |

### 5.2.1.4 Energy and material flows

| ENERGY |
|---|
| > optimise energy efficiency of the urban structure |
| *>> see also: natural environment, built environment, land demand, land use, public space, landscape/green, urban comfort, buildings, costs* |
| • Design compact settlements and compact buildings weighing up low surface to volume ratios against the need for solarisation (next measure) and day-lighting.<br>• Solarise the urban structure: layout of buildings for passive heating/cooling and for natural day-lighting (orientate buildings to the sun, avoid shading by optimising the heights of buildings in relation to distances between them, design roofs to use solar applications efficiently).<br>• Strive for high-density developments enabling the economic application of district heating systems or co-generation plants. |
| > minimise energy demand of buildings |
| *>> see also: built environment, land demand, land use, public space, landscape/green, urban comfort, buildings, costs* |
| • Reduce energy losses by striving for a high insulation standard in new and existing buildings (low energy houses, passive-houses) and for a compact design of buildings (low surface-to-volume ratio).<br>• Reduce the heating demand in temperate and cold climates by maximising passive solar energy gains (i.e. high ratio of windows and glass facades on south facades).<br>• Reduce energy demand for cooling in hot climates by reducing uncontrollable solar irradiation into buildings (including devices for protection against overheating, e.g. shades, blinds, etc.) and by reducing the electricity consumption (to avoid additional internal heat generation i.e. through computers, electric devices).<br>• Reduce electricity demand through efficient lighting systems, natural day-light systems (reflectors, light-shelves, light pipes).<br>• Reduce hot water consumption through use of water saving installations.<br>• Use efficient ventilation systems (controlled ventilation, heat recovery, natural ventilation systems including indoor planting zones, do not use conventional air-conditioning).<br>• Use efficient cooling systems (cooling of concrete components, ground ducts, absorption heat pumps, indoor planting zones, water elements, atriums and courtyards). |

| > maximise the efficiency of energy use and supply |
|---|
| >> *see also: built environment, land demand, land use, public space, urban comfort, buildings, slow modes/public transport, individual motorised travel, transport of goods, costs* |
| • Use efficient heating, ventilating and cooling equipment as well as electrical devices controlled by IT based facility management.<br>• Use energy-saving lighting appliances in buildings and for public space.<br>• Use co-generation plants (CHP) for district heating networks of appropriate size for short pipe lengths preferentially, when demand for heat ensures a useful application of the waste heat. |
| **> give preference to renewable sources for energy supply** |
| >> *see also: natural environment, built environment, land demand, public space, landscape/green, urban comfort, buildings, slow modes/public transport, individual motorised travel, economy, costs* |
| • Use solar energy, biomass and/or heat recovery for room heating/cooling and water heating.<br>• Use photovoltaics, wind engines and/or biomass co-generation plants.<br>• Provide surfaces for active solar systems on roofs and facades. |
| **WATER** |
| **> minimise primary water consumption** |
| >> *see also: natural environment, land demand, landscape/green, urban comfort, buildings, costs* |
| • Use water saving devices for baths, toilets, kitchens etc. and where appropriate use compost toilets.<br>• Collect rainwater for use in toilets, washing machines, gardening, car wash, etc.<br>• Recycle grey water (all domestic waste water but faeces) for use in toilets, washing machines, gardening, car wash, etc.<br>• Use an efficient watering system for green areas (and preferably use plants with low water demand). |
| **> minimise impairment of the natural water cycle** |
| >> *see also: natural environment, built environment, land demand, public space, landscape/green, urban comfort, buildings, costs* |
| • Maximise permeability of urban soil and paved surfaces (e.g. parking and play areas, informal foot & cycle paths, etc.).<br>• Strive for unsealing of existing sealed surfaces where appropriate.<br>• Practise storm water management using rain water retention and infiltration measures to maintain the natural water balance and relieve the waste water treatment plants (green roofs, infiltration swales and hollows, trench drain infiltration, retention ponds) taking into account natural flow rates.<br>• Avoid infiltration of natural water cycles by polluted effluent (discharge) (such as from extensive metallic surfaces e.g. zinc and copper roofs and from intensively used traffic areas) and/or use filter technologies.<br>• Maintain or revitalise natural water bodies (ponds, lakes streams and rivers with soft embankments).<br>• Use rainwater fed landscaping elements to provide a sensory experience to increase the quality of public space, to improve urban comfort and to make people aware of water cycle.<br>• Where appropriate purify black and grey water in wastewater wetland areas on site (e.g. reed-bed sewage treatment). |

## WASTE

**> minimise the volume of waste generated and of waste going to disposal**

*>> see also: landscape/green, urban comfort, buildings, transport of goods, costs*

- Promote sharing of goods and devices ("sharing instead of ownership") by supporting the exchange of goods and providing hire / loan services in neighbourhoods.
- Promote re-use and recycling of waste by separately collecting valuable products and providing interim storage and collection services.
- Promote composting systems for treating the biological fractions of waste on site.
- Avoid the disposal of untreated waste and creation / disposal of waste with negative impacts on health, well-being and the environment.
- Minimise the amount of excavated material to be disposed of (during construction phases) by reducing the amount of soil to be excavated and by using the excavated soil on site, e.g. as building material (concrete aggregates, refilling), as landscaping material, for noise embankments, as cover material, for backfilling, etc.
- Maximise separate collection and recycling of construction / demolition rubble (preferably on site).

## BUILDING MATERIALS

**> minimise primary building material consumption and maximise recyclability of materials**

*>> see also: natural environment, built environment, land demand, public space, buildings, individual motorised travel, transport of goods, costs*

- Maximise the re-use of buildings and building components.
- Design compact settlements instead of detached houses.
- Reduce the demand for building materials by reducing hard transport surfaces (particularly tarmacked roads for motorised traffic), by reducing basement areas and by designing lightweight constructions (e.g. timber).
- Use recycled materials.
- Consider the construction, use and deconstruction phases of buildings when selecting materials (design for recycling): maximise detachability (e.g. screws instead of glue), reusability and recyclability of materials (possibility for re-use of structures is preferential to practicable material recovery); consider reverse-engineering for hvac equipment (building services, supply networks).
- Introduce a building inventory (Material Accounting System): information on quantity and quality (i.e. composition) of all building materials to document the recycling as well as pollutant potential of the building.

**> maximise the use of environmentally friendly and non-hazardous building materials**

*>> ssee also: natural environment, public space, urban comfort, buildings, individual motorised travel, transport of goods, economy, costs*

- Use local and regional materials.
- Use materials of high durability.
- Maximise the use of recycled materials for buildings (e.g. recycle concrete or building rubble on site).
- Maximise the share of renewable materials (e.g. timber structures, paper pellets for insulation).
- Avoid harmful substances (e.g. pvc, solvents, phthalates).
- Use building materials with a low demand for primary and non-renewable energy.

### 5.2.1.5 Socio-economy

## SOCIAL ISSUES

**> promote social diversity and integration for a balanced social structure**

*>> see also: built environment, land demand, land use, public space, landscape/green, urban comfort, buildings, slow modes / public transport, transport of goods*

- Aim at a mixed population in terms of income, age, cultural background and lifestyle concepts.
- Provide a balanced variety of dwelling types for different population groups (e.g. singles, families, senior citizens) and ownership models (owner-occupied flats and rented apartments, including subsidised / social housing).
- Consider social diversity and integration early on in the planning stage since the planning processes for different types of projects (types of accommodation, target user groups) vary considerably.
- Ensure participation of citizens, stakeholders and users in decision-making throughout all phases of the project.
- Increase the identification of people with the new development by starting participation processes early on in the planning process and by establishing building cooperatives (fostering contacts among future neighbours before moving to new dwellings).

**> provide social and other infrastructure with good accessibility**

*>> see also: natural environment, built environment, land demand, land use, public space, landscape/green, urban comfort, buildings, slow modes/public transport, individual motorised travel*

- Provide social services (child care, care for the elderly and other persons in need of support) and health care services (general practitioner, pharmacy etc.) within walking distances (from public transport stops) for most people.
- Provide retail facilities for daily needs easily accessibly on foot and by bike.

## ECONOMY

**> offer incentives for businesses and enterprises to move to the area**

*>> see also: built environment, land demand, land use, public space, landscape/green, urban comfort, buildings, slow modes/public transport, individual motorised travel, transport of goods*

- Use regional and local economic strengths for attracting businesses and enterprises.
- Take existing and emerging regional clusters of businesses into account when selecting businesses to be addressed
- Investigate the possibility of offering start-up credits (are there local credit institutions and are they willing to provide loans?) for appropriate small and medium sized enterprises (SMEs) wanting to establish themselves in the area.
- Prepare targeted information on access to markets for appropriate goods and services (e.g. can businesses find suppliers and customers in the area and are there markets that can easily be opened up from the location in question?).
- Favour SMEs, which are appropriate for fine meshed, mixed-use structures.
- Pay attention to the “communication potential” by providing good access to the transport network and information and communication media.

**> use the available labour resources**

*>> see also: natural environment, built environment, land use, energy, building materials*

- Analyse the strengths and local specifics of the labour force including the availability of workers with different qualifications.
- Where possible, promote the employment of people living near to their work places.
- Where possible, promote the relocation of employees (potential commuters) to dwellings near their working places.
- Look for particular educational institutions (e.g. universities) that enhance the attractiveness of the location.

## COSTS

**> strive for a long-lived economic infrastructure**

*>> see also: natural environment, built environment, land demand, land use, public space, landscape/green, buildings, slow modes/public transport, individual motorised travel, transport of goods, energy, water, waste, building materials*

- Consider the availability of land in the planning area at fair prices (comparison of land prices in this area and in others, restrictions regarding the usage / purchase of land in this area in comparison to others).
- Consider potential problems with respect to property rights (does the acquisition of land constitute a problem?).
- Consider life-cycle cost models for infrastructure integrating all costs (many ecological measures with higher investment cost lead to lower operating costs and resulting lower life-cycle cost).
- Develop a compact urban form with sufficient density as a precondition for attractive and economically viable public transport systems and retail services as well as lower costs for the technical infrastructure (length of energy and water supply networks per head of population, etc.).
- Seek alternative models to finance ecological infrastructure (i.e. sale of shares for photovoltaic solar power plants, green electricity collectives).
- Consider contracting models for operating the technical infrastructure (e.g. companies operating co-generation plants (chp) or wood chip energy supply facilities).

**> offer low cost housing, workplaces and space for non-profit uses**

*>> see also: built environments, land demand, land use, public space, landscape/green, buildings, individual motorised travel, energy, water, waste, building materials*

- Minimise life-cycle costs for buildings (construction, operation, recovery, disposal).
- Integrate high-density areas with compact building typologies to decrease construction costs and proportional plot costs.
- Offer low-price dwellings through special procedures for low price plots (e.g. Städtebauliche Entwicklungsmaßnahme[24)], long-term plot-lease, etc.) as well as through low construction costs and thus low sales costs in order to give more social groups the possibility to own property.
- Minimise construction costs for buildings through selection of appropriate materials and heating, ventilation and air-conditioning systems, prefabricated modules, appropriate tendering procedures.

[24)] This is an urban development measure based in planning law, which is available in Germany under certain circumstances. It allows for example for compulsory public purchase and re-sale of land at prices which are not influenced by the value increase created by the planned development in order to avoid speculation and high profits of developers and to support sale or rent of quality housing at affordable prices.

- Provide conditions for lower household expenditure (i.e. in car-free areas with high-quality provision for other modes; through energy efficient buildings, etc.).
- Provide favourable conditions for establishing building cooperatives (advice, long-term lease options for plots, etc.) – such groups generally achieve lower building costs than developers.
- Minimise maintenance and operating costs by selecting appropriate materials and HVAC systems and building services.
- Offer semi-refurbished existing buildings or new buildings, which are not ready-to-use (i.e. needing some work input from the future users) as an offer to non-profit or low-profit uses.

### 5.2.2 ECOCITY - Visualisation of Interrelations

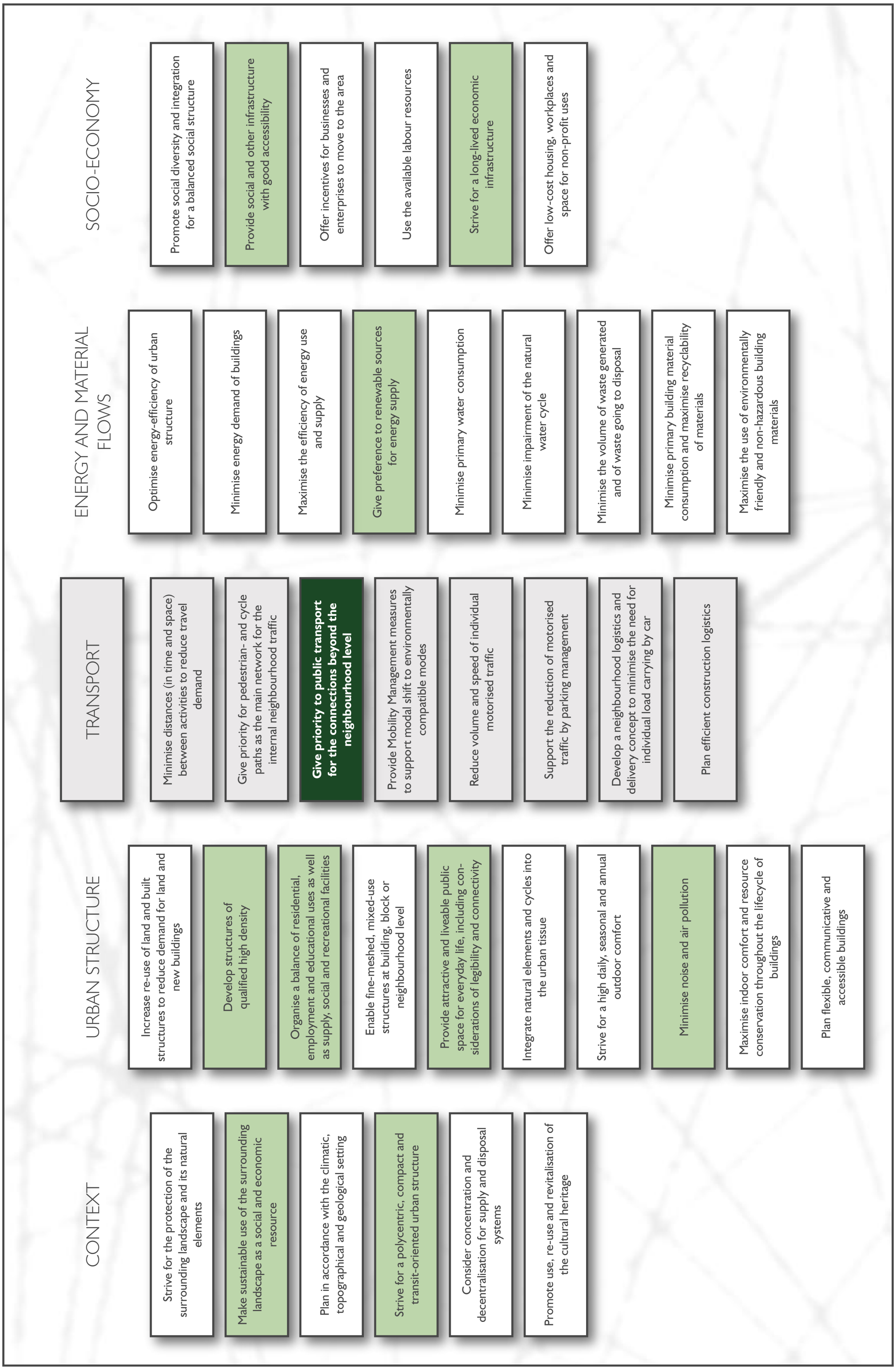
Urban planning is a complex task, which requires planners to consider interrelations and inter-dependencies. Changes in one area - such as density - can affect many other areas, such as transport demand, mode choice, urban climate and energy requirements. Maintaining an overview of this complexity is even more important when striving for the integrated and synergetic solutions required in ECOCITY projects. Together with the planning techniques presented in Chapter 4 and the tables of the previous section, tables and graphics showing interrelations between the ECOCITY objectives for different planning issues can help to tackle the complexity. The following Table 5.2 shows the interrelations between objectives for 'Urban Structure' and 'Transport'. Each coloured cell in the table indicates that measures associated with achieving the objective in the row will also have an impact on the level of achievement of the objective in the column.

The NetzWerkZeug tool presented in Section 5.1.2 also provides graphics which show the interrelations between sectors and subsectors of urban development. A similar structure is used to show the interrelations between the objectives assigned to the five elements of ECOCITY planning. Figure 5.3 shows an example for the transport objective '*give priority to public transport for the connections beyond the neighbourhood level*'.

| MATRIX OF INTERRELATIONS OF URBAN STRUCTURE AND TRANSPORT ON THE LEVEL OF OBJECTIVES | | | TRANSPORT | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Slow Modes / Public Transport | | | | Individual Motorised Travel | | Transport of Goods | |
| | | | minimise distances (in time and space) between activities to reduce travel demand | give priority to pedestrian and cycle paths as the main network for the internal neighbourhood traffic | give priority to public transport for the connections beyond the neighbourhood level | provide mobility management measures to support modal shift to environmentally compatible modes | reduce volume and speed of individual motorised traffic | support the reduction of motorised traffic through parking management | develop a neighbourhood logistics and delivery concept to minimise need for individual load carrying by car | plan efficient construction logistics |
| URBAN SRUCTURE | Land Demand | increase re-use of land and built structures to reduce demand for land and new buildings | | | | | | | | |
| | | develop structures of qualified high density | | | | | | | | |
| | Land Uses | organise a balance of residential, employment and educational uses as well as supply (of goods and services), and social and recreational facilities | | | | | | | | |
| | | enable fine-meshed, mixed-use structures at building, block or neighbourhood level | | | | | | | | |
| | Public Space | provide attractive and liveable public space for everyday life | | | | | | | | |
| | | consider liveability, legibility and connectivity of public space patterns | | | | | | | | |
| | Land-scape | provide attractive and liveable public space for everyday life | | | | | | | | |
| | Urban Comfort | strive for high daily, seasonal and annual outdoor comfort | | | | | | | | |
| | | minimise noise and air pollution | | | | | | | | |
| | Buildings | maximise indoor comfort and resource conservation throughout the lifecycle of buildings | | | | | | | | |
| | | plan flexible, communicative and accessible buildings | | | | | | | | |

**Table 5.2:** Matrix of interrelations between objectives for urban structure and transport

Figure 5.3:
Interrelations of the objective '*Give priority to public transport for the connections beyond the neighbourhood level.*' (marked in dark green) with objectives of the other elements of urban planning (marked in bright green)



### 5.2.3 ECOCITY - Self Assessment List

While the checklist of objectives and associated measures (Section 5.2.1) can be used at all stages of the ECOCITY planning process, the Self Assessment List is a tool specifically geared towards helping a project team to determine whether their drafted plans and concepts conform to the ECOCITY guidelines (Ch 3) and objectives (Book I, Ch 2.4). The exercise should be done at a stage, though, at which significant changes are still possible. It can then be repeated later on to assess and document the progress made.

The ECOCITY requirements are formulated as questions concerning the main elements of urban planning, asking the team to reflect on their solutions and measures with respect to ECOCITY requirements and with consideration of important issues of urban planning. These questions should ideally be answered in a co-operative session by the whole project team. If this is not possible, such a session should at least be organised to discuss the answers given by the team members from different planning sectors. The ECOCITY-Checklist (see 5.2.1) can be used to assist the process. The answers should also be used to identify those areas and issues, which still need improvement in the ECOCITY context.

In addition to the internal self-assessment of a project during the planning phase, the answers can also be used to provide basic information for the external experts and for the preparation of ECOCITY Quality Workshops (Ch 4.6). To make the best use of this tool, all the questions should be answered and the relevant solutions and measures described (including explanations of why they are appropriate for an ECOCITY).

#### 5.2.3.1 Regional and urban context

Q 1: How is the settlement location integrated into the natural and built environment?
*Consider protection of the surrounding landscape, greenfield or brownfield development, polycentric and compact urban structures, inner city development, orientation of the development on public transport axes, cultural heritage, integration in existing structures.*

> List open questions and information needs for Regional and ***Urban Context***.

#### 5.2.3.2 Urban structure

Q 2: How is the reduction of land consumption taken into account?
*Consider greenfield or brownfield development, high-density and compact building typologies.*

Q 3: What makes the urban structure appropriate for pedestrians & cyclists?
*Consider qualified high density and compact building typologies, mixed use, accessibility of basic daily facilities, public spaces and pathway network.*

Q 4: What makes the urban structure appropriate for public transport?
*Consider the location of the site within the region (connection to the municipal and regional network), integration of public transport lines into the neighbourhood, high density around public transport stops.*

Q 5: How does urban design make the city liveable promoting health, safety and well-being of the inhabitants?
*Consider genius loci, public spaces, historic settlement patterns and modern aesthetic concepts, landscape and green areas, bioclimatic and hygienic comfort.*

> List open questions and information needs for ***Urban Structure***.

#### 5.2.3.3 Transport

Q 6: Which means of transportation are integrated into the public transport system?
*Consider railway, tram and light rail, regional and local busses, integration into existing networks, infrastructure provision regarding demand responsive transport, soft measures (e.g. public relations, mobility management – e.g. information centres and campaigns, integrated mobility packages etc.).*

Q 7: How are the slow modes connected with public transport stops?
*Consider requirements of pedestrians and cyclists.*

Q 8: What is the role of car traffic?
*Consider the classifications traffic-calmed (reduced speeds, more space for non-motorised modes), car-reduced (reduced parking, limited access for private cars, no through roads) and car-free (greatly reduced parking, no access for private cars, priority for pedestrians and cyclists)*

Q 9: Which measures are planned for efficient movement of goods and services?
*Consider neighbourhood logistics, waste concept and construction logistics.*

> List open questions and information needs for ***Transport.***

#### 5.2.3.4 Energy and material flows

Q 10: What makes the urban structure and the building standards energy-efficient?
*Consider solar-orientation of urban structure, compactness of building typologies and high density (appropriate for district heating networks) as well as low-energy buildings, passive houses, buildings with low or no cooling demand.*

Q 11: Is the energy supply organised in an efficient way and based on renewable energy sources?
*Consider district heating networks, co-generation (CHP) plants, ground heat exchange systems, natural and mechanical ventilation systems, efficient cooling systems, heat recovery as well as solar energy, biomass and wind power.*

Q 12: What are the contributions to a sustainable use of water?
*Consider domestic and commercial use of potable water, rainwater management, sewage treatment.*

Q 13: What are the contributions to a sustainable use of materials in the construction, use and eventual deconstruction of your scheme?
*Consider minimising material demand, using eco-friendly, non-hazardous materials (certified timber, regional bricks, recycled materials, etc.).*

Q 14: What are your concepts for waste management?
*Consider soil management, separation of waste, reuse and recycling on or off site*

> List open questions and information needs for ***Energy and Material Flows.***

### 5.2.3.5 Socio-economy

Q 15: Which targets and strategies are included in the social concept
*Consider diverse population structure, mix of tenure, provision of social infrastructure such as neighbourhood centres, kindergartens, schools, assisted living, etc.*

Q 16: Which targets and strategies are included in the economic concept
*Consider mix of commercial uses and facilities, tele-working, public / private partnerships, jobs for disadvantaged groups, etc.*

> List open questions and information needs for ***Socio-Economy.***

### 5.2.3.6 Processes

Q 17: In how far have you organised a fair and comprehensive participation process?
*Consider co-operation with the community, involvement of different interest groups, discussion of all relevant aspects, provision of appropriate information, timing of the participation and events, as well as influence on the final results.*

Q 18: To which extent have you realised an integrated planning process?
*Consider involvement of all relevant sectors of sustainable urban development in the planning team (planners and experts as well as city administration), cooperation within the team, appropriate integration of sectoral concepts into the masterplan and application of planning techniques (e.g. planning with scenarios, special optimisation procedures).*

### 5.2.4 ECOCITY - Evaluation Scheme

There is currently no reviewed methodology for the ex-ante evaluation (i.e. *before* implementation) of sustainable settlement development, which is applicable throughout Europe. The ECOCITY Evaluation Scheme was developed as a first step towards a practical tool for an integrated evaluation of sustainable urban development at the master planning stage. The tool can be used either for self assessment, within an auditing procedure or for the presentation of the planning outcome to municipalities and the interested public. The evaluation gives an impression of the extent to which the ECOCITY objectives for the different elements of urban planning will be fulfilled by the planned settlement. The core indicators developed for this tool (see below) can not only be applied to master plans but should largely also serve their purpose for consecutive planning stages – complemented, ideally, by additional indicators.

The focus of the evaluation lies on urban structure and transport, as this was the emphasis of the ECOCITY project. Several innovative indicators and most of the benchmarks have been newly developed out of the context of the project, because no methodology and no reference values were previously available. The methodology was first applied in the ECOCITY project, thus a review is recommended for further improvement and consolidation.

The following section provides an introduction to the evaluation scheme, which cannot be presented here in full detail. Further information on the specific indicators and how to calculate them and on the associated benchmarks is available from the project website on: ***www.ecocityprojects.net***

#### 5.2.4.1 Structure of the ECOCITY Evaluation Scheme

The main principle of the Evaluation Scheme is the connection of the overall ECOCITY goals (see Figure 1.2) and the ECOCITY objectives (see 5.2.1) with criteria, indicators and benchmarks. An indicator shows (indicates) the condition of a characteristic or attribute (= criterion) of the planned development in order to assess how far the objectives of sustainable development have been met. The comparison of the value of an indicator to a given benchmark value allows a relative evaluation of that value: does the indicator show an improvement compared to conventional planning or not and how big is the change? (see also Table 5.3 and Table 5.4 below).

Table 5.3: Definitions and synonyms for terms used in the Evaluation Scheme

| TERMS | goal, objective | criterion | indicator | benchmark |
|---|---|---|---|---|
| **definition** | the ECOCITY goals and sectoral objectives define directions or characteristics for sustainable urban development | a characteristic or property of the settlement on which a judgement or decision (assessment) is based | qualitative or quantitative aspect of a criterion that provides an indication of the condition | the reference value to help determine (ecological) improvement |
| **synonyms** | target, aim | characterising mark or trait, property or attribute | index, meter, instrument used for monitoring, pointer, gauge, dial, (statistical) value | reference, measure |

#### 5.2.4.2 Criteria and Indicators

Overall, the scheme consists of 20 core criteria and 34 related indicators. About two thirds of these indicators are based on quantitative information, the rest is qualitative. Both types of indicators have been used because quantitative indicators are more impartial while qualitative indicators allow an evaluation of certain criteria such as social infrastructure, which are difficult or impossible to usefully assess on a quantitative basis. Additionally, an analysis of strengths and weaknesses for each criterion has been performed in the project ECOCITY in order to detect aspects which are not covered by the indicators (see further information on the ECOCITY website). Table 5.4 lists the criteria and indicators developed for the scheme.

For some criteria the question has been raised as to whether limiting aspects should also be dealt with in individual criteria or whether one should accept that this will be considered by other interrelated criteria. Thus, for example, exceptionally high densities would lead to the deterioration of the quality or urban structures – but this would be flagged up by indicators on landscaping area or public space. It was decided that the aggregation of different indicators will describe the case studies appropriately but that there is no need to reflect the entire approach of the planning for an ECOCITY project within one individual criterion or indicator.

| | CRITERIA | INDICATORS |
|---|---|---|
| CON-TEXT | location of settlement | basic urban supply infrastructure –- *potential, attractiveness and accessibility of means for satisfying basic needs*<br>coping with land demand –- *ratio of brownfield, inner city and greenfield development areas per total planning area* |
| URBAN STRUCTURE | building density | area density - floor area per land area |
| | mix of uses | share of mixed-use areas – *share of gross floor area with a mix of residential and non-residential use*<br>accessibility of basic facilities – *proximity to groceries; kindergarten; primary school; pubs* |
| | public spaces<br>*size and quality* | conviviality index - *quantity of public spaces with potential for conviviality*<br>public space quality - *liveability (active frontages + diversity of uses), accessibility, legibility, safety, connectivity, urban comfort* |
| | landscaping area<br>*accessibility and surface quality* | accessibility of green areas – *share of inhabitants living near public green areas*<br>eco-quality of outdoor areas – e.g. *artificial cover, cut / uncut grass, trees, permanent / temporary water bodies, roof and facade planting* |
| TRANSPORT | infrastructure for private travel | application of transport concepts for the *reduction of car traffic*<br>length of road network *per workday population*<br>length of cycle network *per workday population* |
| | accessibility of public transport | public transport coverage - *percentage of floor area within a radius of 300 m or 150 m of public transport stops* |
| | quiet<br>*noise from routes of transport* | daytime traffic noise exposure<br>night time traffic noise exposure<br>*share of inhabitants exposed to noise above limits* |
| | parking provision | accessibility of public transport vs. private car |
| ENERGY FLOWS | energy demand | annual energy demand – *for heating, cooling and other purposes*<br>*peak power demand per floor area* |
| | energy efficiency | compactness of the structure<br>ratio of solar oriented buildings<br>thermal insulation level |
| | greenhouse gas emissions | share of renewable energy sources<br>global warming potential per MWh - *$CO_2$-equivalent of non-renewable energy production* |
| MATERIAL FLOWS | building materials | reduction of the demand for building materials<br>use of renewable, recycled and/or locally-sourced building materials |
| | soil movement | share of soil re-used on site |
| | water management | concepts for water management – *measures to minimise primary water consumption* |
| SOCIO-ECONOMIC ISSUES | social infrastructure and mix | index of social infrastructure – *availability/existence of social institutions; measures for social diversity and integration* |
| | economic infrastructure | index of economic infrastructure – *quality of local economic development plan* |
| | labour related issues | index of labour related issues – *availability and diversity of jobs, (correspondence to social mix and the economic context)* |
| | profitability | index of profitability – *cost/return ratio* |
| PRO-CESSES | integrated planning | multidisciplinary planning team - *disciplines and institutions integrated*<br>iterative process – *number of optimisation loops*<br>planning with scenarios – *number and content of scenarios* |
| | community involvement | index of community involvement – *quality of the participation process* |

Table 5.4:
Criteria and indicators chosen or developed for the ECOCITY evaluation scheme

#### 5.2.4.3 Benchmarks

The assessment of the indicators is carried out by comparing them with the chosen benchmark values. For all indicators, these were allocated to a score between A (best) and E (worst). If the indicator matches the benchmark - normal practice - score D is assigned. Scores A, B or C are assigned if the indicator is better than the benchmark for D, which shows an improvement over the normal practice. E would show a result that is worse than the normal practice.

| | | |
|---|---|---|
| IMPROVEMENT | A | **best** score: innovative |
| | B | **very good** score: best practice, state of the art |
| | C | **good** score: above normal practice |
| | D | **medium** score: normal practice, state of practice |
| WORSENING | E | **bad** score: below average score, below normal practice |

Setting benchmarks is indispensable to allow a comparative evaluation throughout Europe and to illustrate the level of achievement of the common ECOCITY goals. But in addition, the improvement compared to the local/national state of practice should be rated favourably, even if the European ECOCITY benchmark for best practice is not reached. This would require either additional, locally referenced information on the rating scores in written form or a supplementary assessment with local benchmarks.

#### 5.2.4.4 Presentation of results

The ECOCITY evaluation delivers two types of results:

- appraisal of urban planning issues: shows the performance in relation to each criterion and each planning discipline - useful for planners and experts
- achievement of overall ECOCITY goals: shows the performance in terms of the three dimensions of sustainable development - useful for politicians, investors and the public

The results of the ECOCITY evaluation can be visualized either by bar charts or by spider diagrams. Spider diagrams illustrate the degree of positive development for each criterion with coloured segments as shown in Figure 5.4.

Thus the ECOCITY evaluation scheme is a useful tool for assessing the sustainable development potential of a project at the master planning stage. The results can be used to:

- visualise a characteristic trait of the sustainability of a project,
- point out strengths and weaknesses of a project,
- provide management information to aid decision making,
- derive tasks for consecutive planning stages (in combination with the ECOCITY checklist, Section 5.2.1) and to
- assist in selecting an optimal version from different scenarios.

However, this evaluation has to be considered as a snapshot of the planning process. To establish an auditing and quality assurance system, an ongoing periodical evaluation and monitoring during the planning process, implementation, management and maintenance of the development is required. This can for example be achieved by adapting the ECOCITY evaluation scheme to all relevant stages of a project.

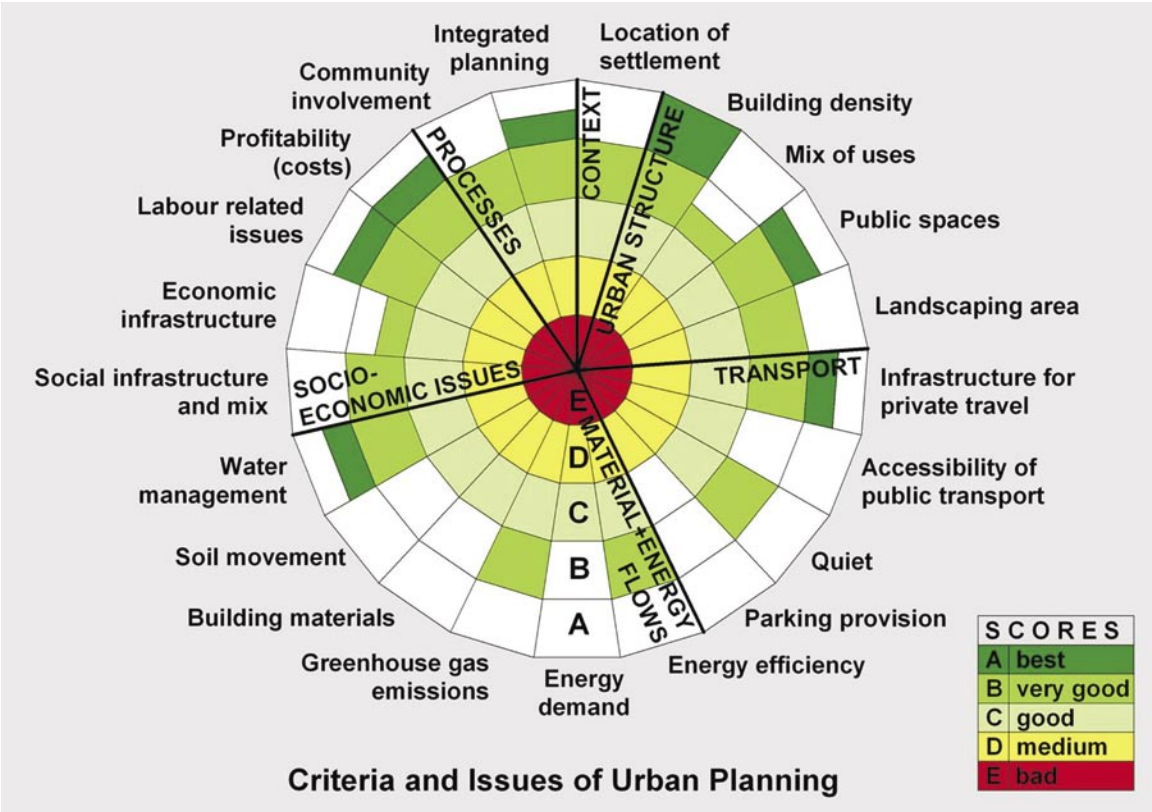



Figure 5.4:
Evaluation compass for criteria of urban planning (example: Tübingen)

Applying the evaluation scheme to the plans and concepts for the ECOCITY model settlements showed that the criteria were most useful for checking the quality of the urban patterns designed (e.g. quantitative indicators for a qualified high density or the annual energy demand for heating and cooling). But those indicators concerning issues influenced by the behaviour of future inhabitants and users were harder to measure reliably. The modal split of transport with its resulting $CO_2$ emissions as well as the socio-economic aspects – some of the most important criteria to evaluate the impact of an ECOCITY on the natural and social environment – can only be estimated very roughly in advance. Such an evaluation is nevertheless a useful exercise to perform, as problematic issues can be flagged up more reliably.

# 6 Summary

This book, ECOCITY Book II, supplements ECOCITY Book I. The latter describes the vision and objectives for ECOCITY settlements as well as their manifestation in the design of the ECOCITY model settlements. This book provides you with information that is intended to encourage and help you to work on realising ECOCITIES within your own areas of responsibility, whatever these may be. Maybe you can create demand as a citizen, influence the decision makers as a stakeholder or even take the decisions yourself. But the importance of *really doing it* cannot be overestimated.

**Two contributions are important for making an ECOCITY happen:**
**the communication of its benefits and an appropriate planning process**

**Benefits**

It might sound trivial, but it is crucial to start an ECOCITY project by communicating the expected benefits to those stakeholders who will be involved in the planning process or affected by its results. This is the best way to secure support and forge alliances of interests. The main stakeholders to be addressed are the local politicians and citizens and later on developers to arouse their interest. This communication is made easier by the fact that all the actors involved can actually benefit from an ECOCITY.

Many of an ECOCITY's benefits can be placed into two main categories: liveability (more space for people in an attractive, quiet, safe and healthy environment) and life-cycle-costs (e.g. investment for infrastructure, for heating of buildings etc.). Some benefits are also of specific importance for some individual groups: for example, ECOCITY patterns privilege non-drivers, children, senior citizens and the handicapped, thus increasing their mobility and accessibility options. And finally, ECOCITIES make a contribution to the long term protection of the natural basis for human life by reducing land demand, energy consumption and emissions compared to conventional solutions.

**Planning process**

The complex process of ECOCITY planning requires an integrated approach in order to be successful. The first step of this planning process is agreeing on the solutions which need to be achieved to realise the vision and turn an urban development into an ECOCITY.

The main issues to be considered for planning urban patterns appropriate for an ECOCITY are, in terms of

- the location: integration into a polycentric, public-transport-oriented urban system
- the settlement form: design of a compact, pedestrian-oriented quarter or neighbourhood of qualified density and mixed-use, including attractively designed public spaces with integrated green areas
- transport infrastructure: planning 'bottom-up', firstly for non-motorised transport, then for public transport and thirdly for private motorised transport
- the energy system: solar orientation of buildings with minimum energy losses, priority on renewable sources for the energy supply

The visualisation of ECOCITY patterns is an important tool for communicating the idea more effectively and thus gathering support for the implementation of an ECOCITY.

As part of the planning approach, the establishment of a multidisciplinary consultancy group for sustainable urban development can be recommended. This can increase the quality of the planning outcomes by providing additional sectoral knowledge. Involving, for example experts from the fields of sustainable urban and transport planning or interactive community planning with broad planning experience helps to identify and hopefully avoid sector-specific weaknesses in the plans and processes and where necessary to find areas for improvement.

***"The future belongs to those, who believe in the beauty of their dreams"***
ascribed to Eleanor Roosevelt, 1884-1962

# Recommended Reading:

Books and Websites recommended for more detailed information on some of the themes dealt with in this book:

## Planning

- DCBA-METHOD: Planning technique and assessment tool for ecological urban planning by Kees Duijvestein, BOOM, Delft **http://www.boomdelft.nl/index.php?id=116**
- Messerschmidt, R. (2002) NetzWerkZeug. Nachhaltige Stadtentwicklung - Sustainable Urban Planning. 10.08.2002. **http://www.netzwerkzeug.de**
- Messerschmidt, R. (2003) NetzWerkZeug Nachhaltige Stadtentwicklung - Anwendung Karlsruhe Südost. Wohnbund Informationen Nr.1/2003. 4.3.2005 **http://wohnbund.de/images/wohnbundinfos/wohnbund-info_2003_01.pdf**
- Local Traffic Performance: ‚bottom-up' design and process method for integrated urban planning, developed by SenterNovem **http://www.ecocityprojects.net**
- DRIVE SLOW GO FAST: design concept for arterial roads for better traffic flow, developed by SenterNovem **http://www.ecocityprojects.net**
- URBAN DESIGN AND TRAFFIC - A Selection From Bach's Toolbox: Edited by B. Bach, E. van Hal, M. de Jong and T. de Jong (2006), CROW, Ede
- NEUES BAUEN MIT DER SONNE - Ansätze zu einer klimagerechten Architektur (2.Auflage), Treberspurg, M. (1999), Springer Verlag, Wien: the book gives a survey of principles and methods of solar architecture
- AHWAHNEE PRINCIPLES: Concerned about the fact that existing patterns of urban and suburban development seriously impair our quality of life, the Local Government Commission (LGC) in California has drawn up fundamental principles to plan and develop communities that will more successfully serve the needs of those who live and work within them. LGC is a non-profit membership organization composed of local elected officials, city and county staff, planners, architects, and community leaders who are committed to making their communities more liveable, prosperous, and resource-efficient.
  **http://www.lgc.org/ahwahnee/principles.html**
- EXPERIMENTELLER WOHNUNGS- UND STÄDTEBAU (ExWoSt, Experimental House Building and Urban Development): The federal government in Germany (Bundesministerium für Verkehr, Bau und Stadtentwicklung) promotes innovative planning and measures on important urban development and housing-political issues in the research-programme ExWoSt, handled by the Bundesamt für Bauwesen und Raumordnung (BBR), information in German.
  **http://www.bbr.bund.de/nn_21288/DE/Forschungsprogramme/ExperimentellerWohnungsStaedtebau/experimentellerwohnungsstaedtebau__node.html?__nnn=true**
  The programme is organised in several research areas, e.g. Urban Development and City Traffic (Stadtentwicklung und Stadtverkehr) (**http://www.bbr.bund.de/cln_005/nn_21888/DE/Forschungsprogramme/ExperimentellerWohnungsStaedtebau/Forschungsfelder/StadtentwicklungStadtverkehr/01__Start.html**) or Mixed-use (Nutzungsmischung im Städtebau) (**http://www.bbr.bund.de/cln_005/nn_21888/DE/Forschungsprogramme/ExperimentellerWohnungsStaedtebau/Forschungsfelder/NutzungsmischungStaedtebau/01__Start.html**)

## Participation, interaction

- ACTION PLANNING: How to use planning weekends and urban design action teams to improve your environment, compiled and edited by Nick Wates (1996), The Prince of Wales's Institute of Architecture, (http://www.nickwates.co.uk/books.htm)
- THE COMMUNITY PLANNING HANDBOOK: How people can shape their cities, towns and villages in any part of the world, by Nick Wates (1999) (http://www.earthscan.co.uk/?tabid=970)
- COMMUNITY PLANNING: project examples for community involvement including a consensus-led approach to planning, by John Thompson & Partners (http://www.communityplanning.net)
- PERSPEKTIVENWERKSTATT: German and extended version of the action planning methodology, by Andreas von Zadow (1997) (http://gmbh.vonzadow.de/publikationen_buecher)

## Assessment, evaluation

- BREEAM: Environmental performance assessment method for new and existing buildings: offices, homes (known as EcoHomes), industrial units, retail units, schools and others, largely oriented on the building level but including some indicators for the urban planning scale (http://products.bre.co.uk/breeam/index.html)
- ECOLUP: Research Project for validation and certification of ecological land use planning with orientation to the demands of EMAS II (www.ecolup.info)
- EUROPEAN COMMON INDICATORS, Towards a Local Sustainability Profile: Final Project Report, Ambiente Italia Research Institute (2003), Milan, (http://europa.eu.int/comm/environment/urban/pdf/eci_final_report.pdf )
- The LEED for Neighbourhood Development Rating System: It integrates the principles of smart growth, urbanism, and green building into the first national standard for neighbourhood design and is elaborated in collaboration between the U.S. Green Building Council, the Congress for the New Urbanism, and the Natural Resources Defense Council. (http://www.usgbc.org/DisplayPage.aspx?CMSPageID=148)
- SUSTAINABLE PROJECT APPRAISAL ROUTINE (SPeAR®): Arup developed a tool to demonstrate the sustainability of a project, process or product to be used either as a management information tool or as part of a design process (http://www.arup.com/environment/feature.cfm?pageid=1685)
- SUSTAINABILITY VALUE MAP: Evaluation tool for sustainable urban development by Chris Butters, NABU (http://www.arkitektur.no/files/file46226_urban_ecology.pdf)

## Project examples

- FORUM VAUBAN: Nachhaltige Stadtentwicklung beginnt im Quartier, handbook developed in the course of the planning and implementation process of the Vauban quarter in Freiburg (http://www.vauban.de/info/vauban-cd.html, in German, summaries in English)
- MODELL KRONSBERG: Hannover Kronsberg - model of a sustainable new urban community (http://www.hannover.de/data/download/umwelt_bauen/h/han_kron_realisierung_en.pdf), the implementation of the new quarter Kronsberg started as a project of the EXPO

2000, the “Ecological Optimisation at Kronsberg” included energy efficiency optimisation, water management, waste management, soil management and environmental communications **http://www.hannover.de/data/download/umwelt_bauen/s/mokro27-31.pdf**

- MALMÖ, QUALITY PROGRAMME Bo01 City of Tomorrow, 1999: a joint agreement between developers, Bo01 and the City of Malmö for a new neighbourhood in the district of Västra Hamnen (Western harbour) designed for the European housing exhibition Bo01 in Malmö, Sweden in 2001, describing a minimum level of quality, which all parties involved pledge themselves to guarantee as regards architectural expression, materials, technology and workmanship **http://www.ekostaden.com/pdf/kvalprog_bo01_dn_eng.pdf**
- MAINZ, BIETERVERFAHREN – ARTILLERIEKASERNE, Modellvorhaben ökologisches und kostengünstiges Bauen an der Kurt-Schuhmacher-Straße, Wohnbau Mainz GmbH: Documentation of the urban planning competition including objectives and criteria for sustainable energy and transport concepts, model project of the German Research Programme ExWoSt (Experimenteller Wohnungs- und Städtebau) **http://www.fm.rlp.de/Bauen/Experimentelles_Bauen/pdf_Experimentelles_bauen/gonsenheim_dokumentation.pdf**
- solarCity LINZ PICHLING (built 1999-2005): a new quarter was designed around the stop of a tram extension, considering many ecological issues with a focus on solar architecture **http://www.linz.at/english/solarcity/frameset.html**
- SUSTAINABLE URBAN DESIGN - Perspectives and Examples: Edited by Martin Dubbeling and Anthony Marcelis, Beursloge Projecten Foundation Amsterdam (2005), Blauwdruk Publishers, Wageningen
- LAND USE AND TRANSPORT, European Research Towards Integrated Policies: Edited by Stephen Marshall, Bartlett School of Planning, University College London, UK and David Banister, Transport Studies Unit, Oxford University Centre for the Environment, UK, Elsevier, Oxford 2007
  This book reports on a series of projects from the PLUME network (Planning and Urban Mobility in Europe) within the Key Action „City of Tomorrow“ of the 5th EU Framework Programme, including the ECOCITY-project

Most of the existing evaluation tools in the construction sector have been developed to assess single buildings in an advanced planning stage when detailed data, e.g. for building materials, is available. Three well-known tools plus one compilation are:

- ECOHOMES / BREEAM: Environmental performance assessment method of new and existing buildings: offices, homes (known as EcoHomes), industrial units, retail units, schools and others. **http://products.bre.co.uk/breeam/index.html**
- LEED (Leadership in Energy and Environmental Design - Green Building Rating System™): LEED is the nationally accepted benchmark for the design, construction and operation of high performance green buildings developed by LEED rating system committees in the framework of the U.S. Green Building Council. **http://www.usgbc.org/LEED/**
- LEGEP: Planning support and assessment of life cycle, energy, heath and costs for all architectural planning stages **http://www.legep.de in German**
- CRISP: Construction and City Related Sustainability Indicators - Compilation of existing methodologies and indicators **http://crisp.cstb.fr**

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# ECOCITY

As defined in Book 1, an ECOCITY is composed of compact, pedestrian-oriented, mixed-use quarters, which are integrated into a polycentric, public-transport-oriented urban system. Featuring attractively designed public spaces with integrated green areas and objects of cultural heritage, an ECOCITY is an attractive place to live and work.
All the actors involved – municipalities, businesses and the residents – can actually benefit from a liveable environment (attractive, quiet, safe and healthy) and the lower costs (e.g. for infrastructure investments) in an ECOCITY. Some benefits are also of specific importance for some individual groups: for example, ECOCITY patterns privilege non-drivers, children, senior citizens and the handicapped, thus increasing their mobility and accessibility options.
The complex process of ECOCITY planning requires an integrated approach in order to be successful. The main issues to be considered for planning urban patterns appropriate for an ECOCITY are: the location, the settlement form, the transport infrastructure and the energy system.
This book contains some general as well as sector-specific guidelines provided as aids for structuring ECOCITY planning and more detailed information on planning techniques (e.g. for integrated planning approaches) as well as planning tools such as checklists of concrete, ECOCITY compatible measures for each element of urban planning (context, urban structure, transport, material flows and socio-economy).
Effective communication of the numerous benefits to be gained as well as an appropriate planning process are important requirements for

making an ECOCITY happen.

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