Energy, Environment and Sustainable Development

Ecocity

URBAN DEVELOPMENT TOWARDS APPROPRIATE STRUCTURES FOR SUSTAINABLE TRANSPORT

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DETAILED REPORT (Section 6)

URBAN DEVELOPMENT TOWARDS APPROPRIATE STRUCTURES FOR SUSTAINABLE TRANSPORT

6.1. Background

According to the Communication from the Commission, 'Sustainable urban development in the European Union: a framework for action', "*around 20% of the EU population live in large conurbations of more than 250,000 inhabitants, a further 20% in medium-sized cities of 50,000 to 250,000 inhabitants, and 40% in smaller towns of 10,000 to 50,000 people"* [1]. This means that 80% of the European population live in urban areas and the majority of these people live in small to medium-sized towns and cities. The EU-funded **ECOCITY project** looked at the sustainable development of just such urban areas with a strong ecological perspective . The challenges in urban development differ somewhat with the size of the settlement (in small towns it can be more difficult to establish an attractive public transport system, for example), but one problem is common to all:

During recent decades, urban growth usually happened in ways contradictory to the concept of sustainable settlement development, although this concept is theoretically agreed upon in many of the relevant policies. Suburbanisation produced spatially diffused and functionally segregated settlement structures – sprawl – in belts around cities and towns, while the population of the generally more compact historic parts declined. This continuing trend causes growth in traffic volumes, resulting in increased pressures on the environment (such as pollution from exhaust fumes or climate problems due to carbon dioxide). It also compromises the effects of many measures aimed at promoting sustainable transport modes.

As a result of these growth patterns, resources such as land and energy, which should be preserved for future generations, are used excessively. Large areas are occupied by the structures of sprawl and the consumption of limited fossil fuels continues to increase, especially for transport. The environment, which should provide a basis for the life of future generations, as well as human health and overall quality of life are impaired by the effects of this excessive use of resources.

In contrast to these trends, a broad consensus on basic principles of sustainable urban (settlement) development, such as **decentralised concentration** (polycentric structure) and a balanced **mix of different land uses** (residential, working, shopping, leisure , etc.) in a **compact structure** implying **short distances,** is to be found from global (United Nations, HABITAT Agenda) down to the national and even municipal level.

The objectives of the European Union for the development of sustainable settlements and for the improvement of urban environments specifically include to "*support a polycentric, balanced urban system* and to *promote resource-efficient settlement patterns that minimise land-take and urban sprawl."* [1].

Such patterns are further described in the Communication from the Commission 'Towards a thematic strategy on the urban environment' (and in other EU policy documents on this topic) as, *"the **favoured vision** of high-density, mixed-use settlements with reuse of brownfield land and empty property, and planned expansions of urban areas rather than ad hoc urban sprawl…"* [2].

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[1] Commission of the European Communities (1998): Sustainable Urban Development in the European Union: A Framework for Action, p.2 as well as pp. 6 and 15 respectively; Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions. Brussels.

[2] Commission of the European Communities (2004): Towards a Thematic Strategy on the Urban Environment, p. 30; Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions. Brussels.

High density and mixed use are characteristic for pedestrian-oriented settlement patterns. The need to design urban patterns which are favourable for sustainable transport is emphasised in many recent concepts and also in the objective of the Key Action 'City of Tomorrow and Cultural Heritage' (under which the ECOCITY project was realised) "*to reduce radically urban pollution and congestion, while ensuring safe, accessible and affordable mobility, through long-term strategic approaches towards land-use patterns favourable to the development of alternatives to the private car"* [3].

The need for such strategic and long-term approaches is particularly crucial because of the long lifespan of buildings and the resulting slow rate of change in existing building stock. The effects of today's land-use and urban planning measures on travel demand are therefore long-term, meaning "*that land-use planning measures set the urban patterns upon which mobility patterns are based for generations*." Thus unsustainable developments cause long-term problems, "*but if we can 'build in' sustainability-oriented (e.g. travel-minimising) features into new development, we could expect these to be a worthwhile investment prevailing over decades to come*." [4].

The ECOCITY project was a component of the Land Use and Transportation Research (LUTR) cluster, which linked 12 synergetic projects looking at sustainable urban mobility in conjunction with land use and environmental issues. The common objective was to develop strategic approaches and methodologies in urban planning which contribute to the promotion of sustainable urban development. This includes the connections between transportation demand and land-use planning, the design and provision of efficient and innovative transportation services, including alternative means of transportation, and the minimisation of negative environmental and socio-economic impacts (more information at: http://www.lutr.net/).

6.2. Scientific/technological and socio-economic objectives

The overall goal of the project was to develop settlement patterns for sustainable cities, emphasising the implications for an environmentally compatible transport system and furthermore creating a framework for the integration of sustainable solutions across all relevant sectors to generate the model of an ECOCITY with an urban environment promoting sustainable lifestyles – implying higher quality of life and reduced consumption of resources. The aim of designing model settlements for specific sites in the seven involved communities was to intensify the implementation of agreed principles and to demonstrate the feasibility and desirability of future urban living compatible with sustainability requirements.

As alternative to urban sprawl a strategy for sustainable settlement planning is developed to determine appropriate locations for sustainable urban development in relation with sustainable transport.

The settlement structure should be especially determined by an optimal transport network with the shortest paths possible for pedestrians and direct lines for public transport according to the mobility demand of people. The desired result should be, that people choose walking most of the time, cycling and public transport frequently, but the automobile only occasionally. Additionally the requirements of an efficient energy supply (promoting solar architecture and the utilisation of renewable energy sources) should be considered.

New settlements should be developed complementary to existing neighbouring settlements in a region (especially the community centre) - planning is co-ordinated, sustainable solutions in new settlements should work as incentive for the improvement of the neighbouring settlements.

The concepts for the sustainable model settlements should be evaluated to derive planning tools for sustainable settlement structures.

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[3] European Commission, DG Research (1998-2002): Guide for Proposers, RTD Priority 4.4.1 »Strategic approaches and methodologies in urban planning towards sustainable urban transport«, Key Action 4: »City of Tomorrow and Cultural Heritage« of the Thematic Programme »Energy, Environment and Sustainable Development« within the 5th Framework Programme.

[4] Marshall, S., Lamrani, Y. (2003):»Planning and Urban Mobility in Europe« (PLUME, Cluster LUTR), Synthesis Report: Land Use Planning Measures, p. 1, http://www.lutr.net/deliverables/doc/SR_Land_Use_Planning_v12.pdf [accessed: March 2005]

6.3. Applied methodology, scientific achievements and main deliverables

Methodology

In the following paragraph two aspects of the methodology applied are dealt with: the management of the work on the project in **phases** and the methods used for **planning** and **evaluation**. An additional outcome was a method to improve the quality of planning results by a **consultancy strategy**.

The project was carried out in three **phases**: in Phase 1 existing concepts, guidelines, criteria and indicators for sustainable settlement development as well as implemented examples of new quarters, public transport oriented linear urban development, car-free housing, etc. (good practice) were collected by Internet-investigation and reviewed to document the state of the art. Based on this input a conceptual framework was defined, including objectives and principles for settlement development towards an ECOCITY, considering the interrelations between different sectors. In Phase 2, based on the above objectives, the concepts for the sustainable model settlements were elaborated in co-operation with the relevant local communities (as local counterparts community committees were established). In Phase 3 a scheme of criteria and indicators was compiled and used to evaluate the concepts.

In this project four sectors are regarded as important for urban development: urban structure, transport, energy and material flows, and socio-economy. These sectors each comprise a number of aspects which were used to structure the conceptual framework as well as the concepts for the model settlements.

URBAN STRUCTURE	TRANSPORT	ENERGY AND MATERIAL FLOWS	SOCIO-ECONOMY
Demand for land / density Land use (mixed use) Public space Landscape / green spaces, water Urban comfort Buildings	Transport of persons Slow modes / public transport Transport of persons Individual motorised travel Transport of goods	Energy Water (supply, treatment) Waste Building materials	Social Issues Economy Costs

Sectors and aspects of urban development

The most substantial part of the project was the planning process in phase 2.

Planning process

The complexity of urban development, including a multitude of sectors and especially the consideration of ecological/sustainability aspects require an integrated planning process, which should also be co-ordinated with the subsequent management of buildings and infrastructure. A multidisciplinary planning team, including experts for the above sectors needs to co-operate in such a planning process. The distribution of tasks among the members of the team and the specification of the tasks in a work plan (elaborated in co-operation of the members) was realised to be necessary to organise the work and should be done at the start of the planning work. Continuous communication in meetings or via information technologies was important to exchange information and co-ordinate the work.

Interactive and participatory elements need to be integrated in the planning process, which should accompany the work from the beginning of planning and continue beyond the implementation of the project (to involve the inhabitants in further necessary decisions), to achieve both the best possible sustainable urban design quality and the broadest possible consensus.

Planning was carried out in the following steps:

1 Pre-planning

The process started with a site analysis to provide a basis for urban planning. This activity focussed on a survey of landscape, including an inventory of sensitive green areas worth being protected (e.g. forests, big trees) and an analysis of connections with the existing transport networks (pathways, roads) as well as on a survey of the relations with the wider surroundings covering the "daily urban system" of the future inhabitants of the Ecocity Settlement (community, region), including an inventory of facilities for mixed use in adjacent areas.

2 Urban planning

The urban patterns of the model settlements were designed in an iterative process, improving the quality of the plans step by step in co-operation of all partners of the planning team and in co-ordination with the community committee. Scenarios were developed, then detailed and finally merged into a master-plan in meetings of the team. The scenarios also proved to be useful to support the debate in the participation process towards consensus.

Strategies for planning the urban patterns of the model settlements gave priority to the requirements of sustainable transport modes.

Most important for making an urban structure appropriate for pedestrians (and for cycling) are short distances (requiring a compact city with qualified density, a balanced mixed land use and a limited size of the total area) and attractive pathways through a diversified surrounding in public spaces of high aesthetic quality.

Most important for public transport is the appropriate selection of sites for new construction, respectively for a new settlement to achieve a linear polycentric development and a decentralised concentration in walking distance around stops (stations) of public transport lines providing for a high passenger potential.

Qualified urban density can be achieved by balancing
high building density as a requirement for
- reducing demand for land
- achieving short distances
- promoting the viability of attractive infrastructure facilities and public transport services

with the requirements of
- sufficient distances between buildings for day-lighting and utilisation of solar energy
- sufficient open and green spaces for social contact and recreation near the apartments to make the structure liveable

3 Detailed planning

Planning of the model settlements was detailed in the form of sectoral concepts for urban planning (especially on the facilities for mixed use to be integrated) transport (with focus on a public transport system, pedestrian and cycling networks, efficient distribution logistics), energy as well as social and economic requirements (to provide services for the inhabitants and employment possibilities), which resulted also in adaptations to improve the draft master-plan.

As stated above this planning process should be accompanied by:

Interaction and citizens' participation

Exchange of information and opinions in a consultation process is considered a minimum requirement for planning an ECOCITY, but the goal is comprehensive participation including actual influence on the planning process or even direct influence on decision-making. For composing the participation process appropriate tools were selected from the broad range of community planning tools available to be applied in the various stages of planning, e.g.:

Community Committees consisting of key representatives of the local administration (planners from the municipality), political parties and members of the city council, and other important interest groups and stakeholders were established in all involved municipalities.

Community Planning Events (such as Community Conferences or Community Planning Weekends) were organised, starting with listing problems, proceeding with developing ideas for potential solutions (turning criticism into constructive dialogue) and ending with the discussion of possibilities for realisation. Possible elements are: pre-interviews with people from key interest groups for preparation, topic based 'Future Workshops' for collection of ideas (on small cards, which are grouped onto different boards to identify key themes), planning sessions for designing plans on a collaborative basis in groups of ‘non-professional’ participants assisted by experts, discussion of possibilities for progress of the project, deriving a vision for the future and/or improvements to the previous plans by the planning team based on results of the participation sessions. Community Planning Events can be applied as an instrument in various stages of a project: in the first design phase to support the development of the basic concept, later to achieve quality improvements for the urban design, to create a consensus vision (for a final master-plan) or to create an atmosphere of trust and confidence between the key actors and informal supporters.

Resources spent for an efficient participation process may pay off by avoiding delays, by improving the quality of plans through input of local knowledge and/or by creating benefits for all participants in win-win-situations.

Evaluation

Criteria, selected in relation to the Ecocity-objectives, were combined in an "Ecocity Evaluation Scheme" as a tool for the assessment of the Concepts for the Ecocity Model Settlements developed in this project to check their contribution to sustainable development and the quality of urban living. It is structured following the sectors: urban structure, transport, energy flows, material flows and socio-economic issues. One or several qualitative or quantitative indicators were assigned to each criterion. Benchmarks with a scale from A (best/innovative) to E (worst) were defined for each indicator, with D determined by the state of the art. The necessary data were collected by means of data demand sheets.

During the project the necessity arose to develop a method for improving the quality of urban planning:

Ecocity Consultancy Strategy

To meet the identified need for improving the plans for particular Ecocity-sites some experts were selected among the partners to establish an international multidisciplinary group (especially for the fields of sustainable urban planning, transport planning and interactive group dynamics), the so called "Quality Support Group". Members of this group joined the local planning team in a workshop to identify weak aspects of the plans and develop more appropriate solutions by means of an exchange of experience and knowledge. To involve responsible local planners and stakeholders was considered helpful to increase the chance for acceptance of the plans (interaction). The list of Ecocity-Objectives and -Measures was used to check the compatibility of the developed plans and concepts with the main requirements for an ECOCITY.
A Self Assessment Questionnaire was elaborated for a check of the developed plans and concepts, focussing on urban patterns, by the teams themselves. The questions are asking for justification of solutions/measures (e.g.: What makes the urban structure appropriate for pedestrians & cyclists ?). The answers turned out to be useful as basic information for the preparation of the external assistance by the "Quality Support Group".
The experience in the project showed, that consultancy by external experts can increase the quality of urban planning by providing additional knowledge. Thus the establishment of an international multidisciplinary consultancy group for urban development projects is recommended.

Scientific achievements

The main results of the project were a **conceptual framework for sustainable (urban) settlement development** including the **vision of an ECOCITY** and **objectives** for the relevant sectors of settlement development (Phase 1) as well as concepts for **sustainable model settlements** in seven municipalities in the stage of drafting master plans (Phase 2).

The vision of an ECOCITY

Considering the long lifespan of buildings, settlement patterns for the future (ECOCITIES) need to be sustainable in the original sense, to ensure a basis of living for future generations. Thus urban development has to meet the main requirements for sustainability, that the rate of resource use is not greater than the rate of their regeneration and that the rate of emission is not greater than the rate at which the pollutants can be absorbed. This can be expressed in the objectives of

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

Settlement patterns for the future need also to be liveable, to be attractive for the present generation. The equivalent objective is:

- maximising human well-being (quality of life)

As stated in the project objectives (Chapter 6.2) appropriateness for sustainable transport is an essential requirement for the sustainability of urban patterns. the main objective for this sector is:

- minimising transport demand

Transport is the sector interrelated strongest to the urban patterns and thus the above objectives are also closely linked:

A main requirement for minimising transport demand is higher density (city of short distances), which contributes to minimise land demands.

Minimised transport demand results in minimising material and energy consumption (for motorised means of transportation) as well as in minimising the impairment of the natural environment and also the impairment of health and safety of the inhabitants (caused by transport, predominantly car-traffic), thus maximising human well-being. And all this also results in economic efficiency, minimising costs.

These interrelations show, that an ECOCITY offers many benefits, ranging from personal convenience to global sustainability. All the actors involved – individuals, groups and institutions – can gain: an ECOCITY offers more space for people in an attractive, safe and quiet environment and also has lower life cycle costs and is less costly in relation to repairing negative impacts on human health and the environment.

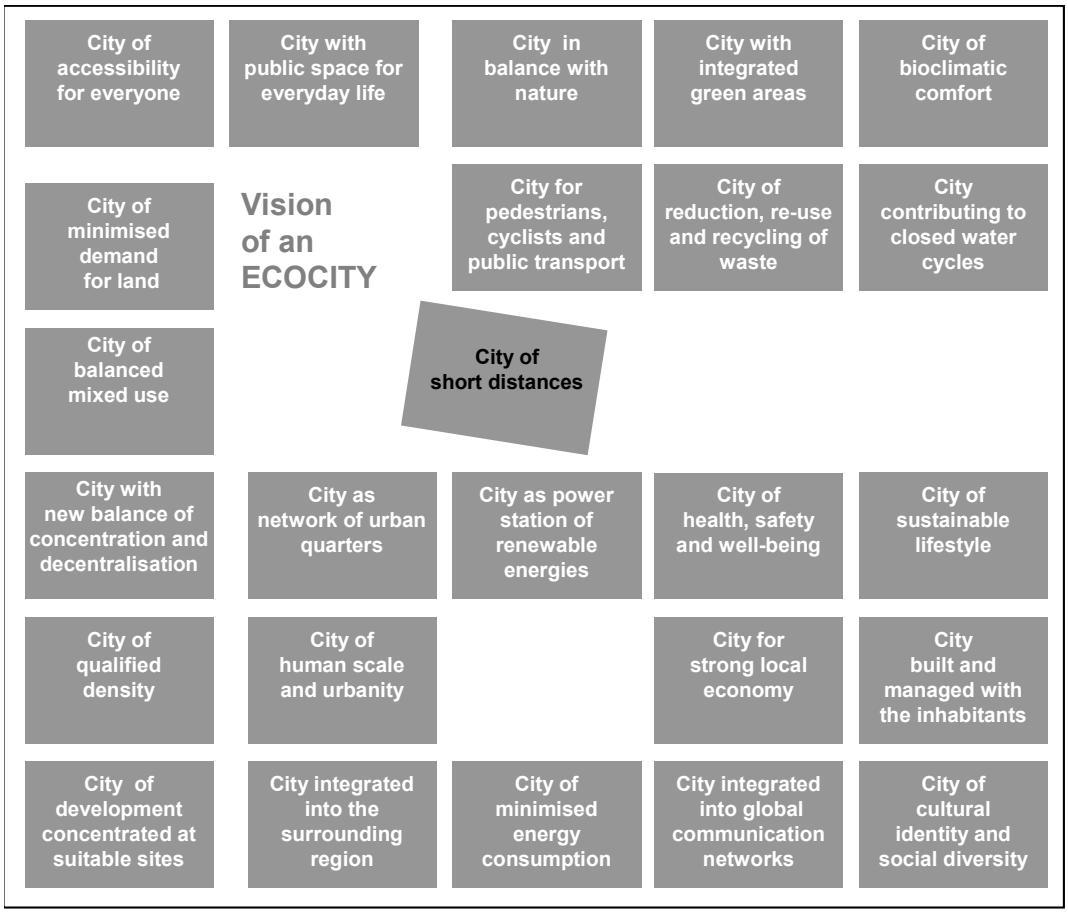
A vision of the final aim is necessary to be able to direct urban development towards an ECOCITY, promoting awareness of the idea. The envisioned patterns of the ECOCITY must meet the above objectives for sustainability and liveability to provide the above benefits.

The most important characteristics of ECOCITY patterns can be summarised in following description:

An ECOCITY is composed of compact, pedestrian-oriented, mixed-use quarters or neighbourhoods, which are integrated into a polycentric urban system in public-transport-oriented locations. In combination with attractively designed public spaces, integrating green areas and objects of cultural heritage to create varied surroundings, an ECOCITY should be an attractive place to live and work. Such sustainable and liveable structures contribute to the health, safety and well-being of the inhabitants and their identification with the ECOCITY.

For this project, an ECOCITY was defined as a **vision** of a **sustainable** and **liveable city or town** to be implemented in a smaller settlement unit, i.e. a model quarter or neighbourhood as an example for the community as a whole.

The ECOCITY vision is illustrated by comprising features of a sustainable community from all the relevant sectors of urban development in a graphic. In addition to aspects related to the design of the urban structure and the transport system, there are also features relating to energy and materials, a community's way of life and the urban economy. According to the focus of the ECOCITY project on the context of settlement patterns and transport system the feature **City of short distances**, which is strongly related to both, occupies a central position. The following graph summarises the elements of the "vision".



Vision of an ECOCITY

The importance of interrelations and context

To be able to find appropriate solutions for the complex system of a settlement (ECOCITY) it is useful to consider the multifaceted interrelations between the sectors of the system, but also the context between the settlement and the surrounding area.

From the **interrelations** between the main sectors of urban development - Urban Structure, Transport, Energy and Material Flows, Socio-Economy - the project ECOCITY focussed on the interrelation between Urban Structure and Transport. But to describe the complexity requires to go more into detail, considering the important aspects of these sectors (see table "Sectors and aspects of urban development"), e.g. the aspects density and mixed use of the sector Urban Structure are interrelated to the aspect slow modes of the sector transport.

As a more comprehensive (but surely not complete) example the interrelations of one of the aspects - Land use ("Mixed Use") - with all relevant other aspects are described, showing the influence of the selected aspect on the others and vice versa:

Influence of Mixed Use on

- Public Space: Different facilities for mixed use increase the variety and people visiting the facilities result in vitalisation of public space
- Urban comfort: good accessibility of facilities is comfortable for the inhabitants
- Slow modes (pedestrians): A balanced mixed use contributes to short distances appropriate for walking
- Individual motorised travel (car-traffic): Short distances reduce the necessity of car-trips
- Transport of goods: Short distances facilitate bringing bought goods home
- Energy (efficient utilisation): Replacing car-trips by walking avoids energy consumption
- Social Issues: a balanced mixed use provides best access for **all** inhabitants to the different facilities
- Costs: Short distances reduce costs

Influence on Mixed Use of

- Land-demands / Density: Higher density provides larger potential of users to make facilities of mixed use economical
- Public Space: social meeting points in areas with priority for pedestrians provide synergies
- Buildings: Flexible buildings allow adaptation for different uses
- Transport of goods: The location of facilities should be appropriate for efficient delivery (logistics)
- Social Issues: The behaviour of people is important for the success of a balanced mixed use
- Economy: An increasing number of working places (tertiary sector) is compatible for a mix with residential use
- Costs: Low transport costs allow longer trips to facilities promoting large monofunctional facilities outside residential areas (sprawl)

The particular aspects can have positive or negative impacts on interrelated aspects. To know these interrelations helps to strengthen positive and to avoid negative impacts.

The **context** between urban development and its natural and built environment concerns the **integration of new built structures into the existing surrounding**, considering the characteristic of the region.

The natural environment, including natural (without conscious human intervention) and agricultural parts, provides the basis for human settlements. Therefore the protection of the surrounding landscapes and their natural elements, avoiding destructive impacts and using the natural resources only in a sustainable way, is an essential objective for ECOCITY planning. Considering the context with urban development means to provide convenient access to the surrounding landscape (as nearby recreation area) to supply the settlement from the regional and preferably also organic food production and to preserve natural, green areas within the development area - especially those worth being protected - and integrate them into the settlement. To provide habitat networks it is important to maintain or create green corridors connecting green zones within the settlement and with the surrounding landscape.

The natural environment also comprises the climatic, topographical and geological setting, which is an important framework condition for planning.

The built environment includes existing parts of settlements and ensembles of buildings as well as networks (especially for transport). It is important to use historical urban grain, traditional for the region, as basis for the design of new structures, considering cultural heritage and to derive the design of new buildings from characteristic regional building forms or constructions for preserving and creating a local identity. For the accessibility it is essential to integrate new pathways within the settlement into the pathway network of adjacent neighbourhoods and to integrate new transport routes into the existing regional network (external cycling paths, local, regional and supra-regional public transport). The regional and municipal energy and material flows should also be considered.

The context of social and economic development in existing and newly planned structures concerns the integration of new inhabitants into the existing population in the neighbouring areas, striving for better human relations by creating contacts between them, and the integration of new facilities into the economic structure, considering the facilities existing in the community and in the region.

To respect this natural and anthropogenic context is an important requirement for planning an ECOCITY. In this project objectives for the surrounding (landscape, neighbouring parts of a municipality, region) in context with a new structure were formulated and specified.

Table: Objectives and Specifications for the Proper Consideration of the Context

NATURAL ENVIRONMENT
> Strive for the protection of the surrounding landscape
Preserve bio-diversity and habitats in the surrounding landscape
Minimise 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
Consider the boundaries of the city as a zone for an exchange between city and landscape (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 recultivation of landscape in areas with a declining population or industry (“shrinking cities”)
> Make sustainable use of the surrounding landscape as social and economic resource
Offer recreation areas in the surrounding landscape with attractive connections from neighbourhoods to support the relation of people to the surrounding nature and to avoid weekend recreation away from home
Use the surrounding landscape as an economic resource (regional and municipal agriculture, forestry, tourism, etc.)
Seek new tasks for urban agriculture (direct marketing of regional food, energy production, maintenance of cultural landscape, events, etc.)
> Plan in accordance with the climatic, topographical and geological setting
Preserve important surfaces for the urban climate and avoid barriers in air exchange corridors (forests as cold air source areas, lakes as climatic balancing elements, valleys and mountain sides as air exchange corridors), avoid industry and highly polluting roads especially in climatic sensible areas, consider the main wind direction for the spatial expansion of settlement areas)
Consider the local climate 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 north 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 poly-centric, compact and transit-oriented structure of the city
Strive for a poly-centric structure of the city with good accessibility of basic needs, of the city centre as culmination of (higher) infrastructures and of working places
Organise the city as a network of mixed use urban quarters with individual characters and identities
Strive for a compact city using all possibilities of internal development
Concentrate urban development at sites with a high potential for public transport (Transit oriented Development)
Promote connectivity in the local, metropolitan and global scale by the integration of new and existing developments in superior transport and communication networks
Strive for a land management on regional and municipal scale
Organise the price system to achieve changes in the transportation system (taxes, subsidies, fares, etc. differentiated by place and time)

> Promote use, re-use and revitalisation of the cultural heritage
Respect the cultural heritage of the region and the city regarding historical development of cities (e.g. phases of growth), mobility, geology, climate, topography, water structures and agricultural field structure
Refer to the historical urban grain (street network hierarchy and design, texture of building lots, land-use patterns, open space elements)
Strive for maintaining and re-using of existing elements such as buildings, open space elements and infrastructure (also contribution to a genius loci based on the continuity of the urban cultural heritage)
Correspond to the consolidated regional and local building typologies regarding weather protection (sun, wind, rain, snow), regional culture for living, aesthetics based on local handcrafts, etc.

ECOCITY Objectives

Based on the objectives for sustainable and liveable settlement patterns (see "The vision of an ECOCITY") and the generally agreed principles for sustainable urban development (decentralised concentration, balanced mix of different land uses, compact, dense structure) a list of more detailed objectives for an ECOCITY was compiled.

The four sectors of urban development (urban structure, transport, energy and material flows, and socio-economy) and their important aspects were used to structure the presentation of the objectives, focussing on the core themes “urban structure“ and “transport“. The objectives are complemented by the subsequent specifications, which are relevant for their achievement.

Objectives and Specifications for the Sectors of Urban Development

URBAN STRUCTURE

LAND-DEMAND
> Increase re-use of land and built structures to reduce land and new building demand
Give priority to the reuse of existing sites (brown field developments)
Increase density of existing sites (e.g. in gaps between blocks or buildings)
Minimise stock of vacant dwellings, buildings and plots by municipal management (e.g. register of available plots within the city, activities for inner city developments)
> Develop structures of qualified high density in ecological, economic and social context
Strive for high density to reduce land consumption and to contribute to soil conservation
Plan for high building density to promote a high social and spatial-visual density
Plan for high density as a precondition for economic public transport, community heating systems and provision of basic facilities
Consider requirements for passive and active use of solar energy, good day-lighting conditions, sufficient open spaces, surfaces for water management, air exchange corridors ..., which are limiting the density
Concentrate structures with high density around stops of public transport
Plan for compact and multi-storey typologies for residential housing and commercial uses
Consider increasing of density by minimising land-demand for motorised traffic and parking

LAND USES - MIXED USE
> Organise a balance of residential, employment and educational uses as well as distribution, supply and recreational facilities
Integrate a balanced ratio of residential housing, commercial uses, cultural facilities, sciences and education
Integrate retail for basic daily necessities
Offer social infrastructure (kindergarten, primary, secondary schools, general practitioner)
Include on new sites facilities servicing the entire community as attractors
Maintain and strengthen existing mix of uses
Add other uses into existing mono-functional areas
> Strive for fine-meshed mixed use structures at building, block or neighbourhood level
Promote a small scale mix of uses
Offer basic facilities (e.g. groceries, kindergarten, primary school, tavern) within walking distance to living and working environments
Strive for variability and flexibility of urban and building structures to facilitate changes of use
Offer differentiated areas with different meshes of mixed structures and different ratios of uses
PUBLIC SPACE
> Provide attractive and liveable public space for everyday life
Allocate sufficient public spaces (squares, streets, green zones) close to living and working environments
Maximise possibilities of interchange and create opportunities for communication and encounter by planning for communicative open spaces
Strive for a multi-functionality (avoid mono-functionality) and a strong identity of public spaces
Orientate buildings to the public space (windows, entrances, attractive ground floor facades supported by appropriate uses)
Organise open space elements and architecture in a high aesthetic quality (water design, surfaces in streets and squares, facades, urban furniture, etc.)
Consider the exposure of public spaces to bioclimatic conditions (wind, sun, rain, snow, etc.) permitting the use of public spaces all along the day and all along the year
Minimise disturbance of public spaces by motor traffic especially regarding safety and noise conditions
Create public spaces appropriate for sensual experience
> Consider liveability, legibility and connectivity of public space patterns
Integrate different fabric types and building typologies into the urban structures for vivid neighbourhoods
Plan a interconnected system of public space with maximised pedestrian networking of public spaces, changing attractions along spatial sequences and avoiding of architectural barriers
Create neighbourhood centres as places to meet people and for the strengthening of the neighbourhood identity
Strive for a genius loci by creating an urban fabric of open spaces, building structures and landscape elements with a special and distinctive identity
Diversify public spaces to various types with a hierarchical structure (squares, parks, streetscapes)
Promote the multifunctional character of roads as liveable public spaces with mixed use of transport area wherever appropriate

LANDSCAPE / GREEN
> Integrate natural elements and cycles into the urban tissue
Maximise landscaping area (ground, facades, roofs)
Create and conserve habitats for various animals and plants
Create and conserve habitat networks (use linear elements to connect open spaces, avoid barriers, create stepping-stone habitats, consider ecological bridges)
Create, maintain or reconstruct green and water elements within the city (trees, hedges, grassland, urban furniture, watercourses, fountains, etc.)
Maintain and conserve bioclimatic important green elements and areas
Create and maintain green corridors connecting green zones in the city and connecting them with the surrounding landscape
Minimise sealed surfaces (footprint of buildings, treatment of pavements, parking spaces, etc.)
> Create landscape patterns for a high social usability
Offer recreation areas as attractive green zones next to neighbourhoods within the city (also to avoid weekend recreation away from home)
Strive for a social structuring of outdoor area seeking for a balance and hierarchy between public, semi-public, private spaces
Offer spaces for children's personal experience and the conscious perception of the natural environment
Integrate urban agriculture (city farms, gardening) and seek for new tasks of the urban agriculture
URBAN COMFORT
> Strive for a high outdoor comfort daily, seasonally and annually
Maintain or improve the urban ventilation on the city level (maintain and create green open spaces and water surfaces as connected open space patterns, maintain and create cold air source areas and cold air corridors
Develop the geometry of quarters and neighbourhoods according to requirements of urban ventilation (choose climatic favourable forms of building layouts and materials for green spaces, blocks and buildings)
Improve the air quality by reducing emissions of traffic, of commercial uses and industry, of households, of energy plants and heating systems at the source
Increase filtering and absorption capacity of urban land by planning or maintaining trees and other vegetation, constructing green roofs and by leaving wide areas with no paving
Reduce the impact of mobile telecommunication, electricity, traffic installations (electrified railway systems) and other technical devices on men’s health and well-being (avoiding of electric and electromagnetic radiation, keeping sufficient distances and using screening materials and constructions)
Plan green roofs for an improvement of the microclimate
Consider water surfaces (e.g. part of rainwater management systems) to improve the urban comfort and to contribute to natural ventilation on the block or building level
> Minimise noise pollution
Avoid noise emissions at the source by taking active measures reducing the noise emissions of traffic, of commercial uses, of leisure and sports activities
Control the noise with passive measures (sufficient distances, noise protection walls/embankments, protection plantings, shields of buildings, layout of buildings and floors)
Minimise impact of construction works on urban comfort

BUILDINGS
> Increase indoor comfort and conserving of resources throughout the life-cycle of buildings
Maintain and re-use existing buildings by keeping uses or conversion for new uses
Strive for low-energy or passive-house standard in terms of construction and HVAC (Heating, Ventilating and Air-Conditioning) equipment (building services)
Use healthy building materials regarding all phases of from production, construction, use and demolition
Maximise the durability, detachability and the ability for recycling of materials and constructions
Plan for reverse-engineering of HVAC (Heating, Ventilating and Air-Conditioning) equipment (building services)
Reduce maintenance needs of buildings
Promote the refurbishment of existing buildings (especially regarding the energy demand and supply)
> Plan for communicative, flexible and accessible buildings
Facilitate change of uses and multiple-shift of uses like living and working, parking and commercial uses
Strive for a close connection of buildings to the public space and active frontages (facades, allocation of uses and entrances)
Strive for communicative buildings with innovative ideas for living
Avoid architectural barriers to accessibility (situation of buildings causing a long way round, steps)
Seek for new housing concepts for seniors and elderly people and housing concepts for different generations (“young and old” projects)
Facilitate transformation and adaptation of inner spaces by the user

TRANSPORT

SLOW MODES / PUBLIC TRANSPORT
> Minimise distances between activities in time and space for reducing travel demand
Strive for an appropriate combination of activities in space (mixed use)
Develop a compact urban form with sufficient density (necessary for an economically viable public transport system)
Create high quality open spaces and architecture (squares, parks, streetscapes)
> Give priority for pedestrian- and cycle paths as the main network for the internal neighbourhood traffic
Create a sufficiently dense and attractive grid for pedestrians and cyclists and avoid long detours (e.g. around large building blocks or main traffic arteries)
Integrate all important destinations (shops, schools, major employment locations) within the neighbourhood and/or close to public transport stops and ensure good connections to external destinations
Design public spaces and streetscapes along pathways with a high spatial quality and changing public events (for attractive walking/cycling and for social control)
Eliminate danger and disturbances of motorised traffic
Provide barrier-free accessibility to transport networks and buildings for everyone
Provide infrastructure for pedestrians and cyclists (parking and storage facilities for bikes, benches/seats, weather protection, etc.)

> Give priority to public transport as the most important part of sustainable transport
Integrate direct public transport lines into to the urban structure
Develop an integrated system of public transport (railway, light rail, bus) to improve the connections with the municipal and regional networks and provide bike & ride / kiss & ride facilities at stops and interchanges
Optimise distances between public transport stops (for economic operation and high coverage of rider catchment)
Create dense developments within walking distance around public transport stops (but do not sacrifice high spatial qualities)
Allocate stops to uses and vice versa in such a way that a majority of important public facilities is near the stops
> Provide Mobility Management measures to support modal shift to environmentally compatible modes
Promote mobility centres with comprehensive support of the transportation demands (mobility help-desk, ride-share agency, car-sharing-garage, car hire system, bicycle hire agency, sale of public transport tickets)
Facilitate public relations on transport issues and awareness-raising-campaigns
Provide a mobility package for households (car sharing, public transport season pass etc.)
Provide comprehensive and easily-accessible information on all travel options (internet platform on travel options, PT schedules including inter-modal options etc.)
Provide real-time information to passengers on time tables (arrivals, departures and connections)
INDIVIDUAL MOTORISED TRAVEL
> Reduce volume and speed of individual motorised traffic
Reduce speed of motorised traffic (traffic calming, regulations)
Strive for a differentiated shape and hierarchy of the road network with parts that are not dominated by motor traffic (lane width, speed, etc.) and with minimum through traffic (i.e. tree-like structures starting from a main collector road)
Promote the multifunctional character of roads as liveable public spaces with mixed use of the transport-dedicated surfaces wherever appropriate
Promote car-free areas which allow experiencing all the advantages of living and moving without a car
Minimise land consumption for motorised traffic
Promote efficient use of cars (i.e. car-sharing in order to cut back car-ownership, agency for ride-sharing)
Restrict access to particular areas for motorised transport (e.g.. to city or neighbourhood centres)
> Support the reduction of motorised traffic by parking management
Reduce parking spaces, i.e. the required ratio of parking space per dwelling (for car-reduced areas and for car-free areas)
Concentrate parking spaces in collective carparks and district parking garages in acceptable distance to dwellings and not directly at the front door or even inside the residential buildings (i.e. district parking lots in the same distribution as public transit stops)
Minimise parking spaces in public areas to reduce the impact of private cars on the quality of public spaces
Reduce land consumption for parking (reduction of parking spaces, multi-storey parking, mechanical systems)

TRANSPORT OF GOODS
> Facilitate a neighbourhood logistics and delivery concept to minimise need for individual load carrying by car
Facilitate a neighbourhood logistic concept including a co-ordinated goods delivery (neighbourhood service centre, shopping boxes, etc.)
Use information system technologies including e-commerce solutions management
Locate facilities with which generate need for goods transportation preferentially at sites allowing short routes for city logistics
Plan for use environmentally compatible modes or alternative fuels for goods delivery
> Integrate waste concepts in neighbourhood transport infrastructure
Ensure access for collection vehicles to waste collection facilities
Integrate locations for interim storage facilities (containers, etc.) in urban and building structure with an attractive design
> Plan for efficient construction logistics
Promote the use of local materials to minimise construction traffic
Organise necessary trips for construction in an effective way

FLOWS

ENERGY
> Optimise energy efficiency of the urban structure
Design compact settlements and compact buildings with a low ratio surface to volume
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, use shading while maintaining good day-lighting conditions, design roofs to use solar applications efficiently)
Strive for high density developments for the possible economic application of district heating systems or co-generation plants.
> Minimise energy demand of buildings
Reduce energy losses by striving for a high insulation standard and air-tightness in new and existing buildings (low energy houses, passive-houses) and by striving for a compact design of buildings (clearly defined volumes i.e. avoiding of oriels and dormer windows)
Reduce the heat consumption by maximising passive solar energy gains (i.e. high ratio of windows and glass facades on south facades)
Reduce energy demand for cooling by reducing solar irradiation into buildings and by reducing the electricity consumption (to avoid additional internal heat generation i.e. of computers, electric devices)
Reduce hot water consumption by water saving installations
Reduce electricity consumption by layouts of buildings favouring good day-lighting conditions (atriums, avoiding deep buildings, etc.)

> Maximise efficient use of energy through building services and energy supply
Prefer efficient centralised energy supply systems and district heating networks
Use co-generation plants (CHP) with a high share of electricity
Use efficient ventilation systems (controlled ventilation, heat recovery, natural ventilation systems with greenhouses, no conventional air-conditioning)
Use efficient cooling systems (cooling of concrete components, ground ducts, absorption heat pumps, greenhouses, water elements, atriums and courtyards, sun collectors)
Reduce the electricity demand by efficient light systems, natural day-light systems (reflectors, light-shelves, light pipes) and avoidance of electrical devices (i.e. replace electric cooking by gas cooking, avoid electric heating and electric hot water supply)
Use information system technologies for energy facility management
> Maximise share of renewable energy sources
Strive for a high share of renewable energies for heating/cooling (solar, wood, biomass)
Strive for a high share of renewable energies for production of hot water (solar, wood, heat recovery)
Strive for a high share of renewable energies for electricity production (solar, wind or co-generation plants in combination with biomass)
Provide surfaces for active solar systems on roofs and facades
Minimise energy costs related to use and maintenance of public spaces and urban furniture by using renewable energy systems
WATER
> Minimise primary water consumption
Save water by the use of more economic installations and by the use of compost toilets
Collect rainwater for the use in toilets, washing machines, garden watering, car wash, etc.
Recycle grey water (all domestic waste water but faeces) for the use in toilets, washing machines, garden watering, car wash, etc.
Seek for the satisfaction of high quality potable water needs of all inhabitants
Design water saving green areas (efficient watering system, water saving choice of plants and trees, etc.)
> Minimise impairment of the natural water cycle
Maximise permeability of urban soil and pavements
Strive for unsealing of existing sealed surfaces
Use measures for rain water retention and infiltration to maintain the natural water balance and relieve the waste water treatment plant (green roofs, infiltration swales and hollows, trench drain infiltration, retention ponds)
Strive for a storm water management with a gradual discharge at a nature-like flow rate and take into account the natural surface discharge
Avoid infiltration of polluted discharge (from extensive metallic surfaces e.g. zinc and copper roofs and from intensively used traffic areas e.g. parking sites) or use filter technologies.
Revitalise natural water courses (brooksides, river banks) and surfaces.
Use rainwater systems for the sensual experience to make people aware of the water cycle, to increase the quality of public space and improve the urban comfort
Consider the possibility of purifying black or grey water by wastewater wetland facilities on the site (e.g. plant-bed sewage treatment)

WASTE
> Minimise the volume of waste generated and of waste going to disposal
Promote a change in consumer habits (durable products instead of disposable products, less packages, refillable containers, etc.)
Promote sharing of goods and devices (“sharing instead of ownership”) by supporting the exchange of goods and providing devices in service facilities on the site
Take into account the ability for recycling of planned buildings (easy detachability, practicable reusability, practicable material recovery and high durability of materials)
Recycle and re-use of waste by separating valuable products, interim storage and collection service
Minimise the amount of excavation products going to disposal by reducing the amount of soil to be excavated and by using the excavated soil on the site, e.g. as building material (concrete aggregates, refillings), as landscaping material, for noise embankments, as cover material, for refilling of courtyards, etc.
Maximise separate collection and recycling of construction rubble, (preferable on the site)
Avoid the biological fraction in domestic waste by promoting compost systems on the site
Avoid the disposal of untreated waste and of waste with negative impacts on health, well-being and environment.
BUILDING MATERIALS
> Minimise primary building material consumption and maximise recyclability of materials
Maximise re-use of buildings and building components
Design compact settlements instead of detached houses
Reduce the demand of building materials by reducing driveable surface, by reducing basement area and by designing lightweight constructions (e.g. timber)
Use recycling materials
Consider the construction, use and deconstruction phases of buildings while selecting materials (design for recycling): Maximise detachability (e.g. screws instead of glue), reusability and recyclability of materials (practicable re-use is more important than practicable material recovery). Consider reverse-engineering for HVAC equipment (building services, supply networks)
Introduce a building inventory (Material Accounting System): Database of assembled building materials in quantity and quality (i.e. composition) to manifest the recycling potential as well as the pollutant potential of the building.
> Maximise the use of eco-friendly and healthy building materials
Use local and regional materials
Use materials with high durability
Maximise share of recycling materials for buildings (e.g. recycle concrete on site)
Maximise share of renewable materials (timber construction, insulation)
Avoid harmful substances (e.g. PVC, solvents)
Use building materials with low primary, not-renewable energy demand

SOCIO-ECONOMY

SOCIAL ISSUES
> Promote social diversity and integration
Balanced social structure: Promote living together of people with different income, of different age, different cultural background and with different conceptions of lifestyle (sustainable, individual) etc.
Provide a variety of living environments and different types of ownership of these accommodations (not only one-family houses, not only owner-occupied flats, not only flats for rent, e.g. flats for rent form different bearers, variety of types of accommodation etc.)
Consider social issues already at the planning stage since the planning processes of different types of projects vary considerably
Ensuring 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 an early starting participation process and by attracting building co-operatives (possible contacts with future neighbours process before moving to new dwellings)
> Provide social and other infrastructure with good reachability
Provide infrastructure for administration, leisure and cultural facilities, offers concerning health and (further) education etc.
Provide retail for daily necessities
Ensure that the facilities can be reached in a short distance (by public transport, by bike or by foot) within the quarter or within the city
Maximise social integration (avoidance of financial obstacles or deterrence of certain groups within the population through special architectural features)
ECONOMY
> Maximise the appeal to businesses and enterprises
Collect information about the city and its image (the city in general and the neighbourhood especially)
Use regional and metropolitan economic strengths for appealing businesses and enterprises
Take access to credits into account (are there local credit institutions and are they willing provide loans for businesses wanting to establish themselves in the area)
Consider access to markets for goods and services (e.g. does the business have suppliers and customers in the area and are there markets that can easily be opened up from the location in question?)
Pay attention to problems with respect to property rights (does the acquisition of land constitute a problem? Are patents and other forms of intellectual property adequately protected?)
Plan for fine meshed mix use structures which favour small and medium sized enterprises
Consider the availability of space (comparison of prices for space in this area and in others, restrictions regarding the usage of this area in comparison to others)
Pay attention to the “communication potential” (Are there particular strengths or weaknesses in accessing the transport network or the new information and communication media?)
> Use the available labour resources
Analyse the strengths or local peculiarities of the labour force
Consider the availability of workers (with what kind of qualification)
Look for particular educational institutions (e.g. universities) that enhance the attractiveness of the location
Take existing and emerging regional clusters of businesses into account

COSTS
> Strive for a long-term economic infrastructure
Strive for high density areas as a precondition for economic public transport and energy supply infrastructure
Consider long-term cost models for infrastructure integrating all costs since many ecological measures with higher investment cots lead to lower operating costs and a resulting amortisation of investment costs
Seek for alternative models to finance ecological infrastructure (i.e. sale of shares for PV-facilities, green electricity models)
Consider contracting models for operating the technical infrastructure (i.e. companies operating CHP or wood chip energy supply facilities)
> Offer low cost housing, workplaces and space for non-profit uses
Integrate high density areas with compact building typologies to decrease construction costs and proportionate plot costs
Offer cheap dwellings (low prices of plots, low construction costs and resulting low total costs or low sales cots) in order give all social groups the possibility of housing propriety
Make offers for attracting building co-operatives (consulting, long options for plots, etc.) since these groups achieve lower building costs than developers
Minimise construction costs for buildings (selection of appropriate materials and HVAC systems, prefabricated, tender procedures or construction teams procedures according to the Dutch model)
Minimise maintenance and operating costs by selecting appropriate materials and HVAC (Heating, Ventilating, Air-Conditioning) systems and building services
Consider total cost for buildings since many ecological measures with higher investment cots lead to lower operating costs and a resulting amortisation of investment costs
Maintain existing buildings as an offer to non-profit or low-profit uses since the prices or rents of such buildings are lower as a result of avoided investment costs for new developments

This list of objectives and the related activities and measures can be used

- to set targets for the planning of projects for urban development (planning parts of a town)
- as a checklist for a first assessment of planning results (e.g. masterplans or sectoral concepts) and also as instrument for the "Quality Support Group"

It should also be used to monitor the compliance with the objectives in the implementation of the plans and concepts.

Location of new development

The various distances to be covered via the modes walking, cycling and public transport result in areas of different size being influenced – while walking and cycling should determine the structure of small settlements (quarters of a city, villages, small towns), public transport is important for the location of these small settlements within a larger city or a region.

Thus the location of new urban development is of great importance for the efficiency of a transport system on these two levels:

The selection of an appropriate site for a part of a community (quarter, neighbourhood) is essential for the efficiency of public transport.

The location of particular buildings/facilities within these units is important for the accessibility for pedestrians and for the distribution of goods.

Appropriate site in favourable location

There are two basic possibilities for a necessary extension of a community:

The alternative usually chosen is a ring-shaped urban expansion, locating new parts of a community around the edges of an existing settlement, increasing the area and thus the distances – this type of development has resulted in an increase of car use.

The sustainable alternative, which also has been rather common before, is characterised by the limitation of the size of a settlement (radius of walking distance). After the whole area has been built up, new buildings are concentrated at an appropriate site near an existing settlement. These new parts of a community should be integrated along an existing main axis of public transport or into an axis of urban development, where a new public transport track could be established (Transit Oriented Development). Such a **linear polycentric** form with limited length allows short travel times between the connected new and existing parts and can make public transport more economical.

To decide among different locations favourable for public transport the types of the developed areas are an important aspect. The following priorities should be considered:

1 Re-use, renovation, retrofitting and revitalisation of favourably located **existing structures**

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

3 Careful and sparing utilisation of favourably located **greenfield** areas for urbanisation

A sensible local combination of these urban development types will help to prevent urban sprawl.

Another aspect to be considered for the selection of sites is the prevention of disturbance by negative externalities (noise, pollution). This is important in particular for the mode of transport making the site accessible.

Main supra-regional roads with heavy car traffic are not suitable for the location of sites for future urban development because of huge negative impacts, which are intolerable especially for residential areas. But as sustainable development should be based on mixed use, this implies that also other facilities should not be located close to such roads. As the public transport infrastructure should be centrally located in a site such roads are also not suitable for a public transport route.

Potential disturbance is also a criterion in a decision among different **local** public transport modes - light rail is preferable compared to railway, which among other impacts separates the areas on both sides of the track, when it is routed through the centre of a site.

The core strategy for the location and design of new developments should include:

- to **identify locations** appropriate for an efficient and attractive service of public transport while favouring brownfield sites
- to **direct urban development** to these locations and
- to **design sustainable (compact, mixed use) urban patterns** there

Concerning the location the ECOCITY model settlements represent various solutions to the site choice problem:

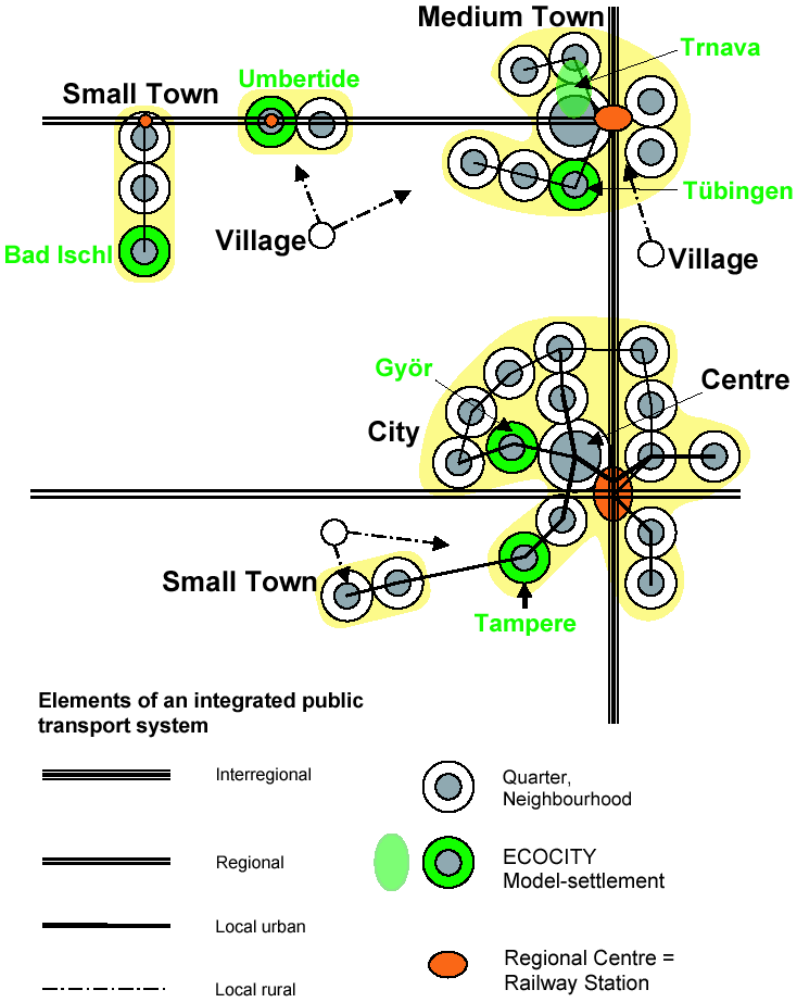
All sites are more or less feasible for a polycentric linear development, in Gyoer and Trnava next to the town centre, in Umbertide and Tuebingen in medium distance from the centre and in Tampere and Bad Ischl more to the edge.

The area in Gyoer and Barcelona is a brownfield, in Tampere and Bad Ischl a greenfield, in Trnava retrofitting an existing structure is combined with brownfield development, while in Umbertide and Tuebingen existing structures, brownfield and greenfield are included.

For Tampere, Bad Ischl, Tuebingen (using existing railwaytracks) and Gyoer new light rail or tram lines were considered, in Umbertide the local railway is improved and in Barcelona the public transport network is extended including new light rail and metro stations.

The graph below shows the integration of the sites for the ECOCITY model settlements into the existing settlement structure as examples for possible locations of new sites in a polycentric urban system in different context.

Fig.: Urban and Regional Structure for Public Transport



Location of facilities

The spatial distribution of all different facilities in the settlement area is determined by the best opportunities for supply with goods and for the accessibility by the users adjusted with the frequency of use.

Facilities with demand for transport of greater quantities of goods respectively heavy products (ecologically-compatible production enterprises) should be situated at the boundary of a settlement unit with access to a railway.

Facilities with demand for transport of goods as well as for good accessibility by the users (shops) should be situated in central sites along an axis, but also near to a main road, allowing short distances for goods distribution.

For the location of all other facilities passenger traffic is the determining factor - facilities, which only exist once in a settlement unit form the centre to guarantee best accessibility for all inhabitants.

Concepts for ECOCITY model settlements

The vision and the objectives for an ECOCITY formulated above are very ambitious. They set standards and describe a target state, for which urban development should head. The concepts for the model settlements developed within the ECOCITY project meet these standards to different degrees but each have their specific strengths and show possible steps towards an ECOCITY.

Essential qualities of the ECOCITY-project are the different sizes of involved cities and towns, situated in different climate zones and the wide spectrum of possible sustainable city-developments (renewal, brownfield and greenfield extension).

Model settlements were designed for the following communities:

Bad Ischl *(14 000 inhabitants, site planned for about 2 000 inhabitants)*

During the last decades sprawl occurred around the compact historical core. The site for the ECOCITY model settlement was selected to reinforce the development axis between the centre of Bad Ischl and the neighbouring communities Strobl and St. Wolfgang at the lake Wolfgangsee, which is promoted by the topographical situation in a valley. As an alternative to sprawl further growth is intended to be accommodated in a new compact sub-centre for the community with balanced mixed use providing attractive service facilities and business development also for adjoining low density residential areas.

Urban Structure

This sub-centre was arranged within a radius of 300 m around the stop of the public transport line, which is planned to connect the centre of Bad Ischl with the community of Strobl. Thus and by concentration of further buildings step by step around other stops of the public transport line (extending existing neighbourhoods) the potential for public transport will be improved, allowing a more attractive schedule. A balanced proportion of dwellings and work places in these sites along the line is important to promote an equal distribution of passengers in both directions.

The facilities necessary for mixed use (adapted to the size of the sub-centre and to the existing facilities, especially in the historical centre) are located in a central area to create short distances from all parts of the sub-centre and to allow combination of trips. Together with higher density through attractive multi-storeyed residential and business buildings, adjusted in height and volume to the historic centre, short distances are achieved, making the structure appropriate for pedestrians.

By orientation of most buildings to the South they are appropriate for active (collectors) and passive (solar architecture) use of solar energy.

Public space was designed as a network of places, streets and green spaces (courtyards, gardens) with a well-regulated variety of patterns and building typologies, creating an attractive, liveable surrounding by diversified facades, plants, “urban furnishing” (benches, fountains), etc. An existing large old farm-house was integrated and should be revitalised as a point of identification.

The new settlement is integrated into the existing landscape, providing convenient access to the surrounding meadows and forests. Green corridors towards the neighbouring settlements are kept free. Sensitive parts of the greenfield site, including a small creek and its typical vegetation and natural landscape elements (such as small forests) were conserved and integrated into the settlement pattern. Additional planned green elements (e.g. “Characteristic trees” along the roads and pathways) create an attractive public space.

The urban structure was designed in parts (areas) considering the borderlines of the lots to be able to implement parts of the Ecocity according to the availability of still privately owned lots. Because of the opposed requirements it needs to form a contrast to the surrounding car-orientated sprawl (although creating a transition by decreasing height of buildings towards the edge) and thus should be cognisable as sustainable urban pattern.

In walking distance from the ECOCITY subcentre there are two additional small developments:

The ECOCITY light industrial estate is a small area which will be developed monofunctionally (but in co-ordination with the ECOCITY subcentre) through the addition of new small and medium-sized industrial enterprises to the few existing ones (the new businesses should preferably have an ecologically compatible focus), thus increasing the employment options for the ECOCITY inhabitants.

The in-fill development 'Neuner area' is a small area which is to be developed to increase the density of a 'sprawl' settlement by adding a small, mainly residential area in higher density, low-rise types of building.

Transport

An integrated system of public transport including regional rail, superior local public transport (light rail or new technologies like cable liners or other people movers connecting the ECOCITY with the town centre of Bad Ischl and the Wolfgangsee Lake), regional and local buses and improved demand-responsive transport services (for additional night and weekend service) is planned. In the transport concept two possibilities for the public transport track were examined - the favoured variant through an area appropriate for undisturbed concentration of future urban development will be difficult to implement due to narrow parts of the local road through the existing low density quarters. But the parallel main supra-regional road is not suitable for a development axis, because its surrounding is heavily polluted and noisy.

An internal pathway system free of private cars (only access for delivery and other services plus emergency needs) and barriers, with weather protection in the centre (passage with shopping, service facilities and arcades), together with the short distances, create an attractive environment for walking and especially for the mobility of seniors and the handicapped. These pathways are also used for internal goods transportation by multipurpose shopping/transport trolleys.

The necessary parking places are concentrated in garages (which are also used as noise protection) on the edge of the area near an adjacent inter-regional road.

Other sectors

To minimise energy demand most buildings are designed as low energy buildings, some of them as passive houses. The higher density of multi-storeyed houses allows an efficient central heat supply, for which sufficient biomass is available in the region.

Sustainable use of water will be supported through decentralised rainwater management (including green roofs and rainwater storage tanks for non-drinking water purposes) and semi-permeable pathway surfaces and infiltration systems for the overflows.

For the economic infrastructure of the ECOCITY, sufficient floor area is provided to accommodate local supply facilities for the inhabitants, as well as a variety of offices and small companies (compatible with a residential area). To achieve a balanced social mix (in terms of education, age, income, ethnicity and sex) housing and other facilities are provided for a variety of generations and social and ethnic groups (including an innovative and accessible social infrastructure).

Barcelona *(Trinitat Nova, 1045 new housing units replacing 891 ones to be demolished)*

The Residents Association of the neighbourhood Trinitat Nova in the North eastern corner of Barcelona initiated a process of community planning to contribute to a general improvement of the urban and socio-economic structure. Technical studies on the development of Trinitat Nova towards an eco-neighbourhood as a basis to adapt the existing masterplan were elaborated. Only a part of this urban reconstruction project, the urban and environmental planning, was worked on within the ECOCITY project.

Two specific sectoral studies about "Mobility and Accessibility" and "Design of Public Spaces Network" as well as a synthesis report, summarising all the sectoral studies made by different specialised consulting companies with experience in a sustainable approach to urban planning and urban metabolism were elaborated.

Urban structure

Considering the complex topography of the site reducing barriers to accessibility in public spaces is a fundamental factor. Providing shopping facilities for daily supplies along main streets and diversification of uses throughout the new development are proposed as means to achieve a good mix of uses. New four-to-six-storey housing units, with shopping and other facilities on the ground floor, are planned, to create an optimal density akin to that which exists in the rest of the city. Higher densities and an improved mix of uses will contribute to creating a neighbourhood of short distances. The whole area is contained within a 1,000 x 500m rectangle, so the longest walking distances are around ten minutes.

According to the Mediterranean climate the project focused on developing structures to create a good quality of public spaces, designing streets, squares, courtyards and inter-block spaces as places for encounter and communication with good bio-climatic conditions, permitting the use of public spaces in all seasons; increasing city safety and security by favouring city life in public spaces. The main landscape features to be taken into account are the proximity to the mountains, abundance of urban green space and views towards the mountains and the sea.

Transport

The general objectives are sustainable mobility and accessibility for the whole area. In addition to the already existing bus routes and underground station, a recently finished light rail route connects Trinitat Nova with the neighbourhoods situated north of the district. An extension of the existing underground line is also in progress.

A new cycle route will connect the area with the existing and planned cycle network of Barcelona. The designation of the whole neighbourhood as a traffic calming area will also increase the quality of public space and thus make walking and cycling more attractive. Taking advantage of the existing steep topography, semi-underground car parks on the periphery are proposed in order to avoid car penetration into the heart of the neighbourhood and to eliminate surface-parking as much as possible.

Other sectors

This housing project will be one of the first constructed according to the new regulations on solar energy use for Barcelona. The design of the buildings has already incorporated a wide range of passive features, especially protect buildings against over-heating in the Mediterranean summer. For heat generation distribution and supply a centralised co-generation system with collective management was proposed.

Concerning water, the priorities are to increase efficiency in distribution and use, creating urban conditions for infiltration and recollection of rainwater and promoting water recycling and re-use.

The most outstanding output is the participative and collaborative approach to seeking solutions to the complex problem of renovating social housing in old neighbourhoods, undertaken within a framework of integrated planning and ongoing feedback in participation workshops. The case is being studied by several international projects as a model for a new way of integrating social, economic and environmental issues in urban contexts.

Gyoer *(130 000 inhabitants, about 6000 flats and 5000 jobs)*

The concept for the ECOCITY is a long-term development proposal for the re-use of a 100-hectare industrial area along the Moson-Danube River, which borders the historic city centre. The concept provides the possibility of extending the centre, helping it to keep functioning and at the same time preserving the central area with a number of protected historical monuments.

Urban structure

The urban structure of the area covered by the plan responds to the following aspects of the location:

- its proximity to the green belt of the Danube
- the existing internal infrastructure due to former industrial activities
- its location very close to the city centre
- the development of a shopping centre on its south-western border

The location of the site is very favourable in terms of accessibility not only to the historical centre, but to the region as well. However, a main road runs between the site and the inner city. The site extends along the River Danube where, between the river and the residential area, a park is planned for recreational purposes. Some existing industrial buildings will be converted to other functions (e.g. canteen→library, power plant→museum, air-raid bunker→energy storage or museum). Some symbolic structures such as the water tower and the school will also be preserved.

A plan was developed for a residential area mixed with offices and commercial facilities in 4-9-storey buildings, resulting in a high density. The large area of the quarter is structured in neighbourhoods, which are organised around a central courtyard or square in a unique way. Here, people will be attracted by service functions such as a nursery school, a mobility centre, a primary school, a bicycle shop, a neighbourhood medical centre or a social meeting space.

The neighbourhoods are connected to the surrounding landscape and the river, but also with each other by a system of ‘green fingers’ running in south-north-direction and giving the area its character as a location for ecological housing. Pedestrians and cyclists can walk and cycle along these green corridors and can reach the roads on the banks of the river easily. This basic urban structure provides cooling in summer, as the main winds pass through the area along the ‘green fingers’ and they are also used for the rainwater drainage system.

Transport

Footpaths and cycle paths provide the main transport network at the quarter level, providing the shortest routes to the main destinations, running both between and through the building blocks. The resulting openings provide good bio-climatic conditions at the same time. The main axes planned for cyclists are integrated into the cycle network of the city. The profile of the streets will be (re)designed in such a way that cyclists are prioritised and car speeds are reduced. Along the Danube, a cycle path will provide connections to the green spaces, the sports grounds and the city centre.

The population density is high enough for efficient and cost-effective public transport provision. New bus routes will form an integral part of the municipal public transport network connecting the site with the city centre, the railway station as well as other residential and industrial districts. A new tram-line, discussed for the municipality, would cross the site and make the connections more attractive.

The main avenue is designed for low driving speeds (about 40 km/h) by narrow lanes and a special junction design without traffic lights, other streets are designed for a maximum speed of 20 km/h. Multi-storey car parks for each block have been planned, street parking will not be allowed except for visitors and short-term parking for services.

Other sectors

The design of the road and pathway network allows the orientation of a majority of buildings to the South, promoting the passive utilisation of solar energy. Heat should be supplied from a biomass co-generation power plant or by using the waste heat of the liqueur factory in the area.

In the quarter several forms of housing in terms of physical and social features and types of ownership are available (e.g. for owner occupiers and tenants, single people and families, young first-time buyers). Sheltered living for the disabled and other social provisions might be grouped around the central square. Private investors are already interested in developing parts of the area.

Tampere *(198 000 inhabitants), new part Vuores (16 000 inhabitants)*

Tampere city has lately examined various alternatives to accommodate its growth. The Vuores greenfield area in the southern part of the city was considered the best alternative instead of quite uncontrolled sprawl all around the city. Long and narrow lakes separate the area from the city centre as well as from the neighbouring Hervanta district centre. The development of the master plan had already begun before the ECOCITY project was started. Because of this, the project has not had much influence on this part of the plan. Nevertheless, in considering transport alternatives, the integration into the surrounding city structure and the energy supply, ECOCITY principles are taken into account. The main influence of the project, however, will occur in the city planning phase.

Urban structure

The built structure is concentrated around one main centre and four subcentres, located along an axis. Most of the dwellings are situated within short walking distances from the centres, which contain a public square, everyday basic services and a large number of workplaces. In addition, the main centre includes less frequently used community services. Thus, there will be a rich mix of uses in these centres and good provision of public and commercial services, within reach of an efficient public transport service. The public squares in the centres are expected to foster a vibrant community life. A two-phase architectural competition for the main centre of the area was organised with a view to finding a unique solution for the centre of Vuores. ECOCITY principles were included in the competition guidelines. However, many questions about its development were still left unanswered even by the best entries.

One essential objective for planning in this area was the sensitive incorporation of the fragile natural environment. Thus, a careful analysis of the natural value of the area was made before starting the planning. The basic elements considered were the varied topography and shape of the terrain, the valuable natural features of the area, its biodiversity, its microclimatic conditions and its existing water system. Consequently, the natural environment is omnipresent in the area. All the dwellings are within a short distances of the green areas. The natural environment penetrates the built structure with “green fingers” and via a green belt which transects the area. An important issue was also the protection of the area’s natural water system. The built structures are concentrated along the main collector street, leaving the link to the surrounding natural environment basically free and not blocked by traffic. The building density is low, especially on the fringes of the area. As regards the microclimatic conditions of the area, cold air pools and shady areas have been avoided in situating the building blocks. The open urban areas will be protected against cold winds.

Transport

Public transport has a central role in the transport system. It will be based on an effective light rail system running through the whole area along its spinal road and serving all its functional centres. It will connect the area directly to the centre of Tampere via a bridge to be built over Lake Särkijärvi (there were plans to dedicate the bridge only for walking, cycling and public transport). Thus, public transport will have the shortest route to the city centre. Before the realisation of the light rail, however, the public transport of the area will be based on buses using the same routes.

A high-quality and comprehensive footpath and cycle network links the residential and mixed-use blocks with short distances to the centres of the neighbourhoods and the public transport stops as well as to the surrounding green spaces.

Through traffic by cars is allowed on the collector road, but the attractiveness for through traffic will be reduce by traffic calming and speed limits. Residential parking will be concentrated in facilities some way away from the dwellings, especially in the areas of blocks of flats to promote the use of public transport.

Other sectors

A regional district heating network fed by a combined heat and power (CHP) plant is used for heating the more densely built areas. It is planned to be supplemented by ground-source

heating systems and active and passive solar systems. Low-energy buildings with improved insulation levels, low-energy windows, ventilation heat recovery and temperature control are realised as a cost-effective way of saving energy.

Stormwater will be managed at the site to maintain the present hydrology of the area - it is controlled and treated by detention, infiltration and wetland systems.

It is intended to create jobs in a variety of sectors to contribute, that many of those living in Vuores will also work there. Most of the workplaces will be located in the service facilities and residential buildings in the five centres to promote mixed use.

Trnava *(70 000 inhabitants)*

An existing part of the town, in the North of the historical core and a neighbouring industrial site (including a disused sugar factory) were selected as site for an improvement of urban structure and the transport system as well as redesigning of a brownfield. The concept of Ecocity Trnava is primarily determined by the authentic historic structure of the site – thus the strategy focused on further improvement of the conditions for pedestrians and cyclists as well as traffic calming measures to avoid disturbances of the historic structure.

Four scenarios for the further development of the selected areas were elaborated and discussed with citizens, local associations and independent experts as well as the representatives of the town council and the mayor. Finally the scenario was selected, that restores and strengthens the city image through an appropriate degree of intensification of land use in some areas and an emphasis on the ecological principles of urban development in the parts for new development. This scenario was elaborated in the more detailed Local Ecocity Master-plan of Trnava.

Urban structure

For the historic city core a strategy of ‘green’ revitalisation was developed to bring ecological values into the historic city fabric. This means more trees and green in the streets and courtyards, new parks, revitalisation of a creek, increased area of unsealed surfaces, more environmentally friendly buildings (also reconstructed ones) and last but not least calmed traffic with car reduction – to give the streets back to the people, while preserving the historic structure.

The scale of the planned development on the site of the old sugar factory has the character of an addendum to the historical structure, providing the components of urban fabric which are missing there. The axes of the streets in the historical part are continued within the new part. Optimisation of functions and the provisions of functions with city-wide relevance in the new development (‘the city of short distances’) were a main design principle. The area loses its industrial character and its function is changed: an exhibition area, a technological park, a university campus, service facilities and housing are planned there. The new development around Rybníková street will have a distinctly mixed-used character.

The concept for reintroducing and managing water in public spaces and green areas includes the transformation of sedimentation basins of the old sugar factory into ponds to retain the rainwater and to revitalise the former hydrological network – most importantly the creek flowing from these ponds to the city centre. Combining greenery and linear water features creates bio-corridors connecting the city with its surroundings while the stream re-appearing in the medieval streets restores their historical image and improves their micro-climate.

Transport

The most important element was the redesigning of a main street (Rybníková) street, which today is both a psychological and physical barrier with heavy transit transport, separating the historic city core and the new development areas of educational institutions, sports facilities and the sugar factory area to be redeveloped as a part of the ECOCITY project. Its proposed transformation into an urban street or boulevard, with smooth but slow car traffic (typically

without lorries and transit traffic) creates conditions (and space) for street life, pedestrians and cyclists and helps to connect the parts on both sides. The new architecture bridges the gap between current under-used areas and the historic city centre. Mixed use – services, shopping and culture – at ground level in buildings is provided near dwellings and workplaces to attract people.

Special attention has been paid to traffic organisation by designing different areas: car-free or car-reduced zones and traffic-calmed streets. Speed reduction and traffic calming is guaranteed through the design of the road layout, narrow lanes for cars, coloured and reflective separation lines, rumble strips on the road, rough paving, humps, longitudinal parking, etc..

Tuebingen *(85 000 inhabitants, site planned for about 3300 inhabitants and 750 jobs)*

The premise of the project in Tübingen was to prevent urban sprawl by concentrating settlement areas at stops of a planned new light rail service. The Ecocity site encloses three different areas: a brownfield area, a densification area and a greenfield area. The target was to develop a strategy for resolving the conflict between the minimisation of land consumption and the protection of surrounding environments versus the need for new settlement areas.

A comprehensive citizen participation process was started with a community planning conference before the start of the design process and resulted in vision plans and consensus points. This was the basis for the development of 2 scenarios with highly different approaches:

1. Internal development east of the railway tracks on brownfield sites only
2. Concentration along existing railway tracks including a new car-free area with a dense and compact development west of a new stop that is served by a new light rail line

The 2 scenarios - in relation to the existing municipal development plan, which includes a large-scale city extension on the greenfield site - were discussed in a second workshop with citizens and interest groups. This event resulted in a high rate of agreement between the general aims of the ECOCITY project and the wishes of the local citizens. It led to the final masterplan which is conceived as an integrated overall concept with 4 implementation steps. A special focus was working out a balanced concept that is dealing with the conflict of the objectives ‘mixed–use’ and ‘carfree transport’ with the help of a city logistic concept.

The interconnection of different urban development activities in an integrated planning process leads to new possibilities of sustainable development and synergetic effects through the integration of land use, urban structure, transport, energy, landscape, urban climate, hydrology and socio-economic concepts.

Urban structure

The densification area of Mühlbachäcker in the north is linked to the central part of the greenfield and car-free Saiben area at the planned light rail stop by a dense and mixed-use building structure bridging the railway tracks. The courtyards to the south along an inner green zone connect the new quarter with the old village. A landscape-oriented housing scheme completes the quarter at the western edge. In the southern part of the greenfield area Saiben a small development is linked to the old village centre of Derendingen. The brownfield development on a former industrial site next to a railway and light rail station is planned as a compact, high-density, mixed-use and commercial structure, with some existing buildings being maintained and the uncovering of a creek.

This creek represents an important landscape structure – a green spine connecting all the ECOCITY areas – and it will be diverted through the new Saiben quarter. The new western city edge, which contains traditional landscape elements such as orchard meadows and ecological infrastructure for water purification and infiltration, has been defined a city growth boundary, to prevent further expansion in the future. A city farm on the northern edge of the Saiben development should produce organic food in the adjacent green zone, which forms part of the star-shaped open-space structure of the entire city of Tübingen. The design of the

public space has been developed especially for the demands of pedestrians and cyclists and is supported by water design. An attractive underpass crossing the railway, covered by a solar roof for weather protection, is located on an axis leading to the city centre and the Südstadt.

Urban climate issues have been considered and measures include keeping free the cold air exchange corridor north of Saiben Central and maintaining the green zone in the Mühlbachäcker area, which connects the western cold air source areas via the ECOCITY site with the city centre. These measures have been validated by an urban climate consultancy.

Transport

To minimise the use of motorised transport, the ECOCITY concept focused on walking and cycling facilities and the appropriate urban pattern characterised by a qualified density and a sound mix of land use (housing, retail and services) as well as on public transport. The backbone of the transport concept is the development of a light rail line on the existing railway track, which is currently being planned as part of a region-wide network. The location of the three areas of the site along this track makes the urban pattern appropriate for public transport. However, to ensure successful implementation, the concept also makes provision for the public transport system being based around bus services.

Depending on the characteristics of the different planning areas and their location within the existing urban structure, the transport concepts applied range from traffic calming to car-reduction and car-free solutions. The disadvantage of the difficult access to the Saiben area via the railway tracks, for example, is turned into an advantage by planning for a car-free area and thus avoiding expensive infrastructure for access and circulation of ordinary motorised traffic. The main elements of the car-free neighbourhood are the minimisation of car-ownership by residents, a reduced supply of parking places and their location at a distance from the residential units which is similar to the distance from public transport stops. This infrastructure is supported by a range of different mobility services (delivery services, car club, good public transport information, reduced-cost season tickets, etc.). Urban quarters with reduced car traffic or none at all offer an adequate alternative to suburbanisation in the form of cost-effective housing in liveable environments.

Other sectors

The urban structure was optimised for solar architecture with south-facing, compact buildings in a high building standard, including a passive-house development. The proposed building typologies show a high potential for the use of active solar energy, such as photovoltaic panels and thermal solar systems. The remaining energy demand will be covered to a great extent by a district heating network based on wood chips respectively wood pellets and bio-oil generated directly in the Saiben landscape area.

The premise of the water concept is to limit rainwater run-off to a level similar to that of an unsealed area, working towards a groundwater neutral city quarter by the infiltration of rainwater and purified grey water. These areas can also be used as attractive open spaces by the residents.

For each part of the area a mixed-use concept (including several residential housing typologies, facilities for elderly people and special options for commercial uses) as well as a special socio-economic profile have been developed. A good accessibility of social infrastructure is ensured partly through proposed new facilities and partly by linking the new development with existing infrastructure in order to maximise the use of existing facilities.

Umbertide *(15000 inhabitants, Urban Renewal Project, 1350 inhabitants)*

The town of Umbertide is situated in the valley of the River Tevere in the middle of the part called "Alta Valle del Tevere", north of the city of Perugia in the province of Umbria. The redesign of a brownfield area focuses on the potential of the local railway and on the development of an urban district around the station linked with the growth process of the historical city, in order to create a central node for the modern city and its mobility needs.

Urban structure

The renewal of the only suitable area left, integrates several elements, different in form and function. Buildings abandoned by industry and the railway (brownfield area), artisan, tertiary and residential structures will be integrated in a single urban organism. This area provides the opportunity to develop a mixed use urban neighbourhood. The urban structure was designed for the requirements of pedestrians and cyclists, in accordance with local bioclimatic urban comfort issues and the local historical typological urban growth process. The existing urban texture and building typologies are inspiring new urban planning which is climatically responsive.

The **climatic aspect** is more important for the urban design in mediterranean towns than in colder climates. Thus the direction of the main axes is determined by wind corridors (in accordance with the existing city's structural orientation): "bioclimatic spines" tunnel the wind from the river park in the south through the project area to the main area of the municipality.

The size and the form of the urban and building structures of the new district, the appropriate distance between buildings as well as the equilibrium between Mediterranean ventilated and protected landscape areas were optimised by air current and micro-climate simulations (using a Fluido-dynamic Simulation Model, FLUENT). On this basis the hierarchical open spaces are designed to achieve good microclimatic conditions: from the large protected park area of the "urban green salotto" (located central between the existing 'workers' village' and the new urban development, connecting both) to the ventilated urban square, the landscape sports area, private courtyard and vegetable garden systems, water and green, pedestrian alleys etc.). At the building level the main aim was to define proper tools for the bioclimatic indoor/outdoor comfort (passive air circulation system to provide either cooling or heating according to seasons).

But the design of the urban texture also respects the characteristics of the existing city with regard to density levels, building heights and typologies. The urban texture comprises a system of buildings of different types arranged around common courtyards ('corte'), which is derived from the ancient Roman 'domus' (typical Roman townhouse). The building types are: apartment buildings, detached houses or terraced houses.

Business and public services will be mixed with residential functions. The first two are situated primarily on the ground floors of the buildings. They are centred around the principal points of the main bioclimatic axis, along the urban green "salotto", the "atrium" buildings or in the multifunctional open and covered areas of the renovated former tobacco factory.

The landscape and the hydrological network, including the historic and more recent rural elements, with water storage and irrigation in a closed cycle, natural green structures, canals and small lakes, is integrated into the urban project.

Transport

Appropriate density and mixed use create short distances for pedestrians and cyclists. The climatic aspect is considered by planning their main pathways in the direction of the wind corridors (integrated in the "bioclimatic spines"). Unlike conventional urban planning, structured along roads for cars, the ECOCITY area is organised according to the wind corridors. It is intended to reduce car traffic in steps - the long-term objective is an almost car-free area.

In co-operation with the operating company FCU the reconversion of the existing inefficient local railway into an "efficient sustainable electric light train for persons and goods", interconnected with the national rail network, is planned. A new multifunctional "bridge"-station with shops, an information centre etc. was designed as a core of the new urban development to overcome distances and barriers which separate the (today marginal) project area from the other parts of the town, linking the project area and the Natural River Park to the medieval city and the contemporary city by footpaths and cycle paths crossing the railway over the bridge. A new city-bus-line will also connect these parts.

Other sectors

The strategy for efficient energy use is based on renewable energies produced and used on site. It includes passive solar buildings using a convective loop system for heating and cooling as well as a district heating network using the existing local agricultural biomass converted into wood pellets by local enterprises to cover the remaining energy demand. The energy saving achieved is 75% and the CO_2 emission reduction is 73% compared to existing Italian building standards.

Many actors are involved in the participation and later implementation process (e.g. the municipality, the FCU railway company , local enterprises interested in bio fuel, biomass, hydrogen and other sustainable energies).

Implementation and Maintenance

This phase of the creation of an ECOCITY was discussed in the frame of the project, but only parts thereof could provide the empirical basis as the actual construction and maintenance were not an element of the study. The most important problems to be solved were identified in the discussions.

A challenge for sustainable urban and regional development (Ecocity) is, that it implies rather large scale projects. The necessary mixed use and the establishment of an attractive public transport link require an adequate potential of customers respectively passengers, which hinges on the “right” number of inhabitants. The necessary concentration of residents (and hence buildings) at suitable sites requires large plots of land in appropriate locations. Implementing the plans, hence often runs into the problem of having to deal with a considerable number of land owners. Additionally the dependence on special sites available at a given point in time often causes significant increases in land-prices.

The necessary volume of an Ecocity-project often causes resistance by nearby residents or citizens’ groups. But in spite of being a major project in the total quantity, an Ecocity is intended to be implemented as a well organised cluster of small projects, often sequentially in phases. The individual implementation activities hinge upon the co-operation of a group of investors down to house- or flat-owners. To provide the essential elements of an Ecocity (facilities for mixed use, development of public transport), at least at a minimum level from the start, the first realised part must be of sufficient size.

*An **Implementation Strategy** hence needs to consider the following elements:*

A necessary condition for the start of the implementation is the availability of land, which should be ensured as early as possible (best would be at the start of the planning activities).

There are some options for the acquisition of the land (lots): e.g. building leases, or purchases.

In the cost calculation of the building project the various aims should be balanced:

- to achieve fair prices for the future owners/renters of dwellings
- to achieve fair prices of the properties for the current owners
- and if possible, to raise money as contribution for financing the infrastructure (a part of the increase of the average property value due to the change of land use).

This would need rethinking of the procedure, because at present mostly the current owners benefit from high prices for favourably located lots.

For sites consisting of lots with different owners it is important to design the urban structure in parts (areas) considering the borderlines of the lots, to be able to implement parts of the project according to their availability.

A framework of incentives and legal/administrative instruments is needed to encourage, support and promote sustainable urban development and design, while discouraging the development of (not really urban) sprawl.

An example for a useful legal instrument to promote the implementation of new urban developments in parts of a town is the "Urban Development Measure" (Städtebauliche Entwicklungsmassnahme) in Germany, which helps regulate the prices for buying and selling plots of land.

Continuing the involvement of citizens and other stakeholders as well as integrating the investors and developers in the decision-making process in the implementation phase should help to avoid conflicts.

To minimise travel distances of the employees in the construction work, the use of local labour should be preferred.

Organisational structures

Experience from larger urban projects shows, that institutions like an urban development corporation are useful to co-ordinate the implementation of this kind of projects. This task involves dealing with building contracts, organisation of architectural competitions (competing or co-operating) and other tender procedures (to find appropriate planners and ambitious investors), real estate management, etc. Such institutions could fulfil many tasks like selecting developers (community, public or private developers, building associations or a combination thereof) who can guarantee high sustainable quality, developing marketing strategies to attract people to move to the new development and to appeal to businesses and enterprises in order to create jobs.

Financing

Incentives like the support by EU-Programmes, national governments, municipalities or private foundations are important to ensure financing, especially for model projects. The co-operation of public and private sector in public private partnerships may enable the implementation of such projects (or parts thereof), which are too risky for the private and too expensive for the public sector.

Quality assurance

To support a consistent implementation of sustainable urban development projects, a quality enhancement and control programme should be developed and approved by the local administration, involved planners, stakeholders and the city council. This should include guidelines for all sectors of urban development, focusing on indispensable issues like qualified density or a fine-meshed mixed use and also dealing with the selection of materials for the construction, considering utilisation and especially an easy recyclability after deconstruction. Contractors of all disciplines involved in the implementation should be informed about this quality programme in workshops and a monitoring institution (local administration, and planers of all disciplines) should assist them in assuring quality by consulting, correcting and potentially rejecting projects of investors and architects.

Instruments, such as legally binding development- and masterplans, the definition of redevelopment areas or additional agreements by contracts under private law (if the land is property of the community) should contribute to a consistent implementation.

After finishing the construction works the goals and functionality of all measures need to be communicated to the users (new residents). For this task it is recommended to establish an information office to provide "instructions" for the residents how to obtain the maximum benefit of living in a sustainable settlement (e.g. in folders) and for the information of the public about the project.

Maintenance

Organisational instruments for a sustainable use of the built structures, based on various applications of information technologies include:

- the management of transport (e.g. co-ordinating demand responsive transport services) and the information of passengers in public transport as well as
- facility management for buildings (to reduce the energy consumption and the maintenance needs during the life-span of the buildings), but also for neighbourhoods (including internal logistics, waste collection, social services, care-taking, etc.).

To promote the participation of all stakeholders in the management of the neighbourhood, local councils, working groups, associations, clubs etc. should be initiated, offering meeting places and media support. Associations of residents could be involved in the arrangement e.g. of public spaces and to support the maintenance of public (parks) and semi-public (court yards of building blocks) or common facilities (e.g. for leisure activities).

Evaluation

To evaluate a project already in the planning phase is a challenge, but it is important to ensure the ecological quality of the solutions before their implementation, because urban structures should be built for a long lifespan and it is difficult to correct errors ex post.

Different instruments were developed for this purpose:

Checklists are appropriate for self-assessment during the entire planning phase. A list of Ecocity-objectives and their specifications for the sectors of urban development (urban structure, transport, energy and material flows, and socio-economy) is used to check, if these objectives are reached in the plans and the concepts developed.

An additional **questionnaire for internal self assessment** was developed to monitor the progress of the project as well as to inquire, how the plans and concepts meet the main requirements for an Ecocity, focussing on the physical urban pattern. Involving the planning team in discussing the answers helps to reconsider the appropriateness of the designed patterns. (This questionnaire could be also be useful for a quick assessment of the ecological quality of other urban development projects).

Criteria and indicators are intended for a more precise examination of the plans and concepts after their completion. Criteria and indicators, selected in relation to the Ecocity-objectives, were combined in an "**Ecocity Evaluation Scheme**" (see chapter Methodology). The evaluation of the plans and concepts for the Ecocity model settlements showed, that the criteria were adequate to check the quality of the urban patterns designed (e.g. quantitative indicators for a qualified high density, the share of green areas or of pathways for different modes of transport). But those results concerning issues influenced by the behaviour of future inhabitants cannot be established satisfactorily, as the value of the indicators for the most important criteria to evaluate the impact of an Ecocity on the natural and social environment (e.g. the modal split of transport and the resulting CO_2 emissions as well as the socio-economic aspects) can only be estimated very roughly a priori. Thus a combination of the checklists and selected indicators may be a first step towards a practical tool for an audit of the urban projects in question. The "Ecocity Evaluation Scheme" could be also developed further towards a tool for the assessment of the sustainability of existing towns and cities.

Main deliverables

Most of the deliverables in the project were envisaged only as input for the next work step. Three of them at the end of the project are publishable: This Final Report, a handbook and a visualisation of the settlement structure presented on the website.

The ECOCITY handbook consists of two parts:

ECOCITY Book I ‘A better place to live’, includes general information on the ECOCITY approach. The vision of an ECOCITY is developed and translated into operational objectives for the planning of model settlements. The seven settlements planned as part of the ECOCITY project are introduced and the main conclusions drawn from the experiences made during the project are presented.

ECOCITY Book II, ‘How to make it happen’, includes general guidelines for the development of an ECOCITY, explaining the objectives in Book I in more detail. It also provides techniques and tools for the planning process. Book II is mostly aimed at planners and other decision-makers who are involved in the development of urban settlements.

Presentation on the website

To visualise the concepts for the model settlements in the 7 communities, presentations were compiled including the main plans and key elements (partly three-dimensional views elaborated on the basis of the plans) with short explanatory texts.

These presentations are to be seen in the 'Public Reading'-section of the project website: http://www.ecocityprojects.net.

Parts of the other deliverables are published as additional information on the project website:

State of the art (Deliverable 1)
Some promising solutions selected from Good Practice: Examples on sustainable development of settlements, solutions for the transport system

Evaluation (Deliverable 12)
The ECOCITY - Evaluation Scheme, criteria and indicators

6.4. Conclusions including socio-economic relevance, strategic aspects and policy implications

Conclusions:

In contrast to sprawl, urban and regional development must involve some central planning to be sustainable. Particularly important planning elements are the selection of the appropriate site for new development and the appropriate facilities for a balanced mixed use.

As argued above (see: Implementation and Maintenance) the dependence on a special site in sufficient size (for the requirements of mixed use and public transport) is a difficulty for such projects - large plots in appropriate locations are not easily available. Instruments of land-use planning to regulate the market would be helpful (public funds for the acquisition of plots in advance, regulations limiting the price of land used for sustainable urban development projects) to find an appropriate site for an acceptable price.

Even for the model settlements it is difficult to meet the ambitious standards set in the vision and the objectives for an ECOCITY. Compromises are necessary for instance in the provision of transport systems: Car-free housing is desirable from the ecological point of view, but often local conditions are thought to be not appropriate to reach this goal. Thus the achievable solution may be to plan a reduced provision of parking spaces and to concentrate these at the edge of a settlement to allow a high quality of car-free public spaces within the settlement.

To evaluate a project already in the planning phase is a challenge, because of the lack of important data. The evaluation of the plans and concepts for the Ecocity model settlements showed, that the criteria were appropriate to check the quality of the urban patterns designed (e.g. density, share of green areas). But problems occurred in evaluating the impact of these patterns on the natural and social environment (e.g. resulting CO_2 emissions). Thus a combination of checklists (e.g. the Ecocity-objectives) and selected indicators seems to be an appropriate tool for the planning phase.

By developing urban structures appropriate for sustainable transport for the large variety of the above cases, the project ECOCITY attempted to pave the road towards a broad acceptance of these solutions.

The results of the project can be summarised in the formulation of quality-standards for urban settlement patterns:

- For the environmental quality - minimising the impacts on nature, as a necessary condition for an ECOCITY
- For quality of life - maximising human wellbeing as an additional condition for ECOCITIES as a better place to live.

Socio-economic relevance and policy implications:

The implementation of model settlement plans is intended to demonstrate, that taking ecological constraints into consideration can actually improve the quality of life and health of the inhabitants of an area. It contributes also to the saving of costs by lower investment needs for supply networks, less need of motorised transport and reduced energy consumption.

The model settlements also meet the policy objectives for Sustainable Urban Development in the European Union [5] aiming at the protection and improvement of the urban environment so as to improve the quality of life, safeguard human health and protect local and global eco-systems.

6.5. Dissemination and exploitation of results

The main instruments for dissemination are the publishable deliverables (see 6.3. "Main deliverables").

Publications:

The two parts of the ECOCITY handbook: (Book I 'A better place to live' and Book II 'How to make it happen') will be provided for the European Commission and distributed by the partners in all involved countries.

Website

Additional information on the ECOCITY project is available in the 'Public Reading'-section of the project website: http://www.ecocityprojects.net.

Additional instruments of dissemination are:
Co-operation with international networks (e.g. "Regional Environmental Center for Central and Eastern Europe" (REC)), disseminating information on the ECOCITY project via publications and websites.
Ecocity related events (e.g. the international meeting in Tübingen, April 2005) and conference contributions (e.g. for CABERNET 2005: The International Conference On Managing Urban Land, April 2005, Belfast).

Exploitation

Implementation of the concepts for the model settlements in the involved municipalities

Other planned activities are: further research co-operation of partners from the consortium, Ecocity projects in new municipalities

6.6. Main literature produced

The main literature are the publications for the dissemination (see 6.3. "Main deliverables").

The two parts of the ECOCITY handbook:

Book I 'A better place to live'

Book II 'How to make it happen'

[5] E.g. Sustainable Urban Development in the European Union: A Framework for Action; Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions, Brussels 1998