

Report of COST Action C11 - Greenstructure and Urban Planning

What is COST

Founded in 1971, COST is an intergovernmental framework for European Co-operation in the field of Scientific and Technical Research, allowing the co-ordination of nationally funded research on a European level. COST Actions cover basic and pre-competitive research as well as activities of public utility.

The goal of COST is to ensure that Europe holds a strong position in the field of scientific and technical research for peaceful purposes, by increasing European co-operation and interaction in this field.

COST has clearly shown its strength in non-competitive research, in pre-normative cooperation and in solving environmental and cross-border problems and problems of public utility. It has been successfully used to maximise European synergy and added value in research co-operation and it is a useful tool to further European integration, in particular concerning Central and Eastern European countries.

Ease of access for institutions from non-member countries also makes COST a very interesting and successful tool for tackling topics of a truly global nature.

To emphasise that the initiative came from the scientists and technical experts themselves and from those with a direct interest in furthering international collaboration, the founding fathers of COST opted for a flexible and pragmatic approach. COST activities have in the past paved the way for Community activities and its flexibility allows COST Actions to be used as a testing and exploratory field for emerging topics.

The member countries participate on an “à la carte” principle and activities are launched on a “bottom-up” approach. One of its main features is its built-in flexibility. This concept clearly meets a growing demand and in addition, it complements the Community programmes.

COST has a geographical scope beyond the EU and most of the Central and Eastern European countries are members. COST also welcomes the participation of interested institutions from non-COST member states without any geographical restriction.

COST has developed into one of the largest frameworks for research co-operation in Europe and is a valuable mechanism co-ordinating national research activities in Europe. Today it has almost 200 Actions and involves nearly 30,000 scientists from 35 member countries* and almost 50 participating institutions from 11 non-member countries and Non Governmental Organisations.

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COST Action C11

Green Structure and Urban Planning

Final report

2005

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COST C11

GREEN STRUCTURE AND URBAN PLANNING

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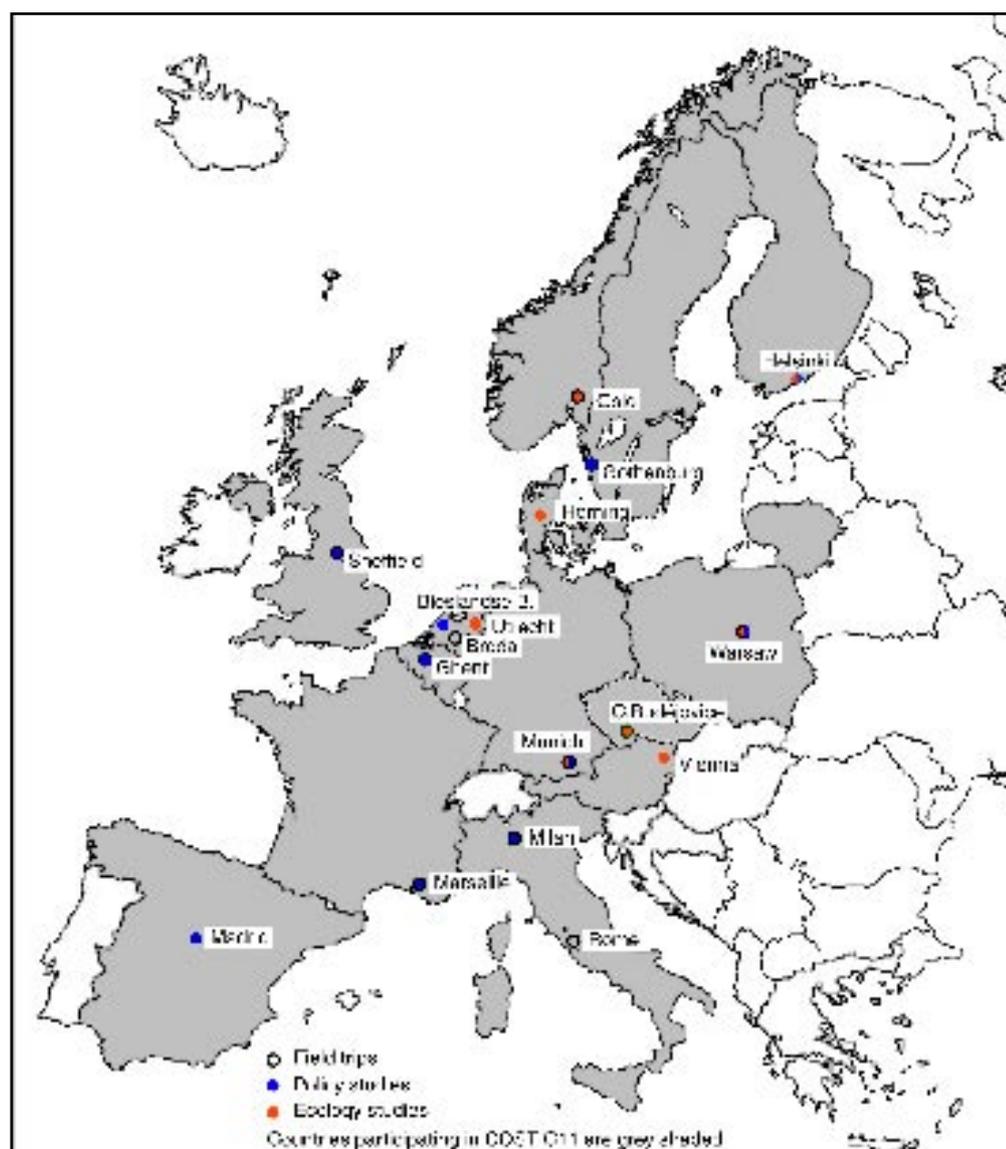


Farmland structuring the urban plan in Breda (The Netherlands), the green structure strategy for Aarhus (Denmark), urban park (Issy-les-Moulineaux, France), small urban green space (Amsterdam), project area for the Akerselva basin, Oslo, the 'Via Appia Antica', historical and ecological corridor, Rome (Italy).

CHAPTER 1

Introduction

General outcomes of Cost C11



Introduction

Bernard Duhem, Chairman

The “ Green structure and urban planning “ Cost action was approved by the European Commission in February 2000 and a practical start was made on the work that September. Fifteen countries were involved in the four-year programme : Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Italy, Lithuania, the Netherlands, Norway, Poland, Spain, Sweden and the United Kingdom. In all, some 40 experts (from universities, government departments, municipalities and consultant bodies) participated in the work.

During the 1990's, the necessity to exchange knowledge and experience about 'green structure' and urban planning had become increasingly apparent to members of an informal network concerned with sustainable urban development, within the framework of UN/ECE research activities sparked by the Rio conference. In this general context, contradictions between the benefits of urban densification and the necessity for 'green' environments were much debated. In applying for this Cost Action, it was decided to focus upon the role played by planning, design and management in dealing with interactions between 'green' and built-up areas. The principal starting questions were : do we have enough information about such interactions, or about the need for, and uses of, such green areas ? How is such knowledge used in the planning, design and management process ?

'Green structure' is not a familiar term in all countries ; indeed, it is even difficult to translate properly into some languages. The underlying idea is : we need to consider the green aspects of planning as a physical structure forming an integral part of the city (e.g. green belts or green corridors), as a network of 'green' elements, as a physical infrastructure playing a role in water management, in the urban micro-climate and in biodiversity, and also as a social infrastructure for leisure, relaxation, human interaction and other social activities. Therefore, green structure is not equivalent to green areas.

The knowledge gathered from September 2000 to December 2004 through this Cost Action was obtained by two main working methods :

- Field visits and local seminars, organised during the nine meetings held in Sheffield (UK), Marseilles (France), Breda (the Netherlands), Munich (Germany), Milan (Italy), Warsaw (Poland), Rome (Italy), Oslo (Norway) and Ceske Budejovice (Czech Republik) ;
- Research and case studies gathered or conducted through three working groups on ecological issues, human issues and policies.

Additional knowledge was provided by a research project (Greenscom) funded through the European Fifth Framework Programme (Action : “The city of tomorrow”), dealing with communication strategies related to ‘green structure’ in urban development. Members of Cost C 11 from five countries : Denmark, France, Finland, the Netherlands and Sweden, were involved with that project.

Perhaps the most surprising thing to emerge from these four years of networking is the overlap between similarities and differences : similarities of questions posed about urban form (sprawl, mobility, etc) ; differences in culture and geographical context -not only between countries but also within each country- hence differences, too, in experiences of urban planning. That is what makes European networking so useful : being confronted by the best practises and understanding the conditions and limitations of their transferability.

This final scientific report starts with an overview of the global outcomes of this Action (Chapter One). We then seek to give an idea of the specific issues and experiences we encountered in the nine cities that hosted our meetings (Chapter 2). The findings of the three working groups follow : ecological issues, human issues and policies. Although some of these papers have been shortened for the purposes of the present publication, further material is available on our website :

<http://www.map21ltd.com/COSTC11>

By this means, we hope that work and networking may continue on a topic which, we are sure, will not cease to grow in importance.

We should like to express our thanks to COST for supporting this Action, both financially and through the help of Science officers, to all the municipalities and ministries that made such interesting meetings and local seminars possible, and, last but not least, to our partners of the Czech Republic that hosted our final meeting at Ceske Budejovice.

Finally, I wish to express my thanks for the editing work of this final report to our three chairpersons, G. Lindholm, B. Oppermann and S. Pauleit, to S. Tjallingii who played a strong role at the beginning and at the end of the Action, to A. Beer and P. Draper who helped a lot for the English and with the website, and last but not least, to my colleague Ann Caroll Werquin. After helping me during four years in chairing this Action, she had the hardest work to give a printable form to this book. Thanks to the French *Ministère de l'Équipement (PUCA, Plan Urbanisme, Construction et Architecture)* for supporting her for all this work. I am sure this book will be very useful to students, researchers, practitioners and that all participants have extend a lot their knowledge in the field, for the final benefit of European cities.

Green Structure and Urban Planning, general outcomes of Cost C11

Sybrand Tjallingii

in co-operation with the editing group: Anne Beer, Bernard Duhem, Gunilla Lindholm, Bettina Oppermann, Stephan Pauleit, Ann-Caroll Werquin

The story of cities and nature is both a love-story and a battle and in both, green structure may be a useful concept. Structuring the scattered archipelago of green areas means joining forces in a battle to defend vulnerable green spaces against increased pressure from busy traffic, construction works and other dynamic urban activities. But green structure may also describe a policy to create conditions for the love-story between urban citizens and their parks and playgrounds. Both the rich and poor benefit from the presence of a green network, a green structure that links small gardens and neighbourhood greens to the green fingers and green belts of the urban landscape. Moreover, bringing landscape to the heart of the city, green structure planning strengthens the attractive green image of the city and creates a link with the identity of the historic landscape in which the city has developed. The COST action Green Structure and Urban Planning focussed on the know-how of green structure planning and maintenance and created a platform for the exchange of experiences.

1 Introduction

Reasons for COST C11

At the turn of the twenty first century, urban citizens seem to like their green areas as never before, but the growth of cities creates a growing concern about both the size and the quality of green spaces in the urban landscape. Gardens are as old as cities but, today, the gardener and the builder find themselves in the company of a host of specialists concerned with planning, design and maintenance of green areas in urban regions. The reason for bringing these specialists together in a COST C11 action was twofold.

Although some European cities are stable or even shrinking, the growth of cities is typical in many parts of the continent and urban sprawl is turning many landscapes upside down. From urban islands in a sea of green the situation changes into an urban landscape with green fragments. Although increasing wealth is one of the driving forces of the change, many citizens, both urbanites and rural people, are concerned about the loss of green landscapes and about the poor maintenance of the remaining green spaces. In the European context, these concerns have been the reasons for

setting up the COST C11 action in order to deepen and expand existing networks of researchers, planners and practitioners.

On the other hand, these specialists find it increasingly difficult to understand each other's language and co-operate. For centuries, the gardener and the builder may have had a simple self-evident common language to discuss their work. Today's discussions often demonstrate a Babylonian confusion that is only partly related to the complexity of contemporary urban and rural development. Serious language barriers also result from an increased specialisation of scientific disciplines and an increased division of responsibility and competence between administrative sectors. Therefore, the COST C11 action was also motivated by the need to develop elements of a common language to discuss the role of green spaces in urban development. As a first step, the COST C11 action was named Green structure and urban planning.

Green structure

Although the concept of green structure is deep-rooted in history, the term as such dates from the 1980s. In the beginning, as happens with relatively new terms - perhaps even more so when it is intended to create a common language - there was a lot of confusion about the many possible meanings of green structure. Gradually, however, the COST C11 participants grew towards a shared understanding of the concept that embodies both a view on the present urban landscape and an idea about the desired future.

Green structure links town and country. In a spatial perspective, green structure is more than the sum of green spaces. Speaking of green structure implies drawing attention to the spatial network that links open spaces, public and private gardens, public parks, sports fields, allotment gardens and recreation grounds within the city to the networks of woodlands and river floodplains in the surrounding countryside. Thus green structure highlights the role of greenways for walkers and cyclists and stresses the importance of ecological corridors for wildlife.

Green structure links the past to the future. From a time perspective, green structure expresses a long history and a long-term planning policy to make the spatial structure of green spaces a basis for sustainable urban development. Sometimes, as in the British Midlands and the German Ruhrgebiet, green structure is brought back to chaotically developed old industrial areas in order to restore the disrupted system of green valleys. As a result the natural and cultural heritage become visible in a new green identity of the urban landscape.

Green structure requires the co-operation of stakeholders. From a decision-making perspective, green structure refers to a green infrastructure that is planned and maintained as a carrier of multifunctional urban development and cannot be claimed by one group of green stakeholders. Green structure is colourful. Green zones along rivers, for example, may perform a multitude of roles, such as: routes for walkers and cyclists, floodplains for water management, ecological corridors for wildlife and attractive edges for residential development.

Shared understanding through field visits

Typically, cities have their own characteristic green structure but share common issues in planning, maintenance and use. The COST participants became aware of this through combined seminars and field visits to nine European cities. More than anything else, the exchange of experiences and on-site discussions with local experts and stakeholders contributed to a shared understanding of the green structure issues. The participants see this rich experience of the state-of-the-art in fifteen countries as an important outcome of the COST C11 action. A few highlights of the field visits may illustrate this point.

Once the power supply of the early industrial city, today the rivers and valleys are the green structure of Sheffield, linking the city's green spaces to the hills of the Peak District. Sheffield shares this change of a historic hydropower river landscape with Oslo. Here, the River Akerselva brings together many different groups of citizens, organisations, developers and municipal departments in a joint programme for river restoration, urban renewal and green space development. The River Vistula plays a key role in the green structure of Warsaw, where the high escarpment of the hills along the river is carrying a chain of the city's important parks, reborn after the complete destruction of the city in the Second World War. Also in Munich, the river is a carrying structure of green spaces and here, too, there is a river restoration programme. Already in the late eighteenth century the River Isar was used as the basis for a beautiful park. English landscape architects inspired Ludwig von Sckell in his design of the Englische Garten. For his part, Frederick Law Olmsted went to Munich to be inspired by the Englischer Garten for his park designs, like those in New York and Boston that may be considered as the precursors of the idea of green structure. Both industrial development and the history of ideas in landscape design have international dimensions, but the result of their interaction with local nature and local landscape contributes to local culture and identity.

The interaction between culture and nature is not only something of the past. Munich shares with the Dutch town of Breda some good examples of planning and design of new residential developments based on the local landscape. Breda pioneered sustainable urban development and adopted a 'local landscape as a carrier of urban development' approach that makes old estates, woodlands and hedges part of new residential districts. At the same time the approach leads to technical-ecological projects that use the potential of the local landscape for creating new wildlife habitats and for rain-water retention and infiltration as a part of flood prevention. The link between flood prevention and green structure planning is also found in the Czech town of Ceske Budejovice and in many other cities. Water supply is more important in cities like Marseilles. Here the canal de Marseilles, taking water from the River Durance, not only brought drinking water to the city, but also created conditions for a new green structure of farmland and a range of wealthy houses with gardens (the bastides) built in the previously dry hills, now watered by the canal.

This illustrates how private gardens may also become part of the green structure. Although most of them are still inaccessible to the public, they play a role in water

management, in moderating the urban climate and in creating conditions for biodiversity.

In many cities the local government takes initiatives to involve private investors in the management and maintenance of public green areas. The Oslo Akerselva programme, mentioned above, is one example. In Rome, the *punta verde* initiative is a promising combined ‘building and investing in green quality’ approach that involves private investors through long-term contracts with the local government. The local government itself remains responsible for the quality of the main green structure in the agglomeration. A good example is the development of the green finger along the old Via Appia antiqua, leading from the countryside in the southeast to the Forum Romanum.

Almost all cities visited by the COST C11 action are facing sprawl, a process of diffuse urbanisation, disrupting the agricultural land surrounding the cities. The process is not only caused by urban pressure but also by a weakening role of agriculture as an economic carrier of the green countryside. Most cities have limited influence on neighbouring municipalities but in many cases regional or national authorities have set up regional parks as a starting point for regional green structures. Good examples are the Ticino Regional Park near Milan and the Kampinoski National Park near Warsaw.

Perspectives, dilemmas and recommendations

The COST C11 seminars focussed on a number of questions proposed by the participants and related to their background and experience. This led to the setting up of three working groups with participants from different backgrounds, which looked at the issues from different perspectives. The results of their studies and discussions will be discussed under the headings: an ecological perspective, a ‘human values and design’ perspective and a planning process perspective. The perspectives are not mutually exclusive, they look at the same issues from different angles.

The last chapter will discuss three central dilemmas that raise a number of questions across the three perspectives.

- 1. Sprawl versus ‘compact city’.** In the 1990s, some cities and countries adopted a ‘compact city’ approach in response to the negative effects of urban sprawl. The critics fear a high-density of buildings that would consume the last green spaces within the existing city. Do the COST C11 experiences throw light on this matter?
- 2. Defence or integration.** The perceived weak position of green areas in urban development has led to defensive strategies to protect green spaces and contain urban development. Critics argue that these limited strategies alone will only lead to a delay of retreat and propose integrative approaches as an alternative. What are the experiences of the COST C11 studies?

3. Bottom-up or top-down. The regional scale of green structure and its role in creating conditions for special functions such as biodiversity and water management, may lead to a top-down technocratic planning approach along sector lines that runs counter to the wish of residents to participate in an integrated bottom-up planning process. What may be learned from the experiences of the cities involved in the COST action?

The three perspectives and the discussion about dilemmas lead to a number of recommendations for designers, planners and researchers, guiding them to the next steps in a learning process that may enhance the role of green structure in urban planning.

2 An ecological perspective

The COST C11 working group ecology and green structure planning was formed to find out more about the use of ecology in urban planning. Ecology, here, is taken to mean understanding the urban ecosystem as a basic set of conditions for both humans and other species. The working group analysed a number of case studies, asking four questions: 1. How have natural and cultural features influenced the development of green structure in the urban environment? 2. What does this green structure mean for biodiversity? 3. How does green structure serve other ecological functions? 4. What role do ecological issues play in green structure planning? The following sections discuss some general conclusions.

Origin of green structure patterns in the urban landscape

Each city has its own distinctive green structure. The origin may be described in layers. Typically the basic layer of green structure goes back to the pre-urban landscape. Some natural barriers resist urban development, such as the rivers and floodplains of Munich, Warsaw, Oslo and Ceske Budejovice. On the other hand these river valleys create excellent conditions for green spaces and in this way needs are turned into virtues. Following the rivers, green wedges reach into the heart of the city, even if flooding is no longer possible, as in Utrecht. In cities such as Oslo and Helsinki green shorelines structure the green network. A second layer of green structure has its origin in the development of an infrastructure network. Historic avenues and parkways are lined with trees and shrubs and, inadvertently, the verges of railways and motorways create ecological corridors in the urban landscape. The third layer of green structure results from deliberately creating parks and gardens, and playing fields as a part of urban occupation. Public green spaces are important but private gardens often occupy more land and play a major role in the ecology of the city. Sometimes derelict land resulting from former occupation and waiting for redevelopment is also an element of green structure. The three layers correspond with the ground layer of 'natural conditions', the infrastructure or network layer and the occupation layer of land-use functions, introduced in the European Spatial Development Perspective (European Commission, 1999).

Green structure and biodiversity

Until recently biologists did not seem to be very interested in the urban environment as a habitat for wildlife. In recent decades, however, ecological research revealed that cities could be surprisingly rich in species. In many cities, not only in intensively farmed parts of Europe but even in Helsinki, the urban area has a higher biodiversity than the surrounding countryside. A green structure approach saves, improves and creates ecological corridors that enable plants and animals to move between core habitat areas and this provides a better chance of survival for vulnerable populations. But the presence, the surface and the density of suitable habitats remain the key conditions and this implies that a diversity of green spaces is the basis for biodiversity. In some cases such as Oslo and Helsinki, restoration and protection programmes seek to create better conditions for wildlife. Other cities, for instance, Munich and Utrecht, also create new habitats such as wetlands and woodlands and new ecological corridors for species dispersal.

It is generally assumed that green structure has a positive effect on biodiversity, but much depends on the size and detailed design of wet and dry, and of the composition of trees, shrubs and grassland in habitat areas, and in ecological corridors that connect them. Our understanding of these ecological conditions is still limited. Even more terra incognita is the ecology of pests and invading new species possibly taking advantage of improved ecological corridors. One of the problems is the gap between research results and practice. The usual grid-cell inventories provide an overall impression of loss or gain, but they do not tell planners and designers how ecological conditions can be improved effectively.

In parts of the city, an ecology-based maintenance practice may considerably enhance biodiversity, especially in grasslands that may greatly benefit from less intensive mowing regimes. Many cities find that these practices are good for native flowering plants and animals, and may also be good for the budget. Nevertheless ecology-based maintenance is not widely applied. One reason is the common belief that urban green spaces should look '*smooth, straight and tidy*'. Most designers and maintenance professionals too, are still educated with this ideal image and do not develop enough ecological skills. As a result, good examples of ecology-based maintenance are rare and many people perceive wild as identical to neglect. Confronted with shrinking maintenance budgets, many municipal parks' departments seem to focus on intensive maintenance for a limited area and a cheap regime for the rest. In cities such as Utrecht the need to set priorities and make a choice of maintenance regimes has been the main reason to make green structure plans. Public protests against neglect have forced the parks' department to make another choice in some cases: an economy-of-scale principle that seeks to save money by applying the same weekly mowing regime to all grassland areas. In this way '*smooth, straight and tidy*' is also cost-efficient, but the diversity of green spaces in different parts of the green structure is reduced to a minimum. Less mowing can be a cheap ecological alternative, but only if applied in

a skilful way, paying attention to time, place and technique, and this requires ecological knowledge to be developed in the department. Cities such as Breda, which have invested earlier in this learning process, are now harvesting both quality and limited costs.

Green structure and flows: climate, water

Urban ecology involves more than nature in cities. It also addresses natural processes of climate and water. In many ways green structure influences the urban climate and thermal comfort in streets. Nowadays, planners and designers sometimes forget that there is a lot of traditional knowledge about climate and design. There are, of course, huge differences between regional climates in Europe. In summer, people in Mediterranean cities are longing for trees to provide shade, whereas urban citizens in boreal climates may prefer open green areas that allow sunshine to enter the built environment. In winter, however, snow glare may cause problems that may be prevented by tree planting between buildings. In central European cities, the *heat-island* effect is best studied. In summer, higher temperatures and dry and polluted air constrain air quality in inner city areas. In some cities, therefore, urban planning promotes green fingers that allow moist and cool airflow to enter into the central area. The city of Warsaw is a good example. The climate argument may help this green structure to survive and resist high-density plans, but in Warsaw this argument does not seem to be strong enough. In the new Munich development, Messestadt Riem, however, a large park was created as a climate corridor and plantings were designed to direct the cool and fresh air into the residential development. The detailed design of the green corridors is important. In some cases trees seem to slow down air circulation, thus enabling air pollution to accumulate. In windy climates such as the coasts of Denmark and The Netherlands, the *heat-island* effect does not play a major role. Here, green hedges are important as wind breaks in both, rural and urban landscapes.

Water does not only shape urban green structure in many ways. Green structure may also play an important role in improving water management. Urban growth goes with a dramatic increase of hard surfaces. Rainwater cannot infiltrate into the soil any longer and this causes sinking groundwater tables. Instead the rainwater runs into sewers that are unable to cope with increased peak discharges from paved surfaces. Thus the sewers have overflows that seriously pollute surface waters. Cities such as Utrecht and Munich, therefore, are disconnecting rainwater from the sewage system, using urban green spaces to infiltrate or retain rainwater. In existing built-up areas there is limited space for water storage, but the urban fringe offers more opportunities. Here, water storage can be combined with recreation areas and even with farming. Some cities, such as Breda, are exploring the options for farmers to become paid water managers for at least part of their time.

Ecological aspects of urban land-use planning

From an ecological perspective multifunctional land use in cities and in the surrounding countryside is both vital and vulnerable. It is vital because nature and natural

processes can only survive in interaction with other functions. But it is also vulnerable because ecology is often put aside or neglected in favour of hard economic or functional criteria. Working with nature requires rethinking 'normal' practice.

The potential synergy between water and green structure planning seems to offer great opportunities. At the neighbourhood level, the rainwater drainage network from roof to park is the starting point for new detailed design and maintenance solutions for buildings, streets and green spaces. At the regional and urban level, the river network is usually the carrying structure. Here the synergy with footpath and cycle track networks and green corridors is an obvious option. Increasing the rainwater storage capacity in existing or new lakes in the urban fringe is an interesting option that is being explored by Breda, Utrecht and other cities in other countries.

Forestry seems to be a natural ally for multifunctional green structure policies, providing an economic function that will keep green areas green. This does not mean, however, that commercial forestry fits the needs of the urban population. Multifunctional urban forests are very popular. They are core elements of the regional green structure in cities such as Warsaw, Vienna, Oslo and Helsinki. The Ghent case illustrates the planning of new urban forests. One of the problems in maintenance is that urban citizens often do not understand the need to cut down trees. They love the forest but not forestry. Even thinning of trees in urban parks has led to conflicts related to different attitudes towards nature.

The relationship of agriculture to urban green structure is much more an economic problem. The choice seems to be between highly productive farmland and urban development. In the case of organic farming (biological or ecological farming), however, there may be more options to combine farming with biodiversity and recreation, for example, by protecting hedges and wetlands. Those farmers, who directly sell local products to urban citizens and, at least partly, get their income from other activities for tourists and school children, may become economic and social carriers of the urban green structure. The *farming for nature programme* of pilot projects in The Netherlands seeks to further explore these options.

A related issue is the flow of organic matter: the options for urban green structure to contribute to the sustainable handling of organic waste by producing compost. A case study of the Danish town of Herning points to the considerable opportunities for the use of urban organic waste in agriculture. In Vienna this link has already been made, by using household compost on organic farms, owned by the municipality. This illustrates the potential role of organic farming in multifunctional land use and, thereby, a potential planning and management option for green structure development.

3. A human values and design perspective

The COST C11 working group on human values and design decided to look at the issues from different angles and generated a number of essays representing a variety of studies and views that are summarised briefly here.

Green structure, origin and nature of an idea

Green structure is a modern concept, with at least two important roots in the history of landscape architecture and urban planning. One is the idea of the public park that developed in the eighteenth and nineteenth centuries in Germany, England and France, when many people felt an increasing need to escape from the industrialising dirty and unhealthy cities. The parks had to be *breathing places for the metropolis*. At the same time, there was a growing awareness that the new parks had to be accessible for every citizen and this led to plans for an interconnected network of green walks and parks cutting through districts for the poor and for the rich. Haussmann and his chief engineer Alphand elaborated the idea for Paris, but it was Frederick Law Olmsted who brought the approach to maturity with his park systems and parkways for American cities. A second root is the Garden City movement that started in England and was inspired by Ebenezer Howard, who reacted to the terrible London urban slums of the nineteenth century. Green garden cities provided an alternative. If cities grew beyond a maximum size there should be satellite towns around the mother-city. Around each city there should be a green belt to contain urban growth.

Underlying the approach to parks and green spaces was an idea of nature that shifted from a romantic and aesthetic attitude to a functional view related to health and recreation. In the late twentieth century an ecological view, stressing the importance of biodiversity, became more prominent. There is no irreversible shift, however. The aesthetic view of nature survives, for example, in the design of the new Warsaw Central Library. Functional views of nature are still dominant in green space designs for most new developments. Urban green is perceived as a symbol of nature, but different people have different symbols and these differences are a major factor in all decisions about green spaces and green structure. The prevailing concept of nature is still framed in the polarity between nature and culture. Nature may help people to recover from the stress of city life. In the sustainable development debate, however, some challenge the polarity and draw attention to the synergy between nature (sustainable) and culture (development). For the city, this implies the need to strive for an ecologically balanced, urban life based on both nature and culture. Is it conceivable to see nature as a basic set of processes that is an essential part of urban culture?

A related philosophical question is the issue of control. If nature is perceived as a place to recover from the stress of urban rationality and control, then, there is a contradiction in green structure planning, if that is perceived as an instrument of control over nature. But perhaps green structure planning can also be seen as creating basic conditions for the freedom of both nature and culture.

Social and psychological aspects

Research has clarified a number of trends that have taken place in the last few decades. One of these trends is urban sprawl. Higher and medium income families tend to leave the densely built inner city areas and move to bigger houses with gardens in the urban periphery or in the countryside. In the past 25 years, for instance, 30% of the inhabitants of Marseilles have left the inner city areas for the outskirts. A majority of

the urban population has more to spend and has a car. Most people have more time for leisure too. As a result car trips to green areas have increased drastically, much more than journeys from home to work. These trends could lead to a social segregation of people with more access to green spaces from those with less. Marseilles and other cities, therefore, have revitalised public parks and recreation areas in the densely built parts of the existing city. Less wealthy people do indeed use these parks intensively, but this does not imply that public parks are primarily serving the poor. Scandinavian research has demonstrated that higher income people, even those with private gardens, seem to visit public parks more frequently compared to people with lower incomes living in apartment buildings. Some planners think that a loss of green space in one area can be compensated by other green spaces further away. This has not been confirmed by research and although we do not yet have a full understanding of these matters, the conclusion seems to be that different green areas have different qualities for different people and one area cannot simply replace another.

So the quality of green spaces is a key issue. At an academic level, environmental psychologists study the preferred qualities of green spaces. In their research they encounter qualifications such as *wild, lush, serene, specious, common, imaginative, festive and essential*. Some researchers have tried to describe the qualities in terms of design characteristics such as *legibility, coherence, complexity and mysteriousness*. These concepts, however, do not yet entirely bridge the gaps between the language of psychologists, designers and users of green spaces.

In the field of psychology and health, numerous studies have underlined the relationship between health and green areas. Decreased blood pressure, less use of painkillers and lower stress levels are reported for people who visit parks and green areas on a regular basis. The positive role of green environments and gardening has been demonstrated in the therapy of stress-related problems such as *burn out*. These studies, too, do not yet bridge the gap between research and practice. They create a basis of *knowing that* green is healthy, but there is still a gap between this general understanding of researchers and the questions of practitioners interested in knowing how green areas can make cities more healthy. In the absence of clear *'cause and effect'* relationships, however, a direct *'goals and means'* reasoning is inappropriate for most issues and practitioners can only expect a better understanding of how green areas may *create the conditions* for healthier cities.

At the detailed level of planning and design, however, there is also *learning by doing* through practical experiments. Some hospitals, for example, try to bring together garden design and therapy and some schools seek to design school gardens that provide better conditions for variety in the play and activities of children. In search of the relevant qualities of green space at the district planning level, the city of Stockholm used socio-cultural quality concepts that are the basis of so-called *sociotopes*, outdoor places with special qualities for certain groups of urban citizens. Questionnaires and interviews with residents combined with expert information led to a map of socio-

topes that can act as an interface between the public and planners.

In some specific practical areas researchers have been able to formulate general principles that make research findings accessible to planners and designers. One of these areas is the integration of a blue and green structure with non-motorised transport networks. A World Health Organisation campaign suggests a 30-minute daily walk for urban citizens to stay healthy and this has inspired urban planners to design networks of footpaths and cycle paths in order to create appropriate and attractive conditions for pedestrian and cycle routes to every day destinations in the city. As an example, the COST action C6 (Fleury, 2002) reviewed the experiences with design guidelines for safe road crossings, social control, lighting and visibility on footpaths and cycle paths that could provide an alternative to the car.

Economic aspects

Many planners and economists assume that the weak position regarding decisions taken about urban land use stems from the fact that green areas are not valued in monetary terms. Thus, different techniques have been developed to value green areas in order to put them on an equal footing with buildings in a cost-benefit analysis. One of these techniques is *contingent valuation* based on questionnaires that ask the users of green spaces about their *willingness to pay* for them. There is serious criticism about the artificial context of this approach and although much research has been carried out on the method itself, very little is known about its actual use in real planning situations. A less controversial and more promising method is the so-called *hedonic price theory*, a way of finding out, for instance, how much house buyers are prepared to pay for the attractive environment of a dwelling. In recent years several analyses of large data sets have produced interesting information about house prices of comparable dwellings in different environments. Finnish research demonstrated a 5% higher price for houses with a view onto the forest, whereas in Dutch research an increase in house prices of up to 28% was found for houses with a garden facing water, especially if connected with a sizeable lake. These findings may seem to make green areas more attractive for developers of residential housing schemes, but in fact they point to the increased value of the edges of green areas. For the real estate agents and the house owners the higher prices may be a good reason to keep green areas green. More interesting for less privileged citizens and for the government is the possibility of using the higher prices to create a fund that provides a financial basis for keeping the green area green, as in '*red pays for green*' schemes that are being tested in several countries. The social context, however, is very important. Experiences in France and in other countries show that even in very attractive green environments house prices may stay low in residential areas with a bad reputation for social reasons.

At the regional level the economy of agricultural land use is a key to green structure policy options. The preceding section has already discussed some ecological aspects, but urban and regional planning requires an economy-based view on the prospects and options of land use. Evaluation studies in the eastern periphery of Vienna resulted

in a map of agro-functional land units, which demonstrated the role of these units in agricultural production, resource protection, hazard damage protection, habitat function, recreation and in spatially structuring the urban-rural landscape. Regional assessment studies such as these can be a basis for multifunctional pilot projects and investment strategies that explore the options at a farm or company level.

Designing the urban landscape

At the detailed design level of streets and squares, the research findings concerning physical conditions, for instance, thermal comfort and tree growth combine with social conditions such as social control and safety. The combined effects in different situations are not well known and are still waiting for more research to be undertaken.

At the level of green spaces in the existing city, protection is not the only option. The Stockholm *sociotope* experience demonstrates that through in-fill projects and urban renewal the urban environment can gain green quality, even if the overall quantity of green is reduced. Such a situation also exists in many international style housing developments of the 1960s that have abundant green spaces, designed for articulating patterns of blocks, rather than for creating green places for playing or walking. Urban restructuring schemes, carried out through interaction with local residents and other stakeholders, have resulted in the revitalisation of neighbourhoods on the basis of some in-fill development combined with an improvement in the quality of the remaining green areas.

New developments also include new green spaces and hence they may add new elements to the existing green structure. The case of a new development on the periphery of the Belgian city of Liège illustrates how derelict lands left by industry and mining, the so-called *brownfields*, may be turned into green spaces. In this case the green areas carry the internal structure of a new residential development and connect the area to the green structure at the urban level. New developments sometimes introduce new principles of green structure, as in the new towns around Paris. The layout of *row* houses or *terraced* houses, common in countries such as Britain and Holland but relatively new to the French tradition, introduce a new, private garden-based green structure that may also lead to new attitudes towards green.

The concept of green structure may also inspire the redesign of the overall image of the city, as was demonstrated by a design study for Kaunas, a Lithuanian city dominated by the Soviet variety of international style design. Instead of looking for more green areas outside the urban area, the image of the city itself is made greener. Green fingers and greenways, together with existing buildings as landmarks, create a new frame based on environmental psychology and design principles.

At the urban regional level, the case of the new towns around Paris illustrates the advantages of creating new nuclei in a polycentric urban network with a strong infrastructure and public transport system. A clear understanding and planning of green structure may guide urban development at all levels.

4 A planning process perspective

Many actors may play a role in the planning processes concerning green structure. The planning-process working group discussed how these actors make so-called *policy arrangements*: coalitions and deals resting on a common discourse. This approach generated questions about the discourse, the coalitions, the power and resources and the rules of the game for a number of case studies in different countries. The case studies revealed a number of interesting aspects, often characterised by an interaction between formal and informal actions and decisions.

Colourful and multi-level planning

Most successful for the quality of urban green structure are those planning processes that combine a strong green policy and interaction with other colours. Embedding the network of green spaces in a *hundred percent of the ground* policy is a precondition for sustainable interaction between green and other functions. In this perspective, good green policy is a colourful policy. These are the lessons learned from integrated planning processes such as the Oslo programme for Akerselva, the Munich Isar Plan, the Ticino Regional Park near Milan, the new towns programme around Paris and the evolution of the Madrid green structure. This does not mean that these programmes managed to avoid conflicts, nor does it mean that green areas were always being given priority. But, when all parties are gathered round the planning table, green spaces are on an equal footing with other issues and cannot be ignored or swept from the table easily. Under these conditions strategies to make allies may be successful.

Green structure planning is rooted in the regional landscape and this requires an appropriate regional organisation that transcends municipal territories and fits in with ecological borders. In this way, for instance, co-ordinated policies for a river valley can be implemented. A regional park authority can sometimes play an important role in stimulating co-ordination and co-operation between partners at different levels of planning practice. Linking the regional to the neighbourhood level is not easy, but the COST C11 cities' experience demonstrates that green structure planning cannot flourish if it is not firmly rooted in the public perception and public support at the level of residential neighbourhoods. Effective green structure planning requires both a multi-functional and a multi-level-planning approach.

Sectors and disciplines

In the 1990s, the city of Sheffield adopted the Sheffield Parks Regeneration Strategy that marked a shift from mono-functional to multi-functional thinking. Parks were the responsibility of one sector, the Leisure Services Department, and were financed by the local council on the basis of a standard that was raised to 6 hectares of outdoor playing space per 1,000 of population. The new approach involved a partnership between local government departments and the voluntary sector and included wildlife conservation, and heritage and health, making open spaces an integral part of economic and social renewal. This illustrates how good green structures emerge

from co-ordinated actions for inter-sector approaches, which make full use of working groups, staff skills, round the table meetings, etc. The users do not perceive green spaces from this perspective and this implies that the different units of the administrative body must overcome their one-sector view and struggle for integrated solutions to solve the problems.

Because the problems and challenges are of a multi-sector character, there is also a need for an interdisciplinary approach with planners, architects, engineers, investors, farmers and foresters, etc. This is achieved in many cases by forming working groups, setting up managers and using instruments such as competitions, to enable interdisciplinary groups to gain sound integrated proposals to solve the problems.

Participation of experts and lay people

In most countries public participation has become a regular part of green space and urban development planning projects. Uggledal, for example, is a small new residential development in the urban fringe of Gothenburg. During the design process, the local planner worked with groups of women, elderly people and school children already living in the area. The fear of the new development causing serious damage to their green environment was one of the motives for their participation. The process resulted in a good fit of the old and the new and no NIMBY (Not In My Back Yard) protests as is usual in such situations. This example demonstrates the need to fine-tune participation processes to the planning situation. There is no standard recipe for participation in the practice of interactive planning.

There is a tendency, however, to explore more options for active participation and this is not limited to the design stage. The city of Utrecht introduced a system of self-management contracts, enabling groups of residents to take over the maintenance of a green area in their neighbourhood. At present there are 800 of these contracts where the municipal department concerned provides expert advice, plant materials and a little money. In this way, lay people and experts are involved together and are committed to parts of the urban green structure network. Both the Gothenburg and the Utrecht case studies were published by GREENSCOM, a European research project that focussed on communication processes related to urban growth and green (Lundgren, 2002 ; Aalbers, 2002).

A different means of active participation is the work of many amateur botanists and bird watchers taking part in regular observations. The information about nature in urban areas largely rests on their work.

Values and interests may differ between professionals and lay people and between different interest groups in our society and this may lead to conflicts and different discourses about facts and values concerning the quality of life in cities. The differences become more visible when investors and real estate agents enter the green structure debate and this will become a normal feature if local governments turn to private-public partnerships responsible for the realisation and maintenance of green spaces. Under these circumstances the tendency towards interactive planning processes is understandable. This does not imply, however, that every stakeholder has to

and wants to participate in every stage of every planning process. A green structure strategy should go with a participation strategy.

A project-oriented approach

Integrated urban projects such as new developments, urban renewal, refurbishing projects and big events such as exhibitions pay attention to the quality of green structure. In several cities new beautiful parks have been left behind after a big garden exhibition. Integration at the project level includes ecological, social and economic aspects and depends on the participation of public and private partners. The *punta verde* initiative in Rome has already been mentioned in the introduction. New green areas in inner city areas result from major reconstruction projects and in the urban fringe 'red pays for green' projects use higher prices for dwellings for funding green areas. At the regional level pilot projects such as those in the Bieslandse Polder near the Dutch city of Delft explore *farming for nature* options. The complexity of modern cities and their planning systems is overwhelming, but a way to act within this structure is to cut down ideology to concrete issues or topics and deal with them using a project-oriented approach. This does not mean, however, that planning can be reduced to project management. Projects should fit into a coherent strategic vision. A green structure plan is such a strategic vision, which can only be effective if it stimulates concrete projects that will become the flagship of the strategy.

Power play, tools and skills

Ideas about co-operation and integration may be confronted with the hard world of competition and power play. Green spaces can also be a battlefield for parties who fight each other for various reasons. The Madrid case is a good example, but in almost all cases there is an underlying struggle for power.

Uncertain futures for farmers and an uncertain political situation around urban plans may create conditions for developers to start buying land. As a result, land prices may rise by a factor of ten and a point of no return in urban expansion is soon reached, causing severe pressure and a diminishing role for the qualities of green. Under such conditions green structure plans may be useful tools for demonstrating the feasibility of a sustainable frame for a flexible future. Planning tools, however, need skills, in this case the skills to forge the *policy arrangements* to make ideas work.

5 Green structure : dilemmas and recommendations

The three perspectives discussed in the preceding sections throw light on a number of green structure and urban planning issues. The question remains what they tell us about the central dilemmas of the introduction.

Sprawl versus compact city ?

In the early 1990s, the *compact city* debate generated a lot of papers and policy documents such as the European Commission's *Greenpaper on the Urban Environment*

(European Commission, 1990). The leading idea was to increase the density of existing cities - or develop them in a compact way - in order to prevent further urban sprawl. Critics pointed out the paradox: an increase at the regional level might imply a loss of green spaces in the existing city (European Commission, 1996). The cities included in the COST studies do not represent all European cities and they have not been studied in a systematic way that justifies conclusions about general trends, but they may illustrate the debate and signal some different aspects.

Sprawl is the dispersion of urban growth in the periphery of cities; it is a creeping process that changes the green countryside into loosely built suburbia, blurring the contrast between town and country. The wealthy newcomers in the countryside still work in the city or depend on its services. Their travelling creates traffic congestion and their cars increase CO₂ emissions. New roads are being cut through the green countryside, causing fragmentation and creating new barriers for people and for wildlife. Moreover, the exodus leaves the old cities with less money to cope with a lot of urban problems.

The Utrecht and Munich cases illustrate the *compact city* policy, devised to prevent further sprawl. As elsewhere, the driving force behind urban growth is not only a growing urban population. A major wealth-driven trend is the decreasing number of people per dwelling, causing a process of *thinning*. Townspeople ask for more space per person and for more private green gardens as well, and this is a major factor in urban growth and sprawl.

In Utrecht, the *compact city* policy, prescribed for all Dutch cities by the national government in 1990, led to the new large housing development of Leidsche Rijn, deliberately built close to the old city on adjacent horticultural land. The area was not very attractive and struggled with economic decline. Under market pressure, however, the density of the new district became rather low for Dutch conditions: slightly more than 20 dwellings per hectare. Easy access to motorways and the absence of public transport at an early stage greatly stimulated car use. Moreover, in the past ten years, the new expansion did not prevent small villages in the nearby *Green Heart* countryside from building lots of houses.

In Munich the official urban development strategy is called '*compact urban green*', thus explicitly suggesting the combination of a compact city approach with a strategy for green spaces within the city. The new Messestadt Riehm district illustrates the result: the location is an old airport not far from the city centre and the design of the new residential area includes a new park. Although some in-fill projects were built on green spaces, the experience of Munich and many other cities such as Sheffield, Marseilles and Oslo, demonstrates how urban regeneration generates new parks within the existing city.

Munich and Utrecht, the two cities with a compact city policy, clearly demonstrate that a compact city strategy does not necessarily increase the density of existing built-up areas and that it does not inevitably lead to a loss of green areas. Cities such as Munich, Marseilles, Milan and many others build on *brownfields* such as former industrial areas, airports, railway areas, and disused harbours. These building projects

themselves usually include new green areas that strengthen the urban green structure. This is not always the case if cities expand by building on adjacent *greenfields*. Although much more compact than sprawl, these expansions sometimes destroy valuable recreation areas and habitats for wildlife. In Helsinki protesters made what they called a '*blood map*' of the city's unstoppable expansion plans. Helsinki is a fast-growing city surrounded by abundant and fully accessible forests (*every man's right*) but no official green structure plan. This is very different from the situation in many other parts of Europe where cities are surrounded by inaccessible, intensively farmed countryside. The latter situation creates conditions for urban expansion combined with new accessible green areas, whereas in the Helsinki case there can only be a loss of green space. In both situations, however, urban and regional green structure plans may be useful instruments to guide urban development with green qualities. The use of green structure plans, however, does not automatically stop undesirable developments, as demonstrated by the building of Milan's Malpensa Airport within the limits of the Ticino Regional Park.

Urban sprawl is not only a matter of urban pressure. The effects of rural pull may also play a role. Increased industrialisation and economy-of-scale processes in agriculture have led to the selling of farms and village houses in many parts of Europe. In some regions urbanites are more than welcome to bring new life to the countryside. But farmers may also survive if they adopt innovative business concepts. Organic farming, and part-time farming, specialising in local products and the combination of production and maintenance tasks by farmers may create an economic base to keep green areas green. Municipalities and regional authorities may subsidise and otherwise stimulate these innovations, as demonstrated, for example, by the farms run by the municipality of Rome, by the contracts with farmers in the green belt of Munich and by the *farming for nature* programme in The Netherlands.

Summing up, the green city and the compact city can be seen as mutually exclusive alternatives, as the disputes in Warsaw seem to suggest, but the real situation in most cities shows a very different practice in which compact and green are combined in many ways. Green structure planning emerges as a promising instrument for creating urban landscapes, with a valuable network of green spaces that contributes to the identity of the local landscape. Green structure is more likely to resist uncontrolled urban development than individual green spaces. At an urban level green structure planning is an instrument that seems to be made for an attractive alternative to both high-density and unlimited sprawl. *Lobe* cities with green wedges create conditions for a long green edge of the city that enables people to combine the proximity of urban services with living close to urban and regional green spaces. At a regional level green structure planning may establish a network of regional parks that structures both urban and agricultural development.

High-density urban areas may have reduced the pressure, but they did not stop urban sprawl and certainly did not reduce the use of the private car. But this does not make the idea of more compact cities obsolete. Most urban citizens love the visual contrast

between built-up and green areas. Therefore, compact building with green quality inside cities and a green structure policy at the regional level is a promising combination.

Defence or integration ?

The dilemma of urban sprawl or high density defines the issue as a choice between various options for urban development. From the green side the dilemma is often seen as a choice between the defence and integration of green areas. Should green spaces be protected by defending them against the city or by giving them a role in a new multifunctional urban landscape?

The defending green story is told as *defending nature against the city*. Urban growth has indeed occupied the places of forests, river valleys and wetlands and this experience reinforces an old idea of the city as the enemy of nature. The polarity of town and country is perceived as the more fundamental polarity between man and nature and this idea is deeply rooted in our cultural history. Some people combine the idea with other archetypical views when they describe the city as the seat of all evil and stress, as opposed to the pure and quiet countryside. On the other side many designers and others hold the view that urban culture has to be defended against the wild nature. The dominating culture in the management of green spaces is still a '*smooth, straight and tidy*' approach, with short cut lawns that express a defence against the wild, against nature. These deeply rooted feelings, often mixed with nostalgia, may give mythical dimensions to the debate and sharpen the polarity, leaving only strategies for defending green spaces against the city as a policy option.

These myths, however, are obsolete. Whether we like it or not, the city is an ecosystem where natural processes work. The COST C11 working group on ecology has studied issues related to biodiversity, climate and the water cycle in urban ecosystems. In the city, of course, natural processes are highly manipulated, but this is no different from the countryside. The manipulation of natural processes can hardly be more radical than on a modern farm. If there is anything left of a general polarity between town and country, it is certainly not the polarity between nature and culture.

The obsolescence of the myths, however, does not imply that the contrast in perception and experience between built-up and green areas is outdated, or that the contrast between wild and cultivated has to be given up. The second COST C11 working group has studied the human values of green spaces and the importance of making them part of urban design. More than ever, urban citizens – an increasing majority of the population – are longing for green spaces and for regional identity, a quality that is intimately linked to the ecology and the cultural history of the urban landscape. This leads to an integrative approach in which *red and green* is no longer an *either* – or dilemma, but a *both* – and option. Likewise, both wild and cultivated are at home in the urban landscape.

The COST planning-process working group described the different approaches as *discourses* and the Ticino case illustrates the way in which the dominant discourse

may shift in the recent history of urban development. In Lombardia, the discourse of defence gradually changed into a discourse of the challenge to combine industrial development with nature and landscape preservation. This resulted in a Territorial Coordination Plan for the Ticino Park. In recent years, however, with the building and possible expansion of Malpensa Airport and plans for new railways and highways, the discourse seems to have changed back to the defensive “*Salviamo il Parco!*” or “Save the Park”. At the regional level, however, this does not imply a complete return to defensive strategies. It may be concluded that defending green in one place may well be combined with integrating green and urban development in another. In this context, green structure planning may be an effective tool for a balanced approach. The myths about town and country, man and nature, cultivated and wild are persistent, they will not simply disappear because of their inconsistency and they seem to be influential in framing research, design and planning priorities. Possibly, a defensive attitude influences the priority in biological research for species counting, which demonstrates the loss or gain of species without linking this to the relevant ecological conditions. Presumably, there is also a defensive background to the focus of environmental psychologists on ‘*green is healthy*’ research and the economists’ preference for ‘*green is valuable*’ research. The defensive approach focuses on knowing that green is good and urban growth is bad. The integrative approach focuses on knowing how green issues can play a role in urban development and this includes *knowing how* to cope with conflicts.

Down at the practical project level, however, the COST studies found a great number of projects that support an integrative approach and emphasise the need for contrast between built-up and green areas and between cultivated and wild. At the regional level the challenge is to know how different activities may take advantage of different opportunities in the urban landscape. New forests and new lakes, for example, may stop urban growth in one area, while giving way to further development in other areas. Green areas need protection in some places, such as the Bastides area in Marseilles but protection here should be part of a general strategy for integrated green urban development. Green structure planning is a very useful element in these planning processes. Many cities demonstrate that there is a lot to be gained by making creative use of the opportunities that present themselves when green structure planning joins forces with planning for other networks such as water, traffic, greenways for recreation and green corridors for wildlife.

It can be concluded that, in practice, integration through co-operation may also include generating support from people with different attitudes and opting for different strategies in different places. At the regional level, an understanding of the potential of green structure may link urban development and design to the identity of the local landscape. At the urban and district level the green structure contributes to the identity of the functional and cultural urban tissue, including providing a contrast between wild and cultivated. At both levels a multifunctional approach to planning and management creates broad support and thereby the conditions for a sustainable role for green areas in urban development.

Top-down or bottom-up ?

Green structure planning cannot escape from the top-down versus bottom-up dilemma. Public support and commitment is indispensable for a good functioning network of green areas and the participation of residents and users in planning and maintenance may ultimately turn green *spaces* into green *places*. Personal attachment creates a sense of place that makes people feel at home. A bottom-up approach to green structure planning is the only way to make this happen. Critics, however, state that this will lead to unrealistic dreams and NIMBY behaviour: shifting the problems to the neighbours.

On the other hand, green structure is also a part of the regional system and so requires specialised knowledge of landscape ecology, water management, traffic flows and land-use economics. Moreover, conflicting interests require *wheeling and dealing* between government officials and representatives of interest groups. As a result, green structure planning may lead to results. Critics argue that these results are often formal compromises that make nobody happy. Moreover, the process becomes bureaucratic and technocratic, making the lay people's local debates redundant.

This is not the whole story, however. In many countries there is also a bottom-up versus top-down debate between municipalities and higher levels of government. At the European level, the principle of subsidiarity delegates responsibility to the lowest possible level of government. Green spaces used to be a clear case of municipal responsibility. Green structure, however, asks for a regional or higher authority to decide in cases of conflicts, as is the case for the road and rail infrastructure and the water network.

The Plan for the River Isar in Munich, for example, managed to bridge the gap between the municipal and higher levels. The city of Munich, upstream and downstream municipalities, regional authorities and interest groups worked together, understanding that they are all part of one ecosystem. It seems that in this process, the direct neighbours, the 200,000 people living next to the river, were nearly forgotten and for that reason some local politicians were opposing the plan. This stresses the importance of including the lowest planning levels in a multi-level approach and of organising a planning cycle that combines top-down and bottom-up stages.

The Park Forest, Ghent project illustrates how this approach can work. Regional policy makers aiming to reverse deforestation in Flanders succeeded in convincing the regional government partners of the need to plan a new 300 hectares multifunctional forest in the urban fringe of Ghent. A new urban forest was proposed, deliberately planned to create a new natural border of the city and steering the growth of the city to less vulnerable areas. This proposal was considered worthwhile from a regional perspective, but at the stage of public participation the local residents rejected the plan as a top-down idea and preferred an open green landscape to a closed forest. The bottom-up participation process changed the plan. The result is an open forest type interwoven with farmland.

Sometimes, as in the Ghent case, a combined top-down and bottom-up planning cycle for a comprehensive landscape plan is an option. The concept of green structure, however, also poses other options to escape the dilemma. In many cases, there is no possibility of making and no need for a comprehensive plan for a large area. Uncertainties about the future of agriculture, for example, or about the market for housing and industrial areas, and about available public funds for recreation and nature conservation, urge planners and politicians to make flexible plans. In this context then, green structure can be understood as the backbone, not the flesh, as a frame rather than the in-fill. Perceived in this way, the knowledge of experts and the power of interest groups, controlled by regional democratic institutions, may very well dominate the strategy for maintaining and developing a regional green structure. This structure may serve as a sustainable spatial and ecological frame for flexible in-fill options based primarily on bottom-up decision-making processes. This approach comes close to the Two Networks Strategy, in which green structure primarily joins forces with the water network and with greenways for pedestrians and cyclists. The traffic network acts as a carrying structure for the more dynamic economic functions (Tjallingii, 1995; European Commission, 1996; Aalbers & Jonkhof, 1995).

Recommendations

The discussion about dilemmas leads to an emphasis on the integrated quality of green structure rather than the quantity of green spaces. Defining quality in general terms is not so easy, however. The existing and potential qualities of green structures are intimately linked to the nature of the local landscape and to local needs. To a certain extent, therefore, the quality of green structure can only be the unique result of local efforts. General quality aspects do exist, however, and it seems justified to recommend further studies aiming at general conclusions about the quality of green structure in different situations. It is not justified, however, to expect a complete set of cause and effect relationships leading to full control over nature and culture. Without ever being able to predict the result of every action, we may expect a better understanding of the physical and social conditions. The quality of green structure will be the result of these conditions and the interactive process between actors in a city. This local interaction can become a learning process, if both the experiences and the context are documented and communicated.

The COST C11 action teaches us that the exchange of these experiences stimulates further action and a continued learning process that can enhance the skills required for finding local solutions. The focus on quality, context, multi-functionality and co-operation is, therefore, the central recommendation and serves as the background of the following remarks.

Recommendations for designers

Multifunctional use does not mean that everything can happen anywhere. Further design studies are needed to explore the options for different functions to be good neighbours in the network of green spaces. The saying goes that *good fences make*

good neighbours and this is also true for the zoning of functions. Designers may explore the zoning and fencing that make the right fit of activities for the local situation. But a programme of *research by design* may also generate more general guiding principles for promising combinations and the spatial and technical conditions for green structure planning.

One of the focal points for further design studies should be the combined planning options for green structure and water. Already many cities have started river restoration schemes that combine flood control with recreation and biodiversity. Disconnecting rainwater from the sewerage system is on the agenda of an increasing number of cities, both in new and existing urban districts. This asks for combined green and water planning at the roof, street and neighbourhood levels. The challenge for designers is to link the regional networks of green and water with the more intricate networks at the neighbourhood level.

A second focal point is the relationship between green and traffic. Design studies need to explore further the options for attractive and safe pedestrian and cycle paths in combination with ecological corridors and water. Besides, the crossings of these greenways by heavy infrastructure deserve special attention.

Recommendations for managers and maintenance

The role of maintenance in creating quality of urban green spaces is underestimated. Design studies always need to be combined with maintenance studies. Special attention is required for the contrast and combination of wild and cultivated in maintenance practice. Interactive *learning by doing* processes involving residents and users should explore further the options for an ecologically and economically sustainable green structure, which combine with the symbols of nature dominating the public debate. From a social point of view, maintenance contracts with residents and other citizen groups deserve further attention. The assessment of pilot projects will be an essential method for focussing on interrelated issues in a practical setting that includes ecological, social and economic issues.

Recommendations for planners

Planners are professional experts in municipal and regional sector departments, but the title *planner* may also be used in a wider context, to include leaders of resident groups, non-governmental organisations and politicians engaged in the process of making plans. A lot may be learned from the experiences of both conflict and cooperation during these planning processes. Here promising combinations of green structure design, financing and maintenance may emerge. True win-win situations may be rare, but they exist and further options should be considered. Pilot projects exploring, for instance, the approaches of *red pays for green* and *farming for nature* may show the way for other creative public and private initiatives. From these experiences we may learn about the real options for integrating green structure into urban planning at different levels and across sector interests.

Recommendations for researchers

Following the tradition of their own discipline, researchers tend to specialise in analytical research and we do need more of this to fill the many gaps in our understanding of the physical and social processes related to green structure. More knowledge is needed about the role of green structure in regulating the urban climate in different parts of Europe and about the role of green corridors in the ecology of pests and pest control. Serious gaps also exist in our understanding of people's attitudes to maintenance practices and about the long-term effects on health of different green spaces in urban areas.

The most important recommendation for research, however, is to focus more studies on the assessment of integrated projects. The COST C11 experience points to the vital role of an integrated approach to green structure and urban planning. Assessment studies are a basic element of the *learning by doing* process that is essential for this approach. Best practices of one city cannot simply be copied by another city. Researchers, therefore, should study and describe carefully both the general aspects of a project and its local context. Designers and planners working on multifunctional options and integrated plans need the assistance of researchers for monitoring, for studies on the effects and to reflect on the role of green structure in urban planning. Only increased co-operation between researchers and practitioners can produce the know-how that is required for effective green structure planning.

References :

- Aalbers, C., Ekamper, T., Tjallingii, S.P. and van den Top, M., 2002. *The Utrecht-Houten Case Study*. GREENSCOM work package 4. Alterra, Wageningen.
- Aalbers, C. and Jonkhof, J., 2003. *S2N, the strategy of the two networks revisited*. Aeneas Publishers, Boxtel, NL.
- Breheny, M., 1992. The Contradictions of the Compact City: A Review. In: Breheny, M.J. (ed) *Sustainable Development and Urban Form* (European Research in Regional Science 2) 138-59. Pion, London.
- European Commission, 1990. *Greenpaper on the Urban Environment*. Luxemburg.
- European Commission, 1996. *European Sustainable Cities*. Report by the Expert Group on the Urban Environment. (p.198, 1999) Directorate General XI, Brussels.
- European Commission, 1999. *European Spatial Development Perspective*. Luxemburg.
- Fleury, D. (ed.) 2002. *A city for pedestrians; policy making and implementation*. Final report COST Action C6. EC Publications, Luxemburg.
- Lundgren Alm, E., Malbert, B. and Korhonen, P., 2002. *The Göteborg Case Study*. GREENSCOM work package 7. Chalmers University, Göteborg.
- Tjallingii, S.P., 1995: *Ecopolis, strategies for ecologically sound urban development*. (p.106) Backhuys Publishers, Leiden.



Sheffield (United Kingdom), Marseilles (France), Zaaipark in Breda (The Netherlands), The Englische Garten in Munich (Germany), Bridge on the Ticino in Pavia (Italy), The new central Library in Warsaw (Poland), The Forum in Rome (Italy), Overall view of Oslo (Norway) , Path connecting the town centre with the facilities area in Ceske Budejovice (Czech Republic).

CHAPTER 2

**Main challenges through
contemporary examples**