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Strategic environmental assessment of regional planning in the Stockholm region

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Abstract

The regional planning in Stockholm shall contribute to the attainment of the following regional development goals:

- Strong international competitiveness
- Favourable living conditions that are equal for all
- A long-term sustainable living environment

To find out how the Regional planning can contribute to the goal about a long term sustainable living environment the Office of Regional Planning and Urban Transportation (the Office) works with Strategic environmental Assessment (SEA) as a part of the regional planning process. A programme on how to work with SEA was formed during 1998-1999. Ten strategic questions was formed on the basis of the knowledge about the environmental status in the Stockholm region. To these questions- aspects on environmental issues in the region- the SEA is supposed to give the answers.

The Office works together with a group of experts from local authorities and organisations. The work is concentrated on trying to find out if the different scenarios presented in the regional planning process are leading to a sustainable living environment. In the work we also try to find alternative planning scenarios which hopefully better can fulfil the environmental objectives for the region. One important part of the work is to develop a dialogue between the planners and the SEA-experts.

This is the first time SEA is used in the regional planning-process in the Stockholm region. Since the regional planning is supposed to give the 26 local authorities in the region knowledge and support to their planning it is of most interest that the regional planning. It clearly points out important measures in order to receive a long-term sustainable living environment.

First I will start with a short presentation of the Stockholm Region. Secondly I will present our Office and the role of Regional Planning. Then I will present the main issues in our programme for Strategic Environmental Assessment (SEA) of the Regional Plan. I will not talk very much about our specific results, as we haven't really completed this work yet. I will instead tell you more about our experiences during the process and conclusions for our coming work with Regional Planning and strategic impact assessments.

The Stockholm region

The Stockholm region is the population centre in Sweden. Here lives 1.8 million people live here, which is a fifth of the total Swedish population. In the northern and southern parts of the region you can find large areas of agriculture and forestry. The eastern part of the region is the archipelago with a large amount of holiday houses. The archipelago is very important for the inhabitants recreation and out-door life.

The people in the region have higher incomes and are better educated compared to the rest of the country. There are 26 local authorities (municipalities) in the region. The City of Stockholm is dominating with almost 750.000 inhabitants, 40 % of the total population of the region.

Stockholm is a region with high environmental values. The physical character, the surrounding water and the unique archipelago give the region special qualities. The Stockholm metropolitan area has only been moderately exploited. The reasons for this are many. There has been no shortage of land to build on, and development has followed the transport routes that radiate out from the centre of the city into the surrounding countryside. Lying between these transport routes are green belts, which make up the heart of the open, undeveloped, areas in the region containing natural, cultural, and open-air recreational areas. In the more urban areas many smaller green belts and parks making Stockholm a very green, and very beautiful city.

The Stockholm region is the only region in Sweden that continuously had an increasing population during several decades. In the coming 30 years the region is expected to grow with 300 000-600 000 new inhabitants. This causes a great pressure on planning. Growth in population and economy causes an increasing demand of new housings, working places and infrastructure for transports. The infrastructure for transports has an important role in keeping the regions economy and social structure together in the region. At the same time more transports causes an increased pressure on the environment.

The County Council

The County Council is an elected organisation providing services for the community and the inhabitants of the county ultimately control it. The tasks of the County Council include the responsibility for health and medical services, public dental care, social

services and public transport as well as providing support for the cultural life of the county, tourism, the business climate, along with regional growth and development.

The County Council works with regional planning, which means carrying out surveys and submitting proposals to the county's municipalities on how land should be used, where dwellings and workplaces should be placed and how roads, railways etc. should be planned.

The Office of Regional Planning and Urban Transportation (the Office) is responsible for regional spatial planning, regional traffic planning and development in the County of Stockholm. We are also responsible for issues concerning the environment, nature conservancy, archipelago and energy. The Office work with and take initiative in structural issues concerning the County of Stockholm and Mälar Region

The role of regional planning

The County council works together with several regional and local stakeholders in order to be able to handle the regions main development issues.

The continued development of the regions physical structure is the main issue of regional planning. Pre-requisites are provided by the existing structure of developed and undeveloped land, the understanding that the transport system will have a considerable structural effect and the ambition to keep the region’s Greenfield structure. In the planning there is a need for readiness to be able to meet the demand for housing and business premises in the various parts of the region up until the year 2030 assuming a variety of future development scenarios. The need to develop the regions technical resources is to be viewed in terms of economic, social and environmental sustainability.

Regional traffic planning shall give a broad holistic picture of travel and transport both today and in the coming decades considering different development scenarios and plans. Traffic development shall be described for the various models of transport and different geographic areas. Good transportation shall be placed under the spotlight in particular. An inventory into the knowledge of the connection between mobility and welfare shall be carried out. An analysis of the shortcomings in the traffic system that are of regional importance shall be carried out. This should form the basis for the prioritisation of further investment. The need to eliminate missing links, bottlenecks and other limitations that restrict the possibilities of using existing infrastructure efficiently, shall be analysed. The need to create new links and nodes shall also be examined, as shall other possibilities to develop the regional infrastructure for business transport.

Objectives and strategies of regional planning

Regional planning is not an obligation in law. The plan shall work as a guide for political decisions, for example in the municipal planning-process.

The regional plan is not only a guide for local authorities but also a very important tool for the strategic development planning in the Stockholm region.

The fundamental objectives for the development of the region are

- Strong international competitiveness
- Favourable living conditions that are equal for all
- A long-term sustainable living environment

Regional planning shall contribute to the attainment of these objectives.

The planning-process

The work with the regional plan is a long process. It started in 1995 when the Office produced a report called “The unknown future”. In this report we describe different scenarios for the development in the region in the coming30 years. Conclusions from this scenario work and knowledge about the challenges for the region resulted in a new report called “The future of the Stockholm region – a long term strategy”. This report was sent out for a formal consultation. After collecting different opinions and new knowledge we could finally form a program for the regional plan in 1998. From this point we have been working with the plan for two years, collecting lots of new knowledge and consulting the municipalities in the region. Now in the year 2000 we are ready for another formal consultation. The regional plan includes at this stage two different scenarios built on our knowledge about possible development of the region. After the formal consultation we will finalize a proposal for a regional plan and hopefully in year 2002 there will be a formal political decision about this plan.

Strategic impact assessments

Strategic impact assessments of economic-, social-, and environmental issues on a regional level are a part of the work with the regional plan. The main purpose is to early in the planning process find out if there are any negative effects and conflicts to objectives in order to bee able to adjust the scenarios in the plan.

There are no complete methods on how to do impact assessments in a regional planning process. We are also working with a perspective 30 years ahead. A lot of development work was therefore necessary.

Strategic Environmental Assessment (SEA)

Objectives and purpose with SEA

The overall objective is to try to find out in what way the regional planning can contribute to a long- term sustainable living environment.

The work is concentrated on trying to find out if the different scenarios presented in the regional planning process are leading to a sustainable living environment. In the work we also try to find alternative planning scenarios that hopefully can fulfil more of the environmental objectives for the region. One important part of the job is to develop a dialogue between experts in spatial planning and the SEA-experts.

This is the first time SEA is made in the regional planning process in the Stockholm region. Since the regional planning is supposed to give the 26 local authorities in the region knowledge and support to their planning it is of most interest that the regional planning clearly points out important measures in order to receive a long-term sustainable living environment.

The role of SEA in the planning process is the same as for the strategic impact assessments of social and economical issues. It is:

- to observe important aspects early in the planning process
- to make the work with developing and analysing scenarios easier
- to expose conflicts of objectives
- to make the planning-process transparent
- to increase the knowledge about the possible consequences

Programme for SEA

The Office has been working together with a group of experts from local authorities and organisations. The first step was to form a programme for how to do a SEA in the regional planning process.

A very ambitious programme for how to work with SEA was formed during 1998-1999. The main point of the programme is ten strategic questions formed on basis of the knowledge about the environmental status in the Stockholm region. To these questions-aspects on environmental issues in the region- the SEA is supposed to find the answers.

Effects regarding the environment of the region	**Aspect/strategic question** Does the regional plan create opportunities….
Global perspective	**…for a reduction of the regions eutrophication of the Baltic See** …for a reduction of the regions emission of carbon dioxide
Protection of regional structures of the region	**...to preserve and develop the green structure of the region?** **...to protect and develop the culture-historical values and characters of urban areas?** **...to keep the natural and cultural values of the archipelago?** **...to prevent that the transport infrastructure causes injurious infringements?**
Reduce of use of energy and material	**...to decrease the regions use of energy and to create an energy system that is environmentally adjusted?** **...to decrease transports and to make the intern and extern regional transports more energy-efficient?**
Quality of life	**...to a good public health and a safe and secure living space?** **...to a stimulating and attractive environment?**

Figure 1–Ten strategic questions, which the Strategic Environmental Assessment is trying to find an answer for.

The ten questions are based on the knowledge of the environmental status in the region. In the following work it has been necessary to focus on questions that are relevant according to regional planning. The strategic environmental assessment has so far been focused on three areas.

- The impact on the environment from traffic and transports
- Preservations and development of the regional green structure
- Environmental values in urban areas

These three areas cover most of the ten questions that are presented above. Questions about nature- and cultural values in the archipelago and peoples health have not been dealt with yet

Indicators

On the basis of the ten strategic questions mentioned earlier in this paper we have developed indicators. This is done in order to be able to make quantitative prognoses in the future. So far we haven't been using these indicators, as the planning process at this stage can't produce basics for this kind of calculating.

Instead the indicators have been a basis for our discussions and at this point not a tool to produce quantitative answers to our questions.

National environmental objectives

Sweden has 15 national environmental objectives. The County Administrative Board and the local authorities have the responsibility to transform these objectives to regional and local level. The County Administrative Board, the County Council and the Stockholm County Association of Local Authorities – KSL together with several regional stakeholders have formed a regional environmental programme for the Stockholm County, based on Sweden's 15 national objectives.

This regional programme is an important basis for the work with SEA in regional planning. The objectives in this program have been the base for our choice of indicators and measurements.

Two different scenarios

The regional plan includes two different scenarios. In these scenarios there are differences in the spread of population, housing and working places. The alternatives are called alternative K for concentrated and alternative P for periphery. Alternative K means that more new houses and places for work are built in the central part of the region, alternative P means that more houses and places for work are built in the suburbs. In both alternatives the building is suggested to be complementary to already existing urban areas. This is in order to better fulfil the objectives of good conditions for public transports, good urban areas and reduction of use of land.

Alternative K means a considerable complement to the existing areas in the central part of the region. This is a good option from various aspects. This development gives good opportunities for shorter communications and helps to keep a high standard of public transports.

The scenarios have been analysed in the SEA-process. We have concentrated on the three areas:

- The impact on the environment from traffic and transports
- Preservations and development of the regional structure
- Environmental values in urban areas

Results

Traffic and transportation

Both in alternative K and P we can see an increase of transportation per person. Some of this increase can be explained with the fact that people seems to travel a lot more in the future. We have also prognoses saying that more people will be employed which leads to more traffic. The public transports increases in capacity. Even so the relative use of public transport decreases in both alternatives. This is explained with the assumption that people will own more cars and also use them more because of the growth in economy. All this leads to an increase of CO2 pollution if nothing happens with technology. It also amongst other things leads to impact on the green-structure, more noise pollution and an increased risk of traffic accidents.

The regional green structure

The regional green structure is of great value for the region and we will do a lot in order to preserve and develop the structure. You can see a genuine conflict between the need of new infrastructure for transports and the green structure. New roads and tracks will cut trough the structure. Some parts of the green structure are very narrow and at the same time we can see a pressure from exploitation in areas of the structure that are close to existing urban areas. In both alternatives great consideration has been taken towards the needs of the green structure. Therefore very little of the structure is suggested to be taken for new housing areas.

Urban areas

The analyses of alternative K and P show a large use of land close to public transports. This means a great complementary building in urban areas. It is good for the environment to build close to existing urban areas. This increases the possibility of building up systems for heating, water supply and public transports etc. At the same time we must be careful not to destroy cultural values in the urban areas.

The planning process

The conclusions from the process until now are that we need to concentrate our work on the impact on the environment caused by traffic and transports. We also need to be aware of the impact on our green structure caused by the growing in population and the need of new housing and working areas. Not very surprising conclusions but at the same time it’s not easy to discuss or solve the problems. From an economical and social point of view mobility is very important on a regional level. This can be a big conflict in objectives. I think that one of the most important results from our work with SEA is the fact that we have spent a lot of time talking about these conflicts. We have tried to discuss them openly in the planning process and now also in the papers that will be sent out for an official consultation during May and November this year. At least we have brought the issues to the surface and that might be an important step towards a broad discussion on these issues amongst all the stakeholders in the region.

Sustainable development – three dimensions

The three regional goals in the regional plan reflects the three parts of sustainable development

- Strong international competitiveness – economy
- Favourable living conditions that are equal for all – social progress
- A long-term sustainable living environment – actions on the environment

Until now we have been working with three separate strategic impact assessments of the regional plan.

It is only when we put all our strategic impact assessments together that we can see if the regional plan is contributing to a long term sustainable development. We have just started our efforts to put all these three dimensions together and we need to develop methods for this very important work.

Experiences and conclusions

There are two very clear purposes with SEA. Both of them have as a necessary prerequisite that the SEA is very much integrated in the planning process. The first purpose of SEA is to support the planning with important facts and consequences of principles, objectives and suggestions from the planning process. It is important that SEA is integrated in the planning process. It is also necessary to have an interaction between the planning-process and the SEA. Secondly there are ambitions to have a holistic picture of all three strategic impact assessments in order to get a picture of what's necessary for a long-term sustainable development. This means that the results from the SEA must be coordinated with the strategic social- and economical assessment. The ambitions are very high and we can't know if we are going to be successful until we have finished the planning-process

So far we must admit that it's been hard to find forms for the ambitious integration that's needed. There have been problems to find a total consensus about how comprehensive the SEA should be in the end. Not everybody involved in the process have been of the same opinion about the role of SEA and how SEA should influence the planning-process. There has been expectations that we already at this stage should have been able to find out precisely what's best for the region in 30 years from now according to the environment and that we should have a plan that includes all this. I would rather say that we at this stage have been able to find out what issues that are the most important and relevant to focus on in the regional planning process. The planning-process has not been prepared enough to take care of the results from our strategic impact assessments.

My experience is that it's difficult to have a constructive discussion between experts on spatial planning and experts on environmental issues. I'm not sure why but they seems to be problems in understanding each-others purposes and arguments. I'm sure that a solution to these difficulties in dialogue must be solved if we shall be able to have a long-term sustainable development. There must be a greater understanding from both sides about the complexity in the task. I am convinced that we can't talk only about

environmental issues when it comes to sustainability for a region like Stockholm. We must deal with both economical and social issues as well as with environmental issues. If the inhabitants of the region are unemployed, have low mobility and low education environmental issues will not mean much to them in daily life or for their future plans.

Anyhow, the work with SEA has contributed to the way the planning-process has been arranged. The work in several steps with first scenarios then alternatives and coming later a regional plan. SEA has made the planning-process more transparent. SEA has also made different steps in the planning-process clearer.

The discussion of relevant environmental issues in a regional plan was held a bit late in the process. SEA has not yet become a natural part of the planning-process. It's not clear how the results have been implemented in the planning-process. The planning-process has had a very tight timetable so far which has made it harder to implement the results of the SEA.

The work with the regional plan is now halfway and our experiences so far will bee of much help when we are evaluating our work far in order to make decisions on how to continue the work with strategic impact assessments.

SEA in our coming work

The planning process is very much a living process. Changes both in methods and perspectives happen all the time. During the process of the official consultation from May to November this year we will consider what's been done up till now. We have worked with SEA for almost two years in the planning process. At this point we are not so sure if it's a good choice to continue the work dealing with environmental issues dealt with separately.

Therefore there will be a priority in our work to coordinate all our three strategic impact assessments. We think that it's impossible in a Regional plan for the next 30 years to focus only on environmental issues. In the region we need very much to be concerned about social and economical issues as well as environmental. This means that we need to make priorities in case of conflicts of objectives. A very ambitious and difficult task lies ahead of us but in the long term it's absolutely necessary in order to reach a long-term sustainable development in the region.

Sustainable development is not a ready concept but a process where you need to have many people involved. You cannot find one final solution; you have to keep the process going on in the society. This is a very important cross-sectorial task and a question of social, economic and ecological issues together.

Dimensions of Social Exclusion and Urban Change

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Abstract / Introduction

This paper is a personal and professional account of the use of spatial information in an urban context, drawing on experience of an on-going city-wide regeneration project in Newcastle-upon-Tyne in the North East of England. The paper outlines the work involved in strategic urban information management and the lessons learnt. It describes the progress at a community level in our follow-on project where we are assessing, developing and experimenting with community participation processes based upon information exchange and development. In particular we will trial and examine:

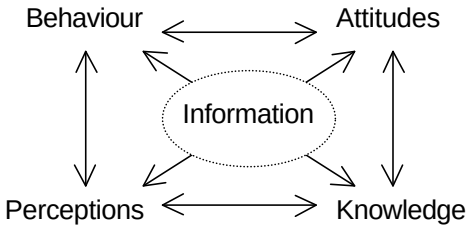
- The utility and value of mapped local government indicator information in educating and informing the community of itself relative to other communities on a range of population features and city attributes.
- The interest of the community in challenging, validating, revising and extending the indicator and information basis to improve our mutual understanding.
- Ways to capture local knowledge and generate qualitative information from the community itself and integrate this information with official and quantitative mapped information through participation activities.
- Integration and interaction of two-way information flows and complimentary processes to mutually improve community understanding
- The value of these processes in improving participation and developing mutual understanding of the city, its population, and communities.

However, it begins with a theoretical statement about the nature of cities and urban decision-making processes.

Theoretical context - Urban complexity and the role of information

Cities are complex systems. They are both ‘hard’ physical systems and ‘soft’ human systems where behaviour and decisions are based on interaction between knowledge, values, attitudes and perceptions. Thus, they are unpredictable in their responses to topic-based initiatives, localised interventions and imposed visions. The procedural issues surrounding municipal management and the analytical ‘values’ behind decisions will be as important as the substantive. This suggests a need to clarify and define the links between behaviour and environment in a new approach that is more than historical design or knowledge based determinism. It has to link hard and soft systems and it has

to include a series of feedback loops (inspired by the descriptions and connections of Short 1984, Kirk 1951).



The diagram illustrates multi-dimensional feedback and the relationships between knowledge, perceptions, behaviour and attitudes operating at individual, household, community and city levels. It also "… usefully underlines the *groundlessness* of systems thinking: there are no absolutes in our epistemology; as systems thinkers we are virtually driven to a process view of the world" (Checkland 1992 p1026) where behaviour is only loosely grounded in our limited perceptions and knowledge of the real world. Theoretically, we have to be concerned with describing real-life process rather than an ideal normative and rational approach to decision-making (Castles *et al* 1971).

There are strong connections between any realistic urban theory adopted by a planner or an organisation and the perspective this provides on the role and balance of data and information in explaining this theoretical position and inter-relationships. For example, in looking for behavioural change there will be a bias towards observation and interview in data collection to explain any change. The theoretical position adopted will to some extent predispose the nature of the technical information collected and used to make 'informed' decisions.

Yet, there is little understanding of urban complexity and the links between the analytical, procedural and physical aspects of the urban system, leading inevitably to confusion and contradiction in practice or policy recommendations. A compartmentalisation of such issues is endemic within the prevailing municipal approach to urban regeneration and thus one of the challenges of any new approach. The dominant paradigm of urbanism demonstrates two types of internal compartmentalisation: (i) based on a specific scale; and (ii) adopting a sectorial topic based approach to understanding linkages.

City-wide regeneration initiative – Action research

The starting point of the regeneration work was to develop a new approach to urban regeneration that recognised both earlier successes and failures. The desired radical and innovative process was to be long-term (20 years) city-wide, holistic, evidence-based, participative and focus upon communities, although there are questions over whether the requirement for evidence and information in the process is "… as much *psychological*, in view of the qualitative character of most administrative decisions, as it is technical in some quantitative sense" (Scott 1967 p225). Political decisions at all stakeholder levels (local municipality through to community / residents' groups) were made from the outset, and continue to be made, without reference to the evidence base.

The new approach required a new understanding that addressed this *'total urbanism'* complexity and the recognition of internal compartmentalisation and the ways in which they can be reconciled, including the pragmatism and abstraction required to respond to real-life political processes.

A team of 20 staff (over a 3 months dedicated working period) was set up to support the initial development of the regeneration initiative. This team was multi-disciplinary, inter-departmental and inter-organisation. One of five overlapping groups was charged in the overview of information collection, organisation and dissemination. The commitment to an evidence-based approach obliged the group to consider a mix of qualitative and quantitative information at all stages.

The group required a robust adaptive framework for regional / city-wide and neighbourhood information that aided the understanding of issues, interconnections and possible consequences of intervention in any distinct sphere. It had to operate and interrelate at different scales for a variety of decision-makers (organisations, communities). The intended aim of the information base in this context is not to predict or forecast, or to quantify links or show causality but rather provide an better intuitive understanding to inform decisions. This heuristic approach where people learn by doing and make informed connections is also didactic and interactive.

Integration using spatial indicators

The implications for the management of data and information within this approach is to adopt the use of a 'package' of spatial indicators. Indicators were chosen to simplify the themes and scope of intervention, to link to existing policies and/or anticipated action, and to provide an accessible and convenient overview to stakeholders and decision-makers.

Indicators are concerned with change and decision-making, implying a distinction between data and information, where the weakness of current practice is that it is data rich without making a connection with action and changing behaviour. Specific criticisms of the use of information has been the lack of integration with political issues and public participation (Riglar 1998, Pinfield 1996) which require creative and imaginative approaches to community involvement. To do this they need to be locally defined, both individual indicators and the process, (Pinfield 1997, Henderson 1990) to ensure they result in better decisions and actions. This is because they do represent a specific locality or cultures' value system and as such the selection and use of indicators can be highly political (Crilly *et al* 1999).

The policy relevance of any indicators set depends on a multi-layered understanding of the urban system (Pearce 1997, Brugmann 1997a and 1997b) gaining new layers and mapping these spatially and as flows or networks. "… a systems approach, in this context, has much to offer. It provides a multi-dimensional framework in which information from different disciplines and domains can be integrated without being forced into a one-dimensional mapping" (Clayton and Radcliffe 1996 p12). Key 'gaps' are the recognised "… dearth of relational data on all social phenomena" (Smith and Timberlake 1995 p91), a lack of spatial dimensions and an over reliance upon empirical information and models (Clark *et al* 1995). The proposed framework is dependent upon

the possibilities of filling these qualitative gaps with a common unit of measurement for each indicator - a spatial unit.

> "within the context of designing and managing sustainable communities, planners require an understanding of the interactions between the macroscopic dynamics of the regional or urban system and its component sub systems… (such a) … defined spatial zone can be seen as a complex system which evolves over time" (Jeffrey *et al* 1997 p58 and p61)

As the use of indicators is based primarily upon an intuitive and qualitative way of understanding urban systems they remain "… a sub-optimal tool for technical assessment and even public education" (Brugmann 1997a p59). There remain issues over control of the information, its source and dissemination and achieving the correct balance between simplicity and utility.

Conceptual model - The city of virtual layers

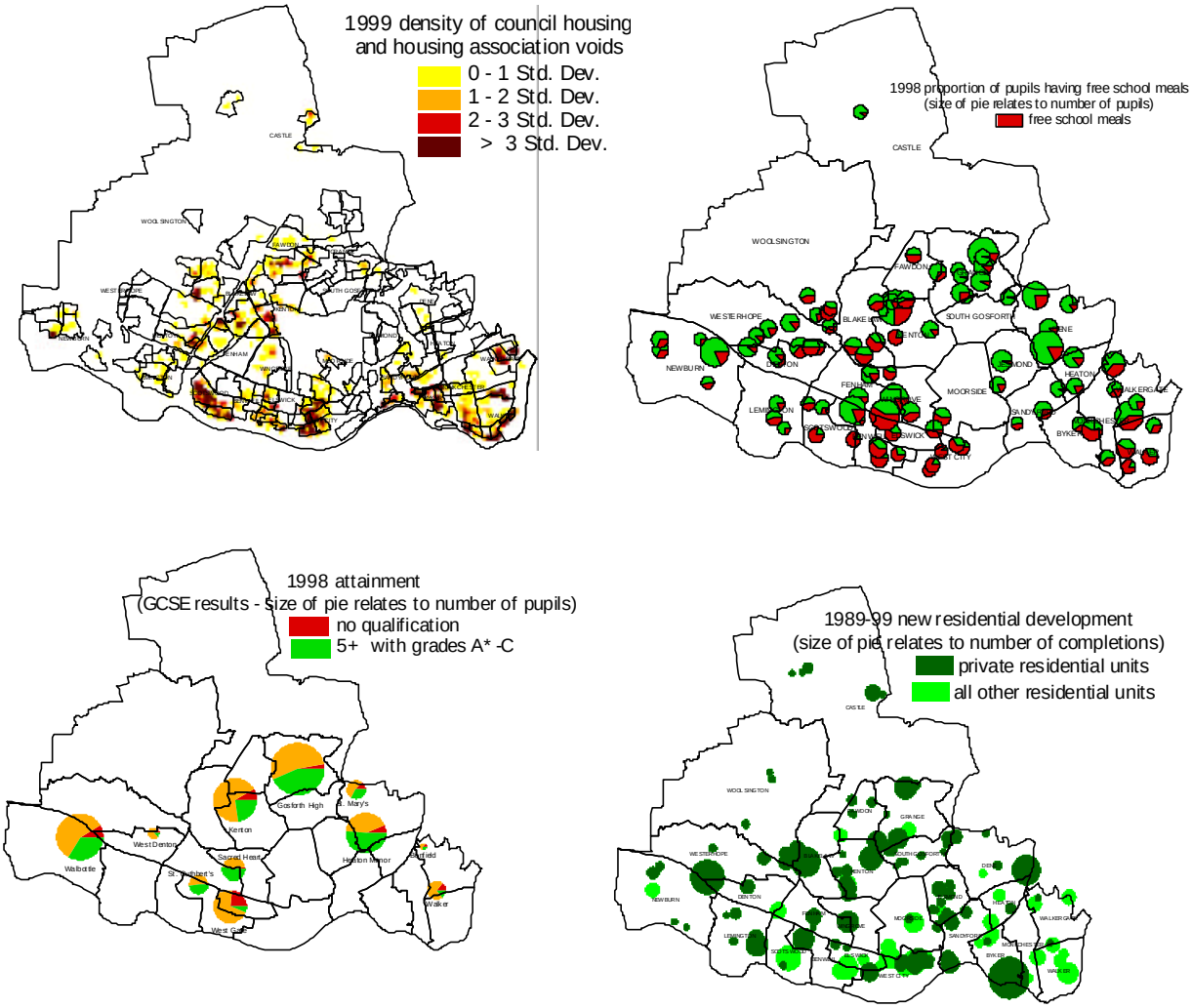
The selection and communication of indicators of urban vitality and viability have an important role in defining the scope of the issues to be addressed by any level of public sector intervention providing an evidence base for action. Thus in part they have a function in relating the conceptual model of the city and its communities. Spatial indicators, produced by a variety of simple analytical tools within a GIS framework, can help us conceptualise the city differently. It becomes a tool to decision-making and thus part of the process.

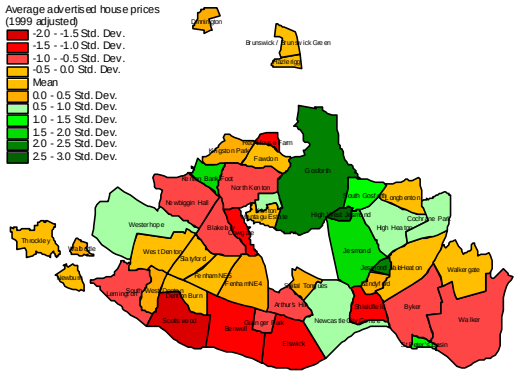
The urban indicators are being used to deconstruct, simplify, communicate and analyse the complexity of the urban systems under investigation. To reflect this complexity, the indicators must be multi-dimensional (dynamic/temporal, qualitative/attitudinal, physical/socio-economic), to allow for trend information, subjective 'quality of life' measures, intra and inter urban comparisons. The basic structure of the indicators is a multi layered data model – each layer being a representational indicator.

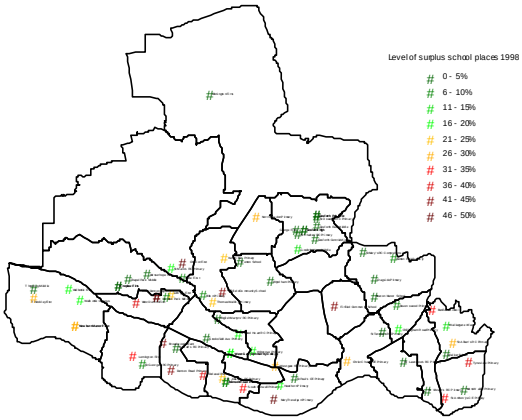
The initial choice of indicators was partly determined by the policy framework within which the municipality is operating and also by the easy availability of local information. The key factor was to provide an overview of all the issues addressed by the regeneration project making use of the best information available. There was an understanding that indicators would allow for continual change as the best available and their replacement or augmentation with others as appropriate.

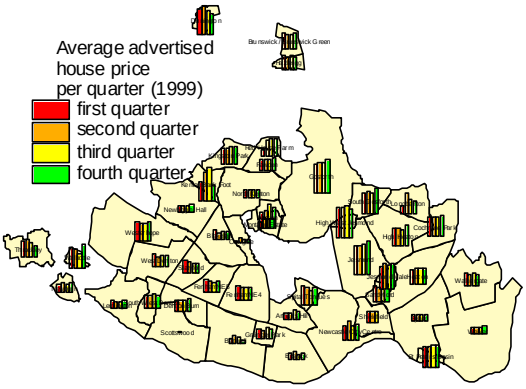
The working structure for the data was initially hierarchical around five key themes, covering the scope of *housing, education, unemployment, health* and *crime.* This has since become a series of clustered indicators with more explicit links to the expressed policy aims. They are deliberately not traditional thematic groupings but 'data clusters' that ideally stress the integrated and holistic nature of decision-making. The initial measures were restructured and expanded to cover themes of *cosmopolitan capital, competitiveness, citizenship, quality of life* and *social inclusion*.

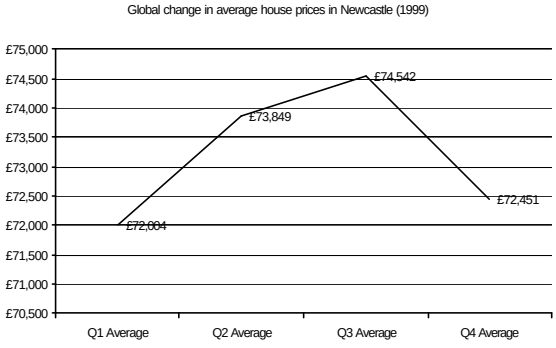
The indicators have been integrated on a consistent spatial basis (utilising customised *ArchView* GIS, *Spatial* and *Network Analyst* add-ons and database management software packages) and presented as a series of dis-aggregated measures. The set of indicators being linked intuitively rather than statistically (using pattern recognition based on consistently comparing individual indicator maps). This form of heuristic urban model and the developmental approach was aimed at transparency and utility in explaining urban complexity. As this conceptual framework remains dis-aggregated with individual indicators unweighted, it is open to non-expert interpretation and localised analysis. The dis-aggregated and accordingly simple basis for underlying data structures makes this an extremely flexible and adaptive framework. Additional 'spatial data layers' can easily be added at the appropriate level of decision-making and immediately linked to core indicators. The underlying database can additionally provide in-depth area data presentation and analysis for understanding localised conditions and interactions – thus not only highlighting geophysical 'hotspots' but also indicating the linked factors causing any 'hotspot'.











Within the proposed data structure each layer is artificial while being potentially interactive and affected by the users. It is principally designed to simplify a plethora of complex interrelated data sets, it also provides a starting point for those interested in asking more questions and exploring the underlying data in more depth.

This is similar in concept to that of ‘augmented reality’ (Mitchell 1999 p40-41) where different agents have the ability to view the urban system, and the spatial indicator data held to explain this system, in a way that matches their own requirements for information. The act of doing so has an impact on the user.

Issues and problems in past and recent regeneration initiatives and their information base

Despite the initial inclusiveness of the information team and its members enthusiasm together with the successful team building and bonding exercises which all helped to overcome difficulties, problems did emerge early in the process.

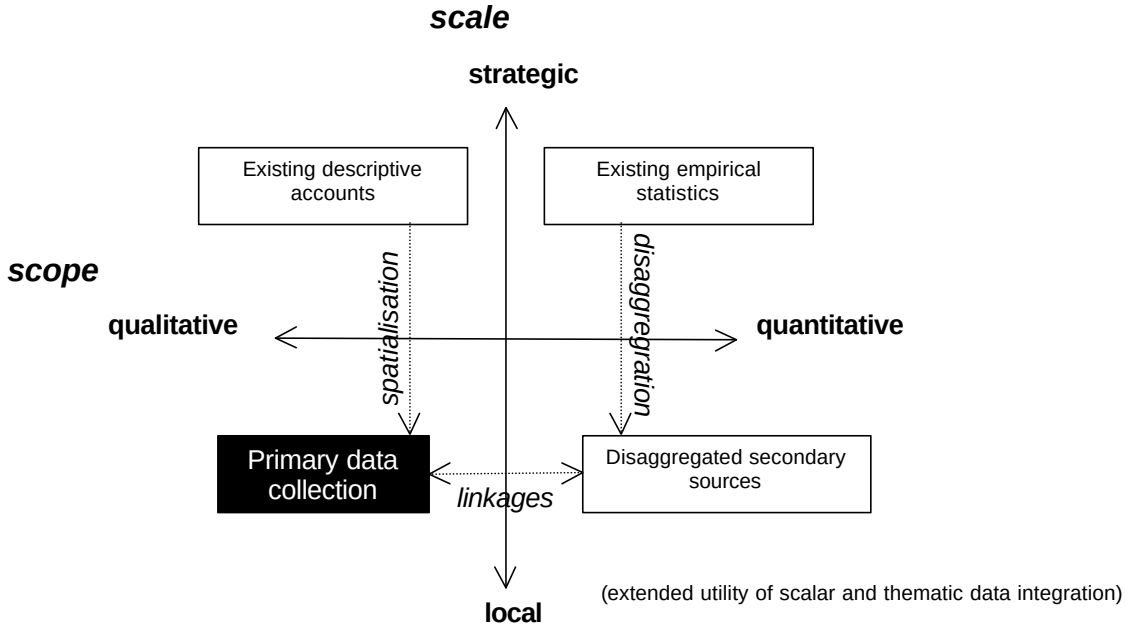
A management perspective of information can be limited, as reflected in the resources (time and technical support) and the level of forward planning allocated to the task. The immediacy of day-to-day pressures can replace the desired holistic overview with urgency. Pressure can also create a low level of morale within information professionals as political expediency forces compromise.

In addition, the lack of any definable *information product*, caused a separation from the on-going procedural aspects, such as communication and participation, from the information team.

The regeneration experience provides a number of lessons for the role of information management:

- Data was regarded and planned as a short-term static task, whereas it is ongoing longer-term and dynamic.
- The time and effort required to generally agree, access and assemble key information and indicators from across the organisation was underestimated by the information team.
- Maintenance and quality assurance procedures were not established and the organisations were often more protective of information rather than the giving of it. This was true even when information was in the public realm.
- *Learned mistrust* became an important underlying issue which worsened as early high expectations were not met; information activities tended to reinforce this view rather than mitigate it and this compromised relations with potential data providers and consumers.
- The Information Group and Participation Groups were not integrated and this separated the information collected from the information disseminated. Thus, whenever information was presented it was in an overly simplified (aggregated) but glossy ‘powerpoint’ format.
- Data was not quality checked adequately and metadata was omitted before use and communication. The doers and the sceptics within the information group were polarised and alienated further.

Changes to the process – The missing layers



The initiative showed some success in achieving a broad scope of thematic indicators mapped and linked to a decision support framework. However, it also highlighted different and opposing meanings of holism and integration held by different participants.

Both scalar and thematic data is required for the conceptual framework. A number of thematic and qualitative 'gaps' were highlighted and required further data. The identification of data 'gaps' can be thematic, scale-dependent or due to problems of data reliability (collection methods, scale / abstraction / aggregation, frequency and updating issues). The initial regeneration initiative suggests that the key areas of omission of data *qualitative* and *spatial*. Public data collection is dominated by the needs of empirical monitoring and fails to address key areas of qualitative research, such as perceptions, attitudes and their links with individual household behaviour. In addition, spatial referencing is based on institutional boundaries, creating problems in disaggregating data at a scale appropriate to a community organisation.

This could be addressed by additional primary data collection or via the manipulation (spatialisation or aggregation/diaggregation) of existing sources.

The focus of the Social Exclusion Project

> "If the community is seen as a series of layers, beginning with the house, the block, the neighbourhood, and the politically defined community, it is clear that most people come in contact mainly with the first two." (Gans 1972 p21)

The current stage of the project is an investigation into the collection, integration on a spatial basis and presentation of 'soft' indicators at a more localised community level. The thematic 'gap' in decision-making, if not also in knowledge of urban systems, is the qualitative attributes of place and community. These 'soft' attributes are assigned to possible indicators, each with its own means of collection on a spatial format. While many of these approaches superficially appear to be unscientific in their collective / individual representation of values, or the transference of mental constructs to a geophysical Cartesian base, it is argued that they are as objective as quantifiable indicators. If they are presented as complementary to 'hard' indicators, they can significantly improve the understanding of patterns and interconnections within a spatial urban system.

Madanipour (1996) provides a useful and through review of 'soft system' issues relating to the urban environment; factors which link perceptions and behaviour and the physical and mental constructs of our environment. One of the key factors of such qualitative and subjective aspects of urbanism is the need for a bottom-up or "micro-perspective" (p74) analysis, based on locality or individual specific studies.

Power of information, principles of operation and data protocol

It is recognised that even the act of defining the different scales in a layered data model is to some extent a technocratic process of defining community. Each of the layers is an abstraction and has to be described and communicated in this context.

Primary data collection is never an end in itself and the use of the material will be value-laden and political. Providers of data (municipal sources through to individuals participating in a household survey) can be cautious of the intended use of their resource and the extent of potential users. They may even adapt their data contribution in response to their perceived fears or wishes over the eventual use of the data. In response and in order to make them practical, there has to be additional procedural requirements in the collection and use of material.

Apathy and 'research fatigue' can be a limiting factor in the involvement of community and residents' groups. 'Research fatigue' is a way of describing a one-way process of data collection, namely from community to researcher, that lacks any feedback on the use of, or findings from the information collected. Communities and individuals who have a history of involvement in survey work, of whatever form, expect to be informed of the outcome of this collection work and maintain a desire for evidence to show how it has been used. Thus, work in similar areas with this apathy may already be well-resourced in local data, but lack of honesty and feedback on data utility and functionality may have created mistrust in any survey or analysis process. In this principle of operation, there is an implication to make the best use of secondary sources and improving analysis beyond the intended use of these sources, combined with a commitment to feedback to data providers.

The non-expert base for the use of information combined with the above factors has resulted in a need for validation and feedback on the relevance, accuracy and presentational appropriateness of the spatial indicators. This validation is partly to assist in raising the relative weight of the soft qualitative evidence next to empirical evidence

and partly to help build community based networks and trust between the consumer, provider and curator of indicator information. Validation is possible by 'triangulation' where data from a mixed and multi-method approach is self-reinforcing. However, I believe the process of two-way information exchange warrants validation by feedback and checking with the data providers and those subject to primary survey work.

Principles of use of information
Honesty and objectivity in collection and communication, Validation through feedback, Make best use of existing primary data sources, Adapt secondary data sources from a mixed and multi-method approach.

The social exclusion project is extending the principles of operation to incorporate metadata and become the basis for an *information protocol*. A means by which both the consumer and provider of information makes moral and professional commitments to ensure correct use of data and avoid and abuse of trust. Potentially it would provide a quasi-legal basis for integrating values (analytical considerations) into the urban management process, and be a tool for aiding participation in this process.

There is assumed power in the control (editorial and collection) of information sources. Mistrust and suspicion over those who collect, control and maintain any spatial database is real. Community sectors are very aware of the potential abuse of data for political ends, this sort of abuse being more likely if the data is built into a technical model which cannot be challenged by non-experts. Any protocol would need to address such issues and it would be advantageous to customise the protocol to specific consumer / provider relationships. The suggested protocol would need to adapt to the dynamic nature of urban data sources and the changing consumer / provider relationship over time.

The initial focus of the project has been the use of a range of low cost, non-expert and 'passive', approaches for primary data collection on a spatial basis to fill identified 'data gaps'.

The ultimate aim of the project is to facilitate *information exchange* and *integration*. To achieve this, there are significant requirements to spatialise qualitative / descriptive accounts from source documents, primary or secondary sources and to aggregate or disaggregate centrally produced empirical statistics as appropriate to the level of data required by decision-makers. This is beyond mere data collection. The evidence-base requires a methodology that, due to the bias towards low-cost non-expert techniques, makes the best use of existing data sources prior to developing new primary data collection methods. It also implies any primary collection techniques that maximise the potential utility of the information.

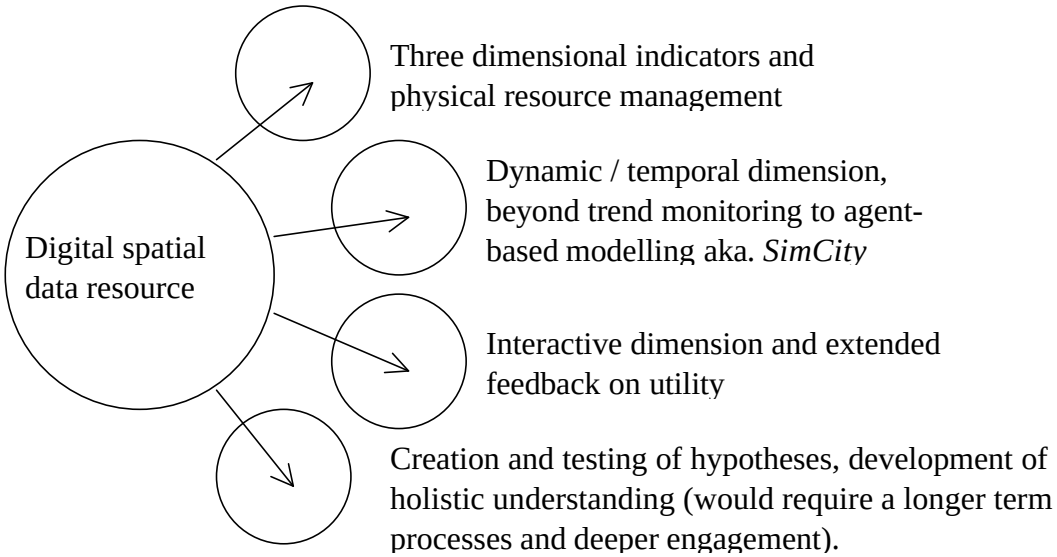
Integration with action - Defining the relationship between data consumers and providers

The social exclusion project is also looking at the 'packaging' of information, to demonstrate the potential improvements to utility and functionality, of Information Technology and the behavioural and attitudinal links suggested above. The only way to investigate the multiple feedback between improving knowledge (although still only partial) and action (changing behaviour, attitudes or perceptions) is by direct interaction between providers and consumers of information, however artificial this distinction may be. Working through this process is a means of redefining the interactions and roles in such relationships.

http://www.newnet.org.uk/atlas/

This project will look at baseline snapshot information exchange, geographical groups, basic and short-term participation processes (based upon a small number of meetings). it will provide a digital database suitable for spatial representation and comparison (based upon consistency in visual representation, notation and icons), integration and interaction of different communities viewpoints.

The work will be both: (i) the communication of simple and intermediate analysis (and techniques); and (ii) ;'raw' data suitable for communities to undertake their own analysis (including the raising of capacity of communities to do this and develop their own understanding). It should be remembered that this analysis does not have to be on a spatial basis. Alternative categorisation of communities besides geographical (For example; ages and lifestyles, attitudinal groupings) will be identifiable from the database.



(The views expressed in this paper are authors' own and do not necessarily represent those of Newcastle City Council.)

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Contribution to the implementation of European nature protection instruments: the ENVIP-Nature project

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Abstract

The project entitled ENVironmental Indicators for Nature Protection - ENVIP-Nature - is a component of the EURO-LANDSCAPE Project of the Joint Research Centre/Space Applications Institute institutional activities of the Fifth framework Programme of the European Commission. It has the objective to develop criteria and indicators to aid the reporting on the performance achieved by European nature protection policies and to provide technical and scientific assistance to the integration of biodiversity issues into sectorial policies. For these purposes, the use of the NATURA 2000 database is demonstrated as well as the application of the ecological network concept for selected ecosystems, habitats and species of European importance. The study strategically targets the lower levels of decision-making according to European recommendations and therefore focuses on the local and regional scales. The project should also demonstrate the potential of using Earth Observation data within a multi-source and multi-scale GIS system.

ENVIP-Nature's harmonised reference product will consist in:

1. A harmonised landscape typology system and associated database enabling the characterisation of relevant landscape elements including their structure and function relevant for biodiversity assessment.
2. A harmonised and spatially referenced set of indicators for the assessment and further monitoring of the landscape with respect to biodiversity.

The methodology is tested over a representative set of pilot areas selected in natural and semi-natural European terrestrial landscapes belonging to different biogeographic regions and including Natura 2000 candidate sites.

The present paper starts with the general context, emphasises the relationship between the landscape composition and structure and the floristic and faunistic species diversity and the necessity to apply a holistic and integrated landscape approach. After introducing the concept of ecological network, the European legal framework and the current progress in implementing the Natura 2000 ecological network are presented. Finally, the aims and methodological approach of the ENVIP-Nature project that is adopted in such framework and the preliminary results are presented.

Keywords: nature protection, ecological network, landscape typology, indicators, Earth observation, GIS.

1. Introduction

The richness and uniqueness of natural and cultural landscapes in Europe is widely recognised. European ecosystems comprise a large diversity of habitats and a rich flora and fauna, with endemic species in almost each country that are vital to protect. Despite many national and international initiatives to preserve this natural heritage since the seventies (Agenda 21, Convention on Biological Diversity (CBD[1]); among others the Bern, Bonn and Ramsar Conventions, EU Habitats and Birds Directives), the biological and landscape diversity of Europe continues to decline at a rapid rate. Indeed, the *Europe's Environment: Dobrís +3 Assessment* stated recently that 'the threat to Europe's wild species continues to be severe and the number of species in decline growing (EEA [2]). Biological diversity is understood here as the variability among living organisms and the ecological complexes of which they are part. This includes diversity within and between species and of ecosystems (CBD[1]). Noss[3] proposes a characterisation of biodiversity that identifies its major components at several levels of organisation. Three primary attributes of ecosystems characterise his concept of biodiversity: **composition, structure, and function**. The 3 attributes determine, and in fact constitute the biodiversity of an area. **Composition** has to do with the identity and variety of elements in a collection, and includes species lists and measures of species diversity and genetic diversity. **Structure** is the physical organisation or pattern of a system, from habitat complexity as measured within communities to the pattern of patches and other elements at a landscape scale. **Function** involves ecological and evolutionary processes, including gene flow, disturbances, and nutrient cycles.

Several causes are indicated for the decline of biodiversity on the Pan-European level (EEA[2]). Traditional farming has given way to intensive agriculture, a process accelerated by the Common Agricultural Policies, with enormous effects on the rural landscape (intensification in areas favourable for agriculture production and marginalisation in less favoured areas). The strong focus of forest management on short-term economic targets has caused a decline in forest biodiversity. The policies pursued in industry, infrastructures, transport and energy production are having a direct and damaging impact on the landscapes. Demographic and socio-economic changes (move of people from countryside to cities and vice-versa, population growth) are also affecting the landscapes. Maintenance and re-generation of natural and semi-natural ecosystems are rendered difficult in this general context. Indeed, over the last decades, the loss and fragmentation of natural and semi-natural ecosystems and the banalisation of landscapes are the main trends observed. As a correlative consequence of these changes, the biological diversity of fauna and flora is also decreasing in quality and quantity. This is illustrated in figure 1. The above emphasizes the necessity to adopt a holistic and integrated landscape approach in order to tackle properly the issue of biodiversity conservation. Landscape is then recognised as a unique mosaic of biotic and abiotic features (for example: cultural, natural and geo-morphological features).

Traditionally, biological conservation has been focused on reserves (size, shape and number). Establishing protected areas sets aside land to perpetuate the valued floral and faunal entities that occur there. However, these limited areas of land do not necessarily

embrace all the elements necessary for their maintenance. To counteract the undesirable consequences of landscape fragmentation and isolation processes, the urgency of a response that is going beyond the protected area principle and considers the landscape as a whole was raised. A proper mosaic management requires to pay attention to all the features of a landscape and to their interaction, in order to determine the fate of local populations in habitat patches (Hanski [4]).

Current initiatives to assess the state and trends of biological and landscape diversity are often purely quantitative (e.g. protected area statistics, number of species), strongly selective (site or species oriented case studies) or based on aggregate or surrogate information because of severe limitations in data supply/access. As a consequence, European biodiversity and landscape issues as well as policy impacts are far from being adequately described, let alone properly communicated to decision makers and the wider public.

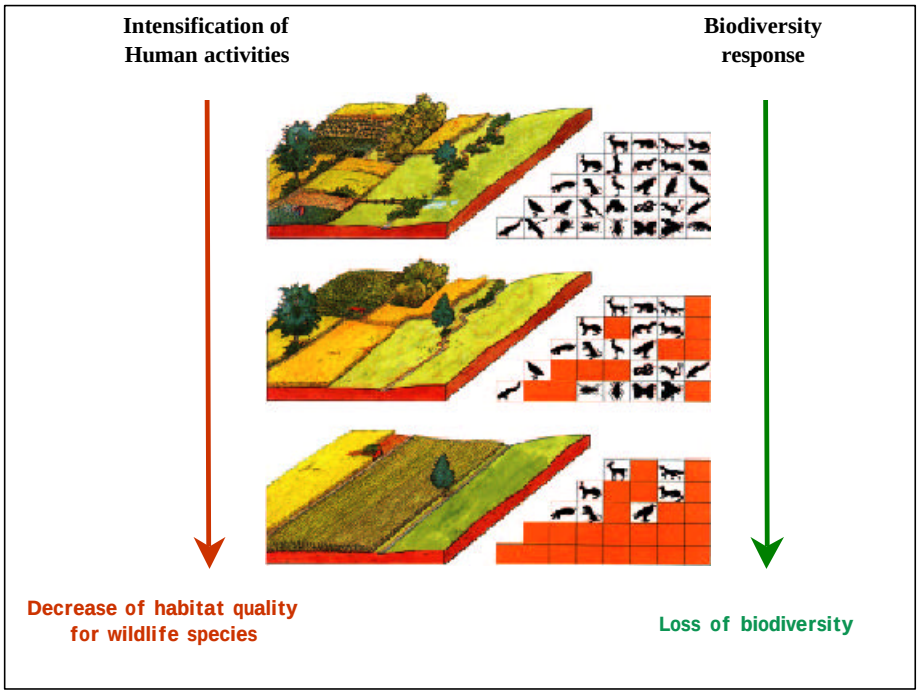

Figure 1: relationship between landscape structure and composition and fauna species diversity (adapted from Melin, 1995)

The project untitled ENVironmental Indicators for Nature Protection - ENVIP-Nature - has been developed within the above presented context with the objective to develop methods, criteria and indicators to measure the performances of European policies with respect to nature protection and to provide technical and scientific assistance to the integration of the biodiversity issue into sectorial policies. The present paper is structured in three parts: The first chapter introduces the concept of ecological network often seen as a valuable tool to tackle the biodiversity conservation and nature protection issues. The second chapter presents the major policy instruments currently available at European level to halt and reverse the deterioration of biodiversity. The

third part presents the ENVIP-Nature project, its aims and the methodological approach adopted in such framework.

2. Concept of the ecological network

The ecological network concept aims to enable wildlife and their habitats to be better integrated in a landscape that is also used and managed for a variety of purposes. It is often seen as a valuable tool to address the integration of environmental issues in land use planning and management and to reach sustainable development in the long term.

The main elements in the landscape that influence survival and dispersal of species are the area of undisturbed natural and semi-natural sites, the distance between them, the presence of corridors and the barrier effects of the landscape and land use in between (Opdam [5]). The idea was therefore conceived to connect conservation zones like protected sites through ecological corridors to favour species circulation and to create buffer zones around core areas (Bennett, [6]). The following elements should compose an ecological network:

Core areas to give the optimal ecological space needed, in quantity and quality, for a species or a group of species. At the European level, it should include representative sites of European importance in terms of biological diversity and naturalness.

Biological corridors to improve the coherence of natural systems. Corridors should provide the necessary connectivity between core areas enabling meta-population's functioning and/or individual dispersal and migration essential to the species life cycle. They should be able to provide the sufficient habitat for the survival of population species, the access to reproduction and wintering zones for migratory species and genetic exchange between sub-populations. They should enable species to migrate from core areas to nature development zones.

Nature development areas to repair or restore damaged elements of ecosystems, habitats and landscapes of European importance. Those areas have the potential to become core areas or corridors. At the European level, the aim is to increase the conservation effect of the ecological network by improving the environmental condition within it and by extending the network to natural restoration areas of European value, especially the degraded ones. The priority is the counterbalancing of the habitat fragmentation effect.

Buffer zones, where management objectives should be to protect core areas and corridors against negative impacts. They may also contribute to enhance the conservation value of the ecological network by enlarging the size of core area appropriate for several species, by reducing the edge effect of core areas, and by functioning as a corridor between core areas.

The ecological coherence of the network should be ensured by the interconnection of core areas, corridors and buffer zones as shown schematically in figure 2, and by taking into account the inter-related species characteristics, habitat quality and landscape structure.

Figure 2: Spatial structure of the ecological network (Bennett, [7])

To be effective, this concept should be adopted at various hierarchical levels (local, regional and European) and clearly should have a European scale of concern. Indeed, the function of a given element in the network depends on the level at which it is observed and the species under concern. Areas of local importance (nature reserves, areas of ecological value, plant and animal refuges) may play the role of core areas at the lower level of the ecological network (local level) and may become an element of an ecological corridor at the middle hierarchical level (regional level). This leads to address the issue of biodiversity conservation into a hierarchical system of decision, where the upper level of decision is based on the measures adopted at lower levels (Savard [8]).

To become a reality, the creation and implementation of the ecological network concept for the European level firstly requires objective, comparable and updated data sets at various scales related to the biological and landscape diversity and related to sustainability by linking environmental and socio-economic aspects.

3. Legal framework at European level for nature protection

The Convention on Biological Diversity (CBD[1]) and other related conventions acted as a driver for Pan-European and European strategies and programmes and gave the guidelines for biodiversity conservation in Europe. The Pan-European Biological and Landscape Diversity Strategy, adopted in 1995 by the Ministers committee of the European Council, provides a frame of recommendations among which the implementation of a Pan-European Ecological Network (PEBLDS[9]). At the European Union level, the European Community Biodiversity Strategy (ECBD) (CEC[10]) is the political framework of the application of the CBD. Its aims are to contribute to halt and reverse the current loss of biodiversity by placing species and ecosystems in a satisfactory conservation status both within and beyond the territory of the EC policy.

Although the Member States have a long history of gathering detailed data at the local level, particularly on the native flora and fauna, harmonised data and spatial information on terrestrial ecosystems, habitats, species and landscapes - within and outside protected areas - are widely lacking at national and European levels. To improve and harmonise the already available information, DG-ENVI of the European Commission is currently setting up a harmonised and coherent European Ecological

Network (1995-2005) commonly referred as NATURA 2000 and designed to maintain both the distribution and abundance of threatened species and habitats of the European Union territory. The list of Sites of Community Importance that will make up its core areas will comprise protected areas established under the *Directive on the Conservation of Natural habitats and of Wild Fauna and Flora* (92/43/EEC) and the *Directive on the Conservation of Wild Birds* (79/409/EEC amended under 91/244/EEC and 94/24/EEC) [CEC,11]. In the latter, the Member States have to determine as Special Protected Areas (SPAs) the most appropriate areas of their territories for the protection of wild birds and their various natural habitats. In the former, they have to determine as Special Areas of Conservation (SCAs) the most appropriate areas of their territories for the protection of habitats and species called 'of Community interest'. Habitats 'of Community interest' are those whose natural distribution is very limited or has dramatically decreased on the EU territory (dunes, heath, bogs, coastal habitats, etc), or habitats which are remarkable and representative of one of the biogeographic regions of the EU (larch forests of the Alps, Atlantic salt meadows etc). Species "of Community Interest" are vulnerable, threatened, rare or endemic species. Member States are encouraged to strengthen the functioning of NATURA 2000 by protecting landscape elements which by their virtue of their linear and continuous structure or their function as stepping stones are essential for species migration, dispersal and genetic exchange. They should endeavour in their land-use planning and development policies and in order to improve the network' ecological coherence, to maintain those important landscape elements. Finally, they should report every six years on the conservation measures implemented and their impacts and also evaluate the progress achieved and the contribution of Natura 2000 to the overall objective of the conservation of habitats and habitats of species.

Each Member State is currently providing to DG-ENVI a list of candidate sites each documented according to the Natura 2000 template. The completeness of the national list, the sites' documentation, the relevance of the sites for the "Community interest" criteria are examined during seminars that have been held so far for the Alpine, Boreal, Atlantic and Continental biogeographic regions. In DG-JRC, a prototype GIS has been designed to integrate and further quality check the thematic and geometric information provided for each site. Once the sites' selection and integration will be completed, the next step will consist in monitoring and updating the network. The development of criteria and indicators will then be necessary in order to evaluate the state and pressure on the network, identify gaps and finally monitor the progress towards the Directive's target. It has to be noted that so far, buffer and corridors are neither requested nor mentioned and defined in the EU Directive, only the quoting of Natura 2000 as an ecological network may intend a further consideration and implementation of such elements. However, the maintenance of landscape elements outside the core areas is explicitly encouraged and the selection of nature development areas for the restoration of habitats is requested.

Last but not least and going further than the nature protection principle, several European policies and directives explicitly recommend the integration of the biological and landscape diversity issue into sectorial management plans such as agriculture, transport and regional development. The development of tools, the definition of criteria

and indicators for this purpose is often explicitly mentioned. The existence of NATURA 2000 could facilitate this exercise. Indeed, at regional and local levels, the Natura 2000 network could also be a valuable tool for facilitating sustainable land planning and development policies in agreement with European recommendations. Also at European level, it could be the operational frame of the proposed European Spatial Development Perspective (ESDP,[12]) which focuses on a multi-sectorial sustainable development in order to protect the environment.

4. Role of the ENVIP-Nature project for nature protection and biodiversity issues

4.1 Objective and methodological approach

The project entitled ENVironmental Indicators for NATURE Protection - ENVIP-Nature - is a component of the EURO-LANDSCAPE Project of the Joint Research Centre/Space Applications Institute institutional activities of the Fifth framework Programme of the European Commission. It has been developed within the above presented context with the objective to develop criteria and indicators to aid the reporting on the performance of the Natura 2000 network and to provide technical and scientific assistance to the integration of the biodiversity issue into sectorial policies. For these purposes, the use of the NATURA 2000 database will be demonstrated as well as the application of the ecological network concept for selected ecosystems, habitats and species of European importance. This is tested in natural and semi-natural European terrestrial landscapes that are selected in different biogeographic regions and include Natura 2000 candidate sites and other protected sites. The set of pilot areas is representative in terms of landscape composition, structure and function, biodiversity, land use practices, socio-economic development and trends acting as factors and constraints for nature protection. The study strategically targets the lower levels of decision-making according to European recommendations and therefore focuses on the landscape and regional scales. The feasibility of a common reporting to the European level is addressed through the harmonisation of the results over the different biogeographic regions. Among the major objectives, the project should also demonstrate the potential of using Earth Observation data within a multi-source and multi-scale GIS system dedicated to nature protection.
The project will be carried out according to the following steps:

- definition of criteria
- establishment of the relationship between certain animal species and their habitats
- definition of a tailored landscape typology system with respect to biodiversity
- application of indicators at species and landscape level

Criteria are derived from guidelines established at the level of the European and Pan-European biodiversity conservation strategies. Criteria provide a vision of what is important to take into consideration in order to reach the aims set by such guidelines. In the frame of the Natura 2000 network, three criteria, namely *naturalness*, *diversity* and *threats* hanging over natural and semi-natural habitats and species are used to choose

potential candidate sites. They will be the starting point of our study and will be investigated for the whole extent of each pilot area, even though other criteria may also be examined.

The methodology is set upon an integrated landscape ecology approach to biodiversity assessment that is built upon the relationship between landscape composition and structure and the floristic and faunistic species diversity as illustrated in figure 1. This relationship will be established by multivariate analysis for selected groups of species for which the requirements in terms of landscape elements including habitats are well known.

The study will then attempt to define a tailored landscape typology system with respect to biodiversity assessment and check the currently available databases. For this purpose, the use of multi-scale remote sensing data will be investigated within a multi-source and multi-scale customised GIS system. Biodiversity information relies on field surveys, Natura 2000 records and will guide the selection of species to concentrate on.

Finally, indicators will be developed in the framework of the OECD-model called "Pressure-State-Response" (OECD [13]) and it's slightly extended model "Driving Forces - Pressures - State - Impact - Responses". Indicators are considered one of the most effective vehicles of linkage between science and policy. They are powerful tools for clarifying values and informing decisions with regard to development planning, and can assist in analysing trends and in thinking systematically about performance and impacts of policies. Indicators can be used to provide decision-makers with useful information on the status and trends in biodiversity and to help determine if broad goals and targets for conservation are being attained (Reid [14]). The OECD model represents a systems analysis view of the relations between the environmental system and the human system. Three types of indicators will be considered in this study:

- *Pressure* indicators describe developments in release of substances (emissions), physical and biological agents, the use of resources and the use of land and characterise the *threat* criteria. They will be derived from socio-economic data but also from land use maps; pressures change the state of the environment and result from driving forces that describe the social, demographic and economic developments in societies and that should be identified.
- *State* indicators give a description of the quantity and quality of physical, biological and chemical phenomena in a certain area and characterise the *naturalness* and *diversity* criteria. They will inform on both landscape and species levels.
- *Response* indicators refer to responses by groups and individuals in society, as well as government attempts to prevent, compensate, improve or adapt to changes in the state of the environment. Policy responses targeted here is the Habitats Directive including the set up of Natura 2000, that adopts appropriate policy measures to control the impacts of driving forces. Sectorial measures should rectify the negative impacts of pressure factors.

The first two sets of indicators should help to diagnose the landscape with respect to biodiversity and measure over time the progress achieved by Natura2000 towards its targets. Modelling techniques simulating potential habitats will support this evaluation. Indicators should include ***baselines*** to measure change from a certain date or state,

thresholds to serve as 'early warning systems' of problems, and ***targets*** to reflect tangible performance objectives (UNEP/CBD, 1997). Actually, these three components are still often lacking, and despite the huge amount of available data, it is not easy to say whether the state of our nature is getting better or worse for lack of data harmonisation and information. In many cases we are "data-rich information poor".

Finally, the ENVIP-Nature harmonised reference product will consist in:

1. A harmonised landscape typology system and associated database enabling the characterisation of relevant landscape elements including their structure and function relevant for biodiversity assessment.
2. A harmonised and spatially referenced set of indicators for the assessment and further monitoring of the landscape with respect to biodiversity.

The harmonisation issue will be investigated by biogeographic regions or/and other relevant spatial unit and characteristics to be defined.

4.2 Preliminary results

Until now high resolution optical images have been acquired on about 35 sites in different countries belonging to different biogeographical regions of Europe. Six of these sites are currently studied more thoroughly as pilot areas in the frame of two study-contracts awarded early 2000. These six pilot areas are included in five different biogeographical regions (Alpine, Atlantic, Boreal, Continental and Mediterranean). Both study-contracts are addressing the two ENVIP-Nature issues, namely the harmonised landscape typology system and the development of tailored indicators, for both the local and regional scales. In parallel, a user requirement study is being made through a questionnaire made to Natura2000 experts in the different Member States to which the pilot areas belong.

Preliminary results over five pilot areas (Killarney National Park (Ir), Färnebofjärden(SW), Schneeberg-Rax (Au), Transborder Sumava/Bohmerwald(Au/De/Cz), Mallorca(Sp)) are presented in the poster session of this conference and can be found in the paper untitled "Deriving Indicators for Nature Protection by Means of Earth Observation Data and GIS" by Gebhard BANKO, Roland GRILLMAYER, Werner SCHNEIDER, Joachim STEINWENDNER, Christine ESTREGUIL.

The sixth pilot area covers the area of Namur (Be) for the local scale and also addresses the regional scale for the administrative unit of Wallonia in Belgium. Wallonia has a very fragmented land cover and is well known and finely mapped. The knowledge of UCL-MILA in developing a very fine landscape typology for Wallonia, based on aerial photographs 1/5.500, gives the ideal starting point for comparing different typology systems at different scales, resulting from different information sources. With respect to the regional scale, the relevance of the European widely available, harmonised and geo-referenced CORINE Land Cover database (nomenclature and scale) and its correspondence with the Palaeartic Habitats classification derived from the CORINE Biotopes project are investigated for further characterising the *state* and *pressure* criteria. Preliminary results related to the relevance of CORINE Land

Cover (CLC) for mapping the spatial distribution of habitats and informing on the *state* of the landscape with respect to biodiversity are reported hereafter.

A comparison exercise of the CLC and the Habitats classification was carried out on the classes relevant for Wallonia and showed that several types of relations exist between both typologies. An ambiguous relation exists for 'generic classes', where the same habitat type can be found in several CLC level 1 classes (for example the habitat class level 2 'Fallow, abandoned land' is found in CLC classes "Artificial surfaces", "Agricultural areas" and "Forests and semi-natural areas"). An 'enclosure' relation exists when a CLC class is described by different habitat classes belonging to different levels of the Habitats classification. This is for example the case with CLC class level 3 "Pastures", including habitat types belonging to habitat classes level 1 "Part of scrub and grassland", "Part of agricultural land and artificial landscapes", and "Wooded heathland and 'bocages'". The differences between the typologies and their organisation reflect the different logics of classification: CORINE Land Cover, based on a combination of land cover and land use data, follows an 'anthropisation' logic while the Habitats classification is based on great vegetation groups based on the physical environment. The types of relations together with the complementarity of the two typologies should be further analysed.

Besides the correspondence of typologies, the scale issue also appears as a major problem for using CORINE Land Cover to map the distribution of habitats. Habitats generally range from a few meters to hundreds of kilometers. Actually, CORINE Land Cover is at scale 1/100.000, all habitat patches smaller than 25 ha (0.25 km^2) and all linear elements with a width inferior to 100 m are not mapped. Those elements and patches are either merged into a neighbour class or grouped into heterogeneous classes such as the "agricultural land with natural vegetation" and the 'mixed forest' classes, that then usually indicate a higher diversity of habitats.

To illustrate the above mentioned CLC limitations and their consequences for the characterisation of the landscape *state* with respect to biodiversity, a comparison between the forest classes and areas as determined with CLC and as described by the forest inventory of 1996 (Lecomte [15]) was made. In a region very fragmented like Wallonia, forest habitat patches larger than 25ha are rare and when any, they are coniferous stands resulting from afforestation which have less interest from the biodiversity point of view. Moreover, no mixed forest class is reported in the forest inventory, whereas it is the biggest forest class in CLC (Figure 3). The total forest cover from both sources is very similar. Broad-leaved and conifer forests are juxtaposed in a mosaic of small homogeneous stands of approximately 3 ha, that seen from the 25 ha aggregated CLC point of view appears as 'mixed forests' ('vegetation formation composed principally of trees, including shrub and bush understoreys, where neither broad-leaved nor coniferous species dominate'). This CLC class means either a mosaic of homogeneous stands or a real mixed tree by tree forest, where conifer and broad-leaved trees are mixed in a stand. The floristic and faunistic ecological meaning of the two is however different especially for plant and insect species. On the other hand, the presence of "mixed forest" as defined by CLC is an indicator of some bird species like

Aegolius funereus funereus (an owl species). This bird species requiring mainly conifers and some broad-leaved trees gives no importance whether the forest is really mixed tree by tree or if it consists of adjacent broad-leaved and conifer forest patches. Therefore, the broad level of information provided by CLC about the spatial distribution and diversity of great groups of habitats should be analysed very carefully and may prove to be relevant depending on the scale and type of the biodiversity issue under concern. On the pilot area of Namur, the value-added information brought by aerial photographs (1:5.500) (MILA/UCL[16]), by high resolution satellite images (SPOT 4 data), and by a simulated CORINE Land Cover with 1ha MMU, will be compared to the actual CORINE Land Cover nomenclature and scale. A scale and data dependent landscape typology system will be derived for Wallonia and will be further analysed together with the results over the five others pilot areas.

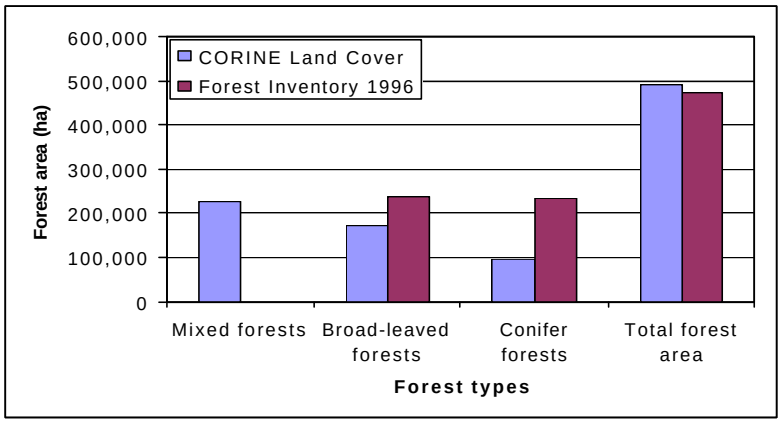

Figure 3: Comparison of forest areas of Wallonia from two different sources

Finally, with respect to reporting on the *threat* criteria for biodiversity at the regional level, the relevance of CLC for the identification of vulnerable or threaten broad areas due to their landscape composition and structure will be the next step of this study. Concerning the policy response issue, its usefulness as a background information within a GIS system will also be analysed to identify gaps in the distribution and the proportion of Natura 2000 candidate sites.

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Strategic Environmental Assessment in Britain: towards a more strategic form of decision making?

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Abstract

In this paper we tackle the spatial and methodological implications for assessment of the promotion of SEA at different levels of government in Britain. Within central government early efforts to introduce SEA were heavily reliant on cost benefit techniques, an emphasis which led to limited uptake of the process. More recent initiatives have sought to transform the SEA process into an accessible and useful tool for integrated decision making. Meanwhile, local government has made substantial use of SEA in spatial planning. Here different methods have been employed and SEA has gained a wide measure of legitimacy. Its impact on decision making has varied between councils, but real progress has been achieved and SEA is now widely accepted as an important element of land use plan making. One clear weakness in the application of SEA at a local level in Britain is however, that councils often prepare the SEAs of their land use plans without reference to the work of their neighbours. There is thus, at present, little evidence of a spatial hierarchy of SEAs developing. This weakness has been recognised in recent Government initiatives which have sought to establish a distinctive tier of regional government. In Scotland and Wales this has involved the creation of elected bodies, whilst the approach taken in England has led to the creation of regional agencies charged with promoting economic development. The characteristics and prospects of these various regional initiatives are reviewed and the implications for SEA and integration considered.

Introduction

The Labour government elected in Britain in 1997 has begun a programme of devolution and constitutional change that has significant implications for spatial planning. The traditional model of Britain as a highly centralised, unitary state is being challenged as powers in many policy areas for primary law making and for secondary law modifications are devolved to Scotland and Wales respectively. In England the creation of Regional Development Agencies (RDAs) offers another example of institutional innovation. The Scottish and Welsh bodies have new responsibilities for spatial planning, whilst the RDAs in promoting their development agendas will develop new relationships with the English local planning authorities. In addition, all of these bodies, excepting the Scottish Parliament which has created its own obligation, have duties to promote sustainable development.

Very swiftly a policy agenda has emerged in which planning and sustainability are being pursued by new organisations over a patchwork of spaces. But how will this affect the integration of environmental considerations into policy and planning? And how will the planning and development of different parts of Britain be affected? To answer these questions the paper addresses several themes. First, we outline central and local government efforts to incorporate strategic environmental assessment (SEA) into their work. We briefly review the approaches that have been adopted and their implications for the wider uptake of SEA. We then analyse the impact of devolution on sustainable development, concentrating on spatial planning. In doing so we highlight the different planning responsibilities of the devolved bodies and the ways in which these link to their development strategies. Our argument here turns on the recognition of sustainability as an important policy issue, which SEA can be used to feed into policy making. Moreover, devolution has focused attention on the management of space, an important consideration for more strategic forms of environmental management. However, the mechanisms for co-ordinating development between these spaces remain underdeveloped.

Central government and SEA

The strategic environmental assessment of central government policy making activities was introduced in Britain in the early 1990s. The environment White Paper of 1990 contained an government undertaking to develop "a more systematic approach…to the appraisal of …environmental costs and benefits before decisions are taken." (DoE [1]). Official guidance on environmental policy appraisal was issued in September 1991 and distributed to all departments (DoE [2]). The government maintained that environmental issues had always been taken into account during policy preparation and indicated that the new arrangements were simply intended to improve the efficiency and consistency of existing practices.

The *Policy Appraisal and the Environment* guide, prepared 'in-house' by a team of civil servants, was promoted as a supplement to existing Treasury guidance on economic appraisal (House of Commons [3]; HM Treasury [4]). The influence of these latter well-established practices is evident in the recommended methodology and techniques. The systematic evaluation of the costs and benefits of each policy option is particularly emphasised, with a selection of suitable appraisal methods being suggested. These include multi-attribute approaches (impact checklists and matrices), systematic subjective categorisation, cost effectiveness analysis, cost benefit analysis (and associated monetary valuation techniques), risk assessment, and weighting and scoring techniques (DoE [2]).

The remit of environmental policy appraisal is broad, covering policies, plans and programmes, and extending across all government departments. Thus the individual proposals subject to environmental policy appraisal vary considerably in spatial and temporal scale and level of detail. Such diversity calls into question the wisdom of promoting a standardised appraisal methodology. The feasibility of the favoured quantitative and cost benefit based approach diminishes as timescales extend, spatial

area increases, boundaries become diffuse, and proposals become increasingly general. The high levels of uncertainty and ignorance associated with strategic decisions detrimentally affect analysts' ability to represent phenomena in quantitative terms. In such circumstances careful consideration must be given to the suitability of cost benefit techniques.

One measure of the suitability of the recommended approaches has been offered by the frequency of their use. In recent years the government has published two reports on the progress which has been made in the practice of environmental policy appraisal (DoE [5]; DETR [6]). The first, published in 1994, reported on the practice and performance of departments, in the period following publication of the 1990 guide, and presented a confused picture. The report concluded that some progress had been made, but that further guidance on monetary valuation was needed and greater efforts could be made to disseminate best practice (DoE [5]). This first report served principally as a response to this latter concern.

A second more detailed study reported in 1997, and concluded that practice had increased and was broadly consistent with the spirit of the 1990 guide (DETR [6]). However, no conclusions were drawn about the extent to which the guide had been instrumental in this growth. On the ground appraisal varied significantly across policies and departments, characterised by the limited use of formal methodologies and recommended techniques (DETR [6]). The use of monetary valuation was significantly affected by time and resource constraints and methodological concerns. Multi-attribute techniques (checklists and matrices) due to their subjectivity and inability to enable comparisons across policies, and in spite of their ability to improve transparency and consistency were infrequently used. A common criticism from policy makers was concerned with the level of detail provided by the guide, which was considered excessive for those with a general interest in environmental matters, and insufficient to satisfy the demands of specialists (DETR [6]). The report concluded that environmental appraisal had failed to have, "the dramatic impact on policy appraisal methodologies that many might have hoped for at the time of its introduction." (DETR [7]).

The main conclusion of the study was, "that no single document can serve the needs of both officials with a peripheral interest in the environment and those whose responsibilities are more heavily focused on environmental issues." (DETR [8]). The report recommended that an environmental policy appraisal 'tool kit' be developed, offering an approach better able to respond to the full range of needs arising across government (DETR [6]). Rather than mechanically applying a standardised approach, departments would develop their own systems and processes for dealing with environmental issues. Consistency across departments would be ensured through the introduction of improved arrangements for disseminating experience and best practice, coupled with a strengthening of the monitoring and review mechanisms.

The general election of May 1997 brought a change of administration and installed a different political philosophy in government. The election manifesto of the Labour Party contained a commitment to, "put concern for the environment at the heart of policy-making", a statement which suggested that a renaissance for *Policy Appraisal*

and the Environment was imminent (Labour Party [9]). The new government seems to have taken on board many of the recommendations of the 1997 report on environmental policy appraisal. New guidance to policy makers was issued in April 1998, offering clear and concise advice on when and how to undertake environmental policy appraisal and identifying sources of information and specialist advice (DETR [10]). This was supplemented in 1999 by a further document which detailed sources of specialist information on environmental assessment and appraisal (DETR [11]). These targeted actions have not occurred in isolation, but have been supported by a range of other initiatives. Most prominent amongst these have been the strengthening of the Green Ministers network, and creation of the Cabinet Committee on the Environment and the establishment of the Parliamentary Environmental Audit Committee.

Whether these changes encourage greater frequency and consistency in the practice of environmental policy appraisal across Whitehall remains to be seen. There is some evidence that practice has increased in the period since the new guidance was issued, but differences persist between departments (Environmental Audit Committee [12]). The quality of appraisals is variable, and questions remain about the consistency with which departments are applying the technique (Environmental Audit Committee [13]). Environmental policy appraisal has yet to meet the aspiration of more environmentally integrated decision making at the national level that was raised by its introduction. The relatively modest progress which has been made with environmental policy appraisal in central government is in marked contrast to the considerable success which has been achieved at the local level.

Local government and SEA

In 1992 the government introduced a requirement for the environmental appraisal of land use development plans (DoE [14]). In Britain, local planning authorities (LPAs) are responsible for the forward planning of land use and have a duty to prepare and adopt development plans. The range of issues to be addressed in these plans is prescribed by government, via legislation, planning policy guidance notes (PPGs) and regional planning guidance (RPG). The status of the PPGs, as formal expressions of government land use and planning policy, coupled with the arrangements for development plan approval, obliges LPAs to ensure their plans are consistent with this guidance. Failure to comply with government policy can result in the delay or obstruction of plan adoption.

The planning system in England and Wales (Scotland and Northern Ireland have separate legislation and arrangements) consists of two distinct tiers. The first provides a strategic framework for relatively large areas (e.g. counties) whilst the second deals with land allocation at a smaller scale (e.g. districts or boroughs). Thus the structure plans prepared by county councils provide the strategic context within which district or borough councils prepare their more detailed local plans. In some areas a single LPA is responsible for both strategic and detailed land use planning. The unitary development plans prepared by these authorities are also tiered and include both strategic (Part I) and

detailed (Part II) policies. With the exception of structure plans, all development plans must be approved for adoption by the appropriate Secretary of State (i.e. Environment for English councils and Wales for Welsh councils). This arrangement means LPAs must ensure that their plans comply with government policy as set out in the national and regional guidance (DoE [15]). For structure plans however, the arrangements are slightly different. The Town and Country Planning Act 1990 (as modified by the Planning and Compensation Act 1991), identifies the proponent county council as the body responsible for deciding whether to adopt the plan. However, the Secretary of State retains powers of intervention, a provision which ensures county council compliance with accepted government policy (DoE [15]).

Land use planning is a distinctive form of strategic decision making, with a formal procedural structure not typically encountered in the policy making activities of central government. Specific decisions about the detailed structure of plans and the precise wording of individual policies are taken by the elected members of the LPAs. However, the framework for the preparation of these proposals is rigidly prescribed by town and country planning legislation and the PPGs. An important and fundamental assumption which underpins the preparation of plans is that development should be permitted; environmental considerations, whilst important, cannot be accorded precedence over economic priorities (DoE [16]).

The requirement for appraisal introduced in the 1992 revision of *PPG12: Development Plans and Regional Planning Guidance,* stated that the environmental implications of the development plan, "should be appraised as part of the plan preparation process." (DoE [17]). The appraisal process itself should involve systematically "identifying, quantifying, weighing up and reporting on the environmental…costs and benefits of the measures…proposed" (DoE [17]). Whilst establishing an expectation that councils prepare environmental appraisals of their development plans PPG12 offered little in the way of guidance. For further information they were simply referred to the *Policy Appraisal and the Environment* guide (DoE [18]). Further assistance was not forthcoming until 1993, when specific guidance was issued in response to the findings of a review of council practice (DoE [19]). The guide, *Environmental Appraisal of Development Plans: a good practice guide,* was prepared by consultants with significant input from councils throughout England and Wales (DoE [19]). Importantly, this work was informed by twelve detailed case studies of best practice. These studies were drawn from some of the more innovative LPAs, including the county councils of Lancashire, Kent and Berkshire (DoE [19]). As a result the new guide offered practical suggestions and presented a methodology that could be tailored to the needs and capabilities of individual councils.

The recommended methodology was straightforward and flexible. Councils were encouraged to experiment, adapting the suggested method to their particular needs, and using it to integrate the tasks of appraisal and plan preparation (DoE [19]). The methodology described in the guidance involved three phases of appraisal: an initial scoping exercise; the compilation of an inventory of existing environmental stock; and, appraisal of the likely impacts of the plan strategy and policies (DoE [19]). In order to cope with the breadth of issues addressed by development plans a multi-attribute

(matrix based) approach was recommended. This resulted in appraisal which was primarily subjective, but had the benefit of enhancing the transparency of the process (DoE [19]). The value of this latter consequence was emphasised by the importance which government placed on involving the public and other stakeholders (e.g. business) in the development plan preparation process (DoE [20]).

The simplicity and accessibility of the recommended appraisal techniques was crucial in encouraging consistency in the extent and quality of practice across local government. The guidance promoted a form of environmental appraisal that would be feasible for any council, irrespective of the extent, or otherwise, of their resources and technical capabilities. This strategy seems to have enjoyed considerable success. Available evidence suggests that in contrast to the reserved response received by environmental policy appraisal in central government, the councils have been enthusiastic in their adoption of environmental appraisal as part of the development plan preparation process. For example, Thérivel reports that the number of LPAs to have completed at least one environmental appraisal has been increasing steadily, from 60 in 1994, to 120 in 1995 and 180 in 1997 (Thérivel [21]).

The lead in environmental appraisal appears to have been taken by the English county councils, who have the highest completion rate and have produced some of the best quality appraisals (Therivel [21]). There is however, clear evidence that practice is progressing in all councils, with every indication that this trend will continue. The techniques recommended by the good practice guidance have been widely adopted, with authorities increasingly customising their appraisals as they become more familiar with the process. Perhaps the most important test of the success, or otherwise, of the environmental appraisal initiative is the extent to which councils have endorsed such exercises as being beneficial to the process of development plan preparation. In a recent survey of LPAs some of the benefits identified as arising from the practice of environmental appraisal included: improvements in the quality of the development plans; a greater degree of legitimacy; faster passage of the plan through the approval process; and, the identification of issues which would need to be addressed in subsequent planning rounds (Thérivel [21]).

In conclusion then, it would appear that at the local level environmental appraisal has been genuinely embraced and accepted as a valuable component of the development plan process. That is not to say that the environmental appraisal of development plans offers a perfect example of SEA. There are problems with the process, most notably the lack of integration across administrative boundaries. Whilst vertical integration does occur between local plans and the relevant structure plan, there is little evidence of efforts having been made to achieve a comparable degree of consistency between adjacent structure plans. So whilst environmental appraisal has proven a relatively effective tool for environmental integration within the context of the existing system of land use planning, there is little evidence of these efforts contributing to the emergence of a more cohesive approach at the regional scale.

Changing nature of space and planning

The traditional model of spatial planning in Britain has been one of a highly centralised and unitary state. Major decisions about future land use were the responsibility of central government. For example, the number of new houses to be provided in each region has been determined on the basis of national projections, with a similar approach used in respect of the extraction of aggregates for the construction industry. This 'project and provide' approach has become increasingly controversial in recent years, with several county councils challenging the quotas imposed on them by central government through the courts. In such cases central government has been accused of setting unrealistic and unsustainable targets, and of being unsympathetic to local concerns. The lack of a meaningful regional tier in the spatial planning hierarchy allowed central government to exert considerable direct control over action at the local level. The relationship between the key players in spatial planning, that is central and local government, has been asymmetrical and biased in the centres' favour.

Recent government reforms have placed an increased emphasis on the importance of the region. New forums for the government and planning of regions have been established extending the range and number of actors involved in spatial planning. This enhanced diversity suggests that negotiation and consensus will be necessary characteristics of these new decision making forums. The insertion of a regional tier in the spatial planning hierarchy potentially offers a means of moderating the control traditionally exerted by the centre. Whilst this will not necessarily lead to the pursuit of substantially different development pathways, the often adversarial and accusatory nature of relations between central and local government, and amongst local government, might be expected to change.

Devolution, planning and SEA

The devolution of responsibilities from national government to Scotland, Wales and the English regions has significant implications for environmental policy making and implementation. In order to understand fully what these will be three inter-related issues require attention: the responsibilities of the different bodies; their duties to promote sustainable development; and, their approaches to environmental management (including SEA). The powers devolved to the Scottish Parliament are greater than those of the National Assembly for Wales: the former has been accorded legislative power whilst the latter is merely responsible for particular policy areas. The range of sectors (i.e. transport, the environment and heritage) affected by devolution in both Scotland and Wales has been far broader than for England. The RDAs, as business-led bodies, lack the democratic legitimacy of the Scottish and Welsh administrations. Their key tasks include formulating a regional strategy, assisting in the promotion of regeneration, developing a Skills Action Plan, and taking a leading role on European funding. Essentially the creation of the RDAs has drawn together the existing responsibilities of a number of bodies, placing them within the remit of a single regional agency. In addition the RDAs have a role in promoting greater regional coherence and enabling the effective delivery of government programmes (DETR [22]).

The different responsibilities of the bodies in relation to planning and two key policy areas impacting on land development and sustainability (i.e. the economy and regeneration) are set out in the Table below.

Key planning and economic responsibilities and powers of the Regional Development Agencies, the National Assembly for Wales and the Scottish Parliament

	RDAs have responsibility for	**National Assembly for Wales has *responsibility* for**	**Scottish Parliament has *legislative powers* over**
Planning	• Rural and regional regeneration; • Administering the Single Regeneration Budget	• Determining policies on town and country planning and issuing guidance to local authorities	• Land-use planning and building control
Economy	• Co-ordinating inward investment	• Economic development, including the functions of the Welsh Development Agency and Business Connect network	• Economic development, including the functions of Scottish Enterprise, Highlands and Islands Enterprise and the local enterprise companies
Regeneration	• Contributing to the formulation of Regional Planning Guidance	• Promoting and supporting urban and rural regeneration	• Area regeneration, including the designation of enterprise zones

Although accorded more limited devolved powers than Scotland, Wales has a unique responsibility as the first government body in Britain to be given a duty to progress sustainable development. Under the Government of Wales Act 1998 the Assembly is legally required to prepare a Scheme setting out how it proposes, in carrying out its work, to promote sustainable development (UK Government [23]). For any legislature such a responsibility, if taken seriously, is formidable and for a Welsh bureaucracy that has limited experience of policy *making* (as opposed to *delivery*) and limited resources the challenge is all the greater. That the Assembly is taking this duty seriously is already clear. In its internal operations machinery of government and policy appraisal issues are being addressed to ensure that sustainability is considered across all its work. Its external relationships are also being reconsidered, so as to promote a partnership approach to the delivery of sustainable development. That policy makers in Wales face a considerable challenge in seeking to integrate the environment into their mainstream operations is evident. In a submission to the Environmental Audit Committee's 1998 enquiry into the greening of government, politicians showed little appreciation of the need to overcome firmly embedded functional or sectional divisions. Whilst the Assembly aspires to promote cross-sectoral committees and policy integration the necessary administrative and political skills may be lacking. The Environmental Audit Committee perceived the potential institutional inadequacies in Wales and in commenting on the implementation of the sustainable development Scheme stated that "We received little evidence on the efficacy of this framework" (Environmental Audit Committee [24]). The subsequent establishment of a Sustainable Development Unit (of two full time staff) may have gone some way to ease the fears of the Committee but its location in a vertical policy division (Transport, Planning and the Environment) may not have helped in the horizontal integration of policy.

The greater political commitment to devolution in Scotland meant a greater amount of preparatory work about how sustainable development would be progressed within the parliament had been undertaken. Whilst the devolution legislation imposed no duty for sustainable development, the Consultative Steering Group on the Scottish Parliament recommended that any Bills prepared be accompanied by an assessment of their effects on sustainable development. The commitment to the environmental, or in this case sustainability, appraisal of policies is an important one. The Environmental Audit Committee, in marked contrast to their evaluation of to the Welsh situation, commended the Scottish approach to the progression of sustainable development [25]. The Committee's view was a reflection of Scotland's high level political commitment to sustainable development. As Lord Sewel who had responsibility for the issue in the Scottish Office argued:

> "In Scotland, we have moved forward rapidly to make sustainable development a mainstream issue for Government, for local authorities, for business and for the people of Scotland. The cross-linking of issues comes naturally to Scotland; there is a genuine interest in Scotland in delivering on the three arms which make up sustainable development: a sound economy, strong social development, built on a real concern for the environment."

The Scottish Parliament in a debate on 3 February 2000 agreed a motion that placed sustainable development at the heart of its activities [26]. It is too early to assess whether distinctive approaches to sustainable development are emerging in Scotland and Wales, though this seems likely. As *Down to Earth*, the Scottish strategy for sustainable development puts it: "The Scottish Parliament will choose for itself the form [of sustainable development] which best suits the circumstances of Scotland" (Scottish Executive [27]). If the priorities in Edinburgh and Cardiff do begin to diverge from those in London, then the ways in which the devolved legislatures become involved in the planning of British space is likely to become more complex. No longer can policy simply be driven from London, with a reasonably uniform hierarchy of policies, plans and programmes promoted across Britain. The paradox is that whilst SEA may be more widely practised in London, Edinburgh and Cardiff its value diminishes because each capital city operates in a geographically defined and bounded space with little attempt to provide for spatial hierarchies or planning across the national boundaries.

The government's management of space in relation to the RDAs is more straightforward. They are directly accountable to central government, making co-ordination from the centre feasible. RDAs are bodies whose primary function is the promotion of greater regional economic competitiveness but who nevertheless have a statutory duty to "contribute to the achievement of sustainable development in the United Kingdom where it is relevant to its area to do so" (UK Government [28]). To assist the RDAs in pursuing this task the Sustainable Development Unit of the Department of the Environment Transport and the Regions prepared a brief guidance note. This makes it clear that "Sustainable development should … inform the actions

and decisions the RDA takes in pursuance of its economic objectives" (DETR [29]). The guidance then identifies broad ranging sustainability appraisal as an important activity: "it is anticipated that all of the RDAs policies, programmes and projects will flow from an assessment of their impact on society, the economy and the environment" (DETR [30]). In practice, it seems likely that the commitment of RDAs to promoting sustainable development will be variable, depending upon their perceptions of the competitive position of their regions and the influence of environmental and social lobbies on the business groupings within the RDAs.

RDAs are providing coherence to regional policy formulation and making more integrated delivery possible. For example, they must produce Regional Strategies setting out the competitive strengths and weaknesses of their regions. In so doing they have brought together economic, social and environmental issues. Before submission to central government for approval these Strategies have been assessed against sustainability criteria. As an appraisal process the experience and practice of the RDAs has been variable, but in some cases a significant commitment has been evident. For example, the Regional Strategy for South West England states that "As one of our Operating Principles, sustainability is central to the priorities of the Strategy. Plans and activities of the Strategy will increasingly be subject to sustainable development appraisal" [31]. The North West RDA was rather more advanced and in drafting its Strategy "A full sustainable development appraisal … [was] carried out and taken into account" [32]. The tests against which the North West RDA wishes to appraise its Strategy and the approaches of its partners include: regional competitiveness, social inclusion, environmental management, job opportunities, skills, value for money, community involvement and innovation [33]. All the RDA Strategies were submitted to central government in late 1999 for approval, which was given in early 2000. Interestingly, the response to each RDA made explicit mention of the government's commitment to sustainable development (DETR [34]).

A further important aspect of the work of the RDAs is their input to the preparation of the new Regional Planning Guidance (RPG) for England. Historically, such guidance has been non-statutory and primarily intended to "provide the necessary framework for the preparation of structure plans." (DoE [35]). RPG was issued by the Secretary of State based on national planning policies and the advice of the regional planning conferences, bodies made up of the relevant LPAs. The new arrangements for RPG preparation seek greater democracy and accountability in the preparation process (DETR [36]). In the future the preparation of RPG will be undertaken by Regional Planning Bodies (RPBs), and the government has indicated that this function might well be assigned to the regional chambers designated to oversee the work of the RDAs. Such a move would increase the range of stakeholders involved in the preparation of RPG and is seen by the government as being crucial in the pursuit of more coherent and sustainable patterns of development. In addition, RPBs will be encouraged to make use of sustainability appraisal when preparing RPG to ensure, "that thinking about sustainable development is ingrained in the strategy making process, and thereby influences subsequent decisions." (DETR [37]).

Clearly the government can use its overview of the RDA Strategies to ensure coherence between regions and a more strategic input to regional economic development. In England its level of control, or ability to steer, is much greater than it is for Scotland or Wales. So whilst a more strategic vision for England may emerge from the work of the RDAs there may be a less united picture of development for Britain as a whole. The extent to which Westminster may allow Wales or Scotland to develop distinctive agendas is a moot point, but raises important questions about the role of strategic thinking and co-ordination between different tiers of government. Whilst more SEA may take place in Britain it may not lead to policy development and integration that crosses political and administrative boundaries.

One further note of caution must be added with regard to the value of SEA. Appraisal will inevitably take place in different economic and political contexts. The situation so far with appraisal in the English regions, Scotland and Wales is that much is owed to the experiences of local government with development plan appraisal and of deprived regions in securing European funds. That appraisal criteria can be sensitive to local circumstances and the interpretation of results sympathetic to local conditions has been an important outcome of this work. Therefore we should perhaps expect to see appraisal processes emerging which whilst broadly similar are able to facilitate to quite distinct development outcomes.

In Wales, success in implementing the sustainable development Scheme has been limited by the presence of well entrenched economic actors. Under the terms of the Scheme a sustainability strategy is to be developed, with appropriate appraisal criteria, and this has been formulated in draft form. However, Wales is a deprived region which places great emphasis on economic growth and has also produced a National Economic Strategy and a strategy to secure Objective 1 funding from the EU. Neither of these documents makes more than passing reference to the sustainable development Scheme. So, rather than sustainable development providing a strategy for Wales as the Scheme's proponents had hoped, these aspirations are subordinated to narrowly constructed economic programmes. There is at present the, perhaps, naïve hope that over time the sustainable development strategy can feed into revisions of the economic policies and that through an ongoing appraisal process sustainability will emerge as the guiding light for Wales.

Conclusions

The experiences of central and local government suggests that flexibility and the capacity to respond to the demands of different decision contexts are crucial for the successful practice of SEA. Whilst the desire to use a metric compatible with that of mainstream economic analysis, most evident in the efforts of central government, is perhaps understandable given the emphasis which is being placed on integration and sustainable development, such an approach appears to do little to encourage the use of SEA. The preference for qualitative methods observed in local government seems to have contributed to the greater success which has been achieved at this level. Such an approach appears more capable of responding rapidly to the distinctive needs of

strategic decision making. The lack of integration across administrative, departmental and sectoral boundaries which characterises SEA is however, a significant weakness of the process and raises questions about the effectiveness of SEA as an instrument of sustainable development implementation.

Innovations at the regional level in Britain have strengthened and defined this tier of the spatial planning hierarchy. The greater autonomy of Scotland and Wales in comparison to the English regions may well result in the emergence of quite distinctive patterns of development in these areas. While the English RDAs and RPBs may assist in defining a strategic vision for England as a whole, fostering greater integration between regions, the devolved assemblies may elect to follow quite different pathways to sustainability. The implication for SEA is that whilst consistency of practice may emerge in England, encouraged and co-ordinated from London, the approaches supported in Edinburgh and Cardiff may be quite divergent. Consequently, whilst the practice of SEA may increase, the ability of the process to facilitate policy integration in Britain as a whole may well be significantly diminished.

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Strategic Environmental Assessment and Spatial Planning

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Introduction

In December 1999, the Council of the European Union agreed a common position on an amended proposal for a Council Directive on Assessment of the Effects of Certain Plans and Programmes on the Environment (the SEA directive). It is a framework directive which leaves the details of its transposition and implementation to be determined by the individual Member States.

This paper examines some of the issues which will arise when considering its detailed transposition and application to spatial planning. Central to the analysis is the notion that SEA is a process which operates alongside (or within) the spatial planning process and needs to be interdependent with it at critical appraisal and decision points.

SEA Process

The SEA process, like the EIA process used in project appraisal, can be characterised as a series of linear stages in assessment, supplemented by a number of feed-back loops. The linear stages typically include screening, scoping, undertaking plan assessment, preparing and submitting an SEA report, consultations based on this (and possibly other) documentation, decision-making relating to the approval of the plan, followed by plan implementation (involving links to other subsequent plan, programme and project appraisals and decision-making). As the linear process proceeds and plan alternatives are discarded and remaining alternatives are modified, elaborated or refined, the feedback loops in the process also come into operation.

Certain of these linear stages and many of the possible feedback loops are not specified in this framework directive. However, they will often need to be articulated in Member State SEA regulations or in non-mandatory guidance.

Spatial Planning Process

Spatial planning (that is, planning with an explicit or implicit spatial dimension) exists in many different forms in all Member States. If SEA is to be successfully co-ordinated with (or integrated within) the spatial planning process, this diversity must be taken into account when formulating the details of SEA regulation and guidance in any specific planning context. The contextual variables which need to be reflected in the details of the SEA process include some or all of the following:

- The stage in the overall planning process in which the plan is prepared (early-strategic; late-programmatic) and its relationship to other plans and programmes in the planning hierarchy (the so-called 'tiering' issue).

- The planning objective (economic, social, environmental, sustainable development, etc.).

- The competent authority for the approval of the plan and its geographic scope (local, provincial, regional, national).

- The range and type of sectors covered by the plan: multi-sectoral (land-use, physical, general development plans) or single sector (transport, tourism, energy, water resources, minerals, forests, waste disposal, etc.).

- Duration of the planning process (annual or multi-annual cycle) and time horizon of the plan (short, medium or long-term).

- The level of detail to which the plan is prepared and its level of spatial precision.

- The procedural characteristics of the planning process. (Which stages in the planning process are specified and do they have regulatory status? What is their character, sequence and timing? Which stakeholders are involved in the planning process and what is the nature and extent of their participation? How 'open' is the planning system, in terms of public access to planning documentation, appraisals and decisions?)

- Planners, their planning culture and how this is reflected in their planning methodologies. (What are their academic and professional backgrounds - architecture and design, geography, economics, environmental science, or other social sciences? Does the planning culture rely predominantly on technical analysis, professional judgement, stakeholder participation, or a combination of these?)

Co-ordinating/Integrating SEA and Spatial Planning Processes

The early experiences in implementing project-level EIA, under the provisions of Directive 85/337, provide ample illustration of its reduced effectiveness when insufficiently co-ordinated with the project planning process. Similar deficiencies should be avoided, if at all possible, when implementing plan-level SEA. To achieve this, the SEA process needs to be sufficiently tailored to the characteristics of each spatial planning system to which the SEA directive will apply. This might be achieved in two ways.

- Define, using process flow diagrams, the contextual characteristics of the planning process with which the framework requirements of the SEA directive are to be co-ordinated or integrated. Then formulate, within these framework requirements, the detailed operational requirements of the SEA process, for cost-effective co-ordination/integration with the specified planning process. This, to the extent that it is achievable, has the advantage of securing co-ordination/integration with minimal disturbance to existing planning procedures and practices.

- An alternative approach, again using process flow diagrams, would be to adapt the existing planning process so that the framework requirements of the SEA directive can be most cost-effectively co-ordinated/integrated with it. This is unlikely to be the preferred approach but there are circumstances where some modification to the existing planning process may be justified. These are where the planning process is due to be modified for other reasons and where relatively small changes to planning regulations and procedures can bring more than commensurate benefits through improved co-ordination/integration. Therefore, worthwhile opportunities to improve spatial planning systems should not be overlooked whilst detailing how the SEA directive can be best implemented in any particular planning context.

Some Procedural and Methodological Issues

In the final analysis, successful co-ordination is realised through good practice rather than appropriate regulations. Scholten and Post (2000) have identified a number of relatively simple ways in which procedural co-ordination can be achieved. For example, they recommend 'procedural tuning' to ensure that assessments, carried out by different teams and relating to different planning themes, are undertaken at similar times with a sufficient time allowance for the communication and exchange of findings between them. However, for this to be effective, the parties involved need to appreciate the importance of exchanging findings and how to use and act upon the information they receive. This highlights the need for awareness raising, SEA guidance and training. The paper returns to this issue later.

The methodological issues involved in achieving good practice in SEA, and its successful use within the spatial planning process, are more complex. Early findings from reviewing small samples of SEA reports suggest that there is a substantial quality problem, at least equal to that experienced with first generation EISs (Lee et al, 1999). One of the main areas of deficiency in SEA methodology is strategic-level forecasting under conditions of uncertainty. The more extensive and systematic use of scenario and sensitivity analyses could be helpful here.

A second area of technical difficulty relates to integrated appraisal which is of growing importance as planning authorities adopt sustainable development goals for their spatial plans. This development raises the issue of consistency between separate environmental, social and economic appraisals, based upon different data sets, assumptions and methodologies which are then brought together in integrated sustainability appraisals (Lee and Kirkpatrick 1996). Additionally, there is the issue of

the use of multi-criteria analysis to assist in integrated appraisal and decision-making where impacts of different kinds (environmental and non-environmental) fall unequally on different socio-economic groups. Possibly, some of the simpler techniques, like the Planning Balance Sheet (Lichfield 1996) and the Goals Achievement Matrix (Hill 1968), will be of the greatest practical use.

The use of environmental indicators and sustainability indicators is attracting increasing attention and will be discussed in a later session at this Conference. At the level of general principle, it is hard to quarrel with this development but, as always, the devil lies in the detail. What types of indicators - process or target-based - are proposed and what are the relative merits of each? In what context - *ex ante* appraisal or *ex post* evaluation - are they to be used? How many indicators are proposed for use in spatial planning, and is there an optimal number for this purpose? How is each of the indicators to be defined and what type and quality of data, over what time period, are available which correspond to this definition? Crucially, how are environmental and sustainability indicator data to be analysed and interpreted? Possibly, more attention needs to be paid to such questions to reduce the uncritical use of all types of indicators.

Similar types of issues arise in the case of Geographic Information Systems (GIS), whose use will also be discussed during the Conference. When McHarg's Design with Nature was first published in 1969, many were impressed both by the power of the message it contained and the potential of the simple overlay method it described. Soon afterwards the technique was computerised and GIS was born. Its potential value is considerable in the kinds of analysis which are needed in SEA of spatial planning. Whether, over the intervening years, the improvement in its powers of analysis and interpretation has matched its increased computational capabilities will, hopefully, be evaluated during this Conference. Linked to this is whether, and in what circumstances, its added value sufficiently offsets the costs of data gathering, periodic updating and analysis which its use entails.

Although various reviews have been published on both EIA and SEA methodologies (Canter and Sadler, 1997; Cassios, 1995; Kleinschmidt and Wagner, 1998), there remains an urgent need for clear practical guidance on SEA methods to be used in spatial planning, accompanied by short course training in their application.

Next Steps

The final section of this paper brings together a number of suggestions on preparatory initiatives for detailing and implementing SEA requirements for spatial planning in Member States. These could be undertaken during the three year period likely to be available for the transposition of the SEA directive into Member State law.

- **Screening** Establish clear screening procedures and, on the basis of these, identify the main types of plans and programmes likely to be subject to SEA.

- **Planning Context Analysis** Analyse the 'context' (as described in Spatial Planning Process) of the planning process for each of the plans and programmes identified under Screening above. In each case, use flow process diagrams to

determine how the different stages in the SEA process can best be co-ordinated with, or integrated within, the most appropriate stages of the planning process. Also, identify any desirable modification to the planning process itself and important linkages to other plans, programmes and project authorisations.

- **Procedural Guidance** Prepare procedural guidance, specific to the context of the plan concerned, relating to the co-ordination/integration of SEA requirements into the different stages in the planning process. Officer and institutional responsibilities for each of these co-ordination responsibilities should be clearly defined.

- **Methodological Guidance** User-friendly and practical guidance on SEA methods for use in specific spatial planning contexts should also be prepared. The guidance should be illustrated, using spatial planning case studies or trial runs.

- **Awareness Raising and Short Course Training** An awareness raising and short course SEA training programme should be prepared for major types of stakeholders engaged in the planning process. It should be practice-oriented, draw upon the procedural and methodological guidance listed above and, where possible, use trainers with practical SEA experience.

- **Quality Control and Systems Monitoring** Establish quality control procedures both for reviewing the quality of SEA reports and for evaluating the performance of the SEA process as a whole. The results should then be used to update guidance and training programmes and in periodic SEA regulatory reviews.

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PSSD – Planning System for Sustainable Development

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GIS-based Interreg II C Project

The INTERREG II C is one of the most important instruments for adapting the ESDP to use. During the ESDP process, it has been noticed how difficult it is to get reliable and comparable information about the present state and future trends of spatial structure and development. From now on, it is important to focus on developing the evaluation and monitoring system. The evaluation criteria and the indicators need to be developed so that it is possible to compare and evaluate different regions according to common principles. The problem is that as long as there is no jointly approved transregional GIS-based method for evaluating spatial changes, it is very difficult to make detailed comparisons between regions. In the PSSD project grid methods have been chosen to represent a hypothetical solution to this management problem within GIS. The first objective is a creation of a prototype for a common GIS-based regional planning method in the Baltic Sea region. The method will make an extensive use of GIS data. The second objective is a computer-aided tool for common use of the method. One of the main ideas of the PSSD is to integrate some environmental and socioeconomic GIS data in spatial analyses. Thus the method and the tool will automatically include built-in elements for contribution to sustainable development.

Background

Administrative Framework

The PSSD project is one realization of the European Regional Development Fund's (ERDF) Interreg II C Community Initiative concerning "Transnational Co-operation on Spatial Planning 1997—1999". The PSSD is directed to the measure 7.2.1 of the Baltic Sea Programme: Further development of spatial planning strategies and exchange of experience in the field of spatial planning (European Commission [1]). The PSSD is a transnational GIS development project, which aims to develop especially grid related GIS methods for the management of the spatial dimension of sustainable development and of the ESDP-framework in regional planning (European Commission [2]).

Background Analysis

The development of GIS-based spatial planning methods has so far been very fragmented in Europe, because of different spatial features and problems between states, regions and cities. In this split situation, one way to interpret the European Union's ESDP (European Spatial Development Perspective) is to see it as a call for some unifying of methods between the member states. This kind of new, bipartite

international framework for spatial planning presupposes some dualism also in the application of national and regional GIS-based methods: an ability to manage both the common and the area-specific needs at the same time.

There is also an ever-growing need for joint, sufficiently simple evaluation models for spatial structure in Europe. How is the framework of the ESDP to be realized if there is no tool capable of doing this? At the same time, research is going on all over the European Union – on international, national, regional and local levels – to discover new, reasonable, computer-aided ways of evaluating, for example, the environmental impacts of, and feedback from, development policies and land-use. At present the problem is that there is no common transregional GIS method within the Baltic Sea states. The common or transregional spatial structure and development of the Baltic Sea region can be monitored, evaluated and described only imprecisely until there are joint methods, models and tools sufficient for every purpose needed. In view of this, GIS is one of the main sectors to be developed.

Project Basics

Objectives

The PSSD project has on purpose set very ambitious objectives for itself. The first objective is the creation of a prototype for a common GIS-based regional planning method in the Baltic Sea region. The second objective is a computer-aided tool for common use of the method. The most important purpose of these objectives is to be widely seen beyond the PSSD project. It is to be hoped that they would show the right direction to go now and in the future. In the PSSD project it is more a question of how far to that direction it is practically possible to proceed.

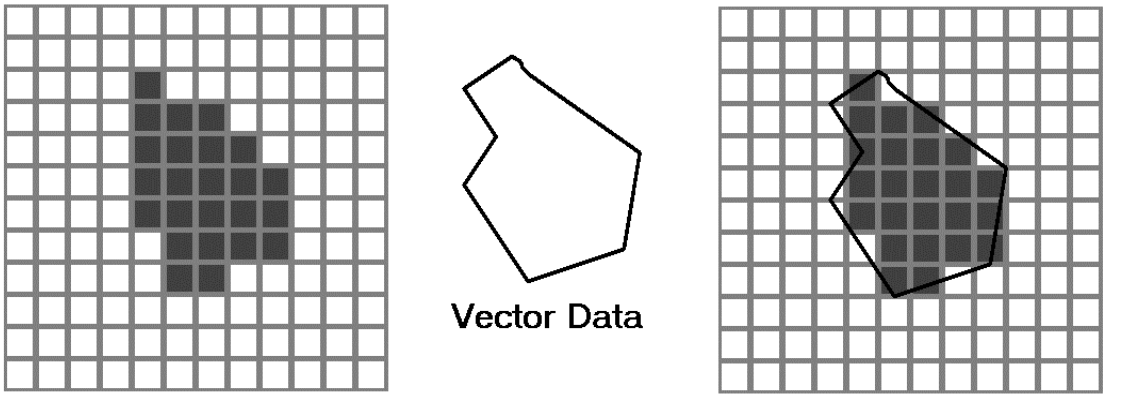
Partners, Budget and Timetable

The Finnish, the Danish and the German partners for this project have been chosen with regard to the need for expertise both in the field of the problematic between environment, socioeconomic factors and planning, and in the field of new information techniques including GIS. In practice it is a question of co-operation between spatial planners, GIS professionals, researchers and sustainability experts. The Regional Council of Päijät-Häme leads the project on behalf of the South Finland Regional Alliance. The latter is a coalition of the seven Finnish regional councils: Päijät-Häme, Häme, Itä-Uusimaa, Uusimaa, South Karelia, Southwest Finland and Kymenlaakso. The other Finnish partners are the Finnish Environment Institute, the Geological Survey of Finland, the Technical Research Centre of Finland and the Baltic Region Healthy Cities Office. The Danish partners are the National Environmental Research Institute, the Danish Forest and Landscape Research Institute and the Region of North Jutland. The Technical University of Hamburg-Harburg is the German partner. Besides these partners with budget shares the project has also several reference partners around the Baltic Sea. The total PSSD budget is 1 772 000 euro and the planned duration is 33 months. The project will be finished in the spring 2001.

Grid Methods

Although the basic idea of using a grid in spatial analysis is very old, the computer methods based on it have become somewhat more frequently used in spatial planning only recently, thanks to huge developments in the fields of hardware, software, methods and datasets in the '90s. One main advantage of grid-based methods is that they enable simultaneous survey (on a same map) of, for example, environmental values and the impact of land-use decisions on them. They are also scalable, internationally movable and suitable for time-series monitoring. This is therefore an opportune time to link together the best parts of these different grid-based methods in order to formulate one common analysis, evaluation and monitoring model of the spatial structure. The Baltic Sea region is a very challenging area for this kind of transnational and methodical GIS collaboration because of its heterogeneous spatial planning practices and environmental problems.

Grids can be both raster- and vector-based and that is one reason why they enable plenty of possibilities for applied spatial analyses. One of the hottest topics in recent years has been the Map Algebra, "a geographic language" designed specifically for the use of grid data (Tomlin [3]). It offers possibility to use so called local, focal and zonal -type of functions in analyses. Nowadays it is also fairly common to use both vector- and raster-based grids in various data generalization processes, because transformations between these two are already available in most of the GIS software. Data generalization is often needed for the regional planning purposes (biodiversity modeling, land-use classifications, accessibility zoning etc.). The picture below shows the basic difference between vector and grid data.



Activities

One of the main ideas of the PSSD is to integrate some environmental and socioeconomic GIS data in spatial analyses. Thus the method and the tool will automatically include built-in elements for contribution to sustainable development. This is more easily said than done though, because in general the substance of sustainable environmental and socioeconomic integration itself seems to be very difficult question to solve. Therefore this project is only able to produce some

demonstrative maps concerning the substance. The project tasks has to be seen as an effort to make some grid methods more widely known and as an effort to introduce their usefulness to spatial planners with the help of some real-world cases.

Tasks in General

The PSSD is a pretty complicated project because of a fairly big number of partners, miscellaneous co-projects and dozens of detailed tasks. We have tried to set up the project tasks to serve the demonstration of practical adaptations of grid methods in spatial planning, because we have chosen grid methods to present a partial hypothetical solution to at least some GIS analysis problems within the Baltic Sea region. The principle in the project is that every partner's tasks must develop and/or test grid methods somehow, or produce some other results to other partners for supporting the development work. The appropriate way to approach the planning problems from the basis of some scientific and general knowledge has been chosen. In practice it means that some guidelines of the sustainable development documents, the European Spatial Development Perspective (ESDP), the DPSIR-model (Holten-Andersen [4]) and the general spatial planning process has been considered as a framework for the common project activities and tasks. The four PSSD work groups co-ordinate the methodical development work of partners to ensure the synergy. The special WWW-platform is used in the collection and evaluation of the indicators between the partners. Also the appropriate ways to visualize indicators and results of spatial analyses on grid maps are specified. The partners make experimental map analyses zoomed in their special needs. Nearly every partner prints demonstrative maps as a result.

Partners' Tasks

The Finnish Environment Institute investigates bringing together GIS data on natural environments and socioeconomic factors. The Geological Survey of Finland develops methods of utilizing geological data in spatial planning. The test area will include a model for the classification of rock areas according to e.g. their suitability for construction or need of conservation. The Technical Research Centre of Finland produces evaluation methods to find environmentally safe, cost effective and competitive areas for construction. The Baltic Region Healthy Cities Office investigates, on the one hand, indicators of inhabitants' health and social wellbeing with reference to urban planning, and on the other, their visualization on maps. A noise model is being constructed in the test area. The Danish National Environmental Research Institute studies ways of visualizing the spatiotemporal aspect using grid technology. The Danish Forest and Landscape Research Institute's subtasks involve investigation into the potential recreational uses of the natural environment and their accessibility. The Technical University of Hamburg-Harburg develops testing and quality evaluation methods to be used in the study of indicators employed in spatial planning following the principles of sustainable development. They are used to assess the indicators used in the other project subtasks. The methods, analysis models, and tools developed within this project will be tested in practice in the spatial planning of the seven South Finland provinces as well as of the Danish province of North Jutland.

Target Areas

Regional level is the main level for studies in this project. So when there is a term "spatial planning" used, it means especially spatial planning on regional level. Target areas has been selected from among the activity areas of the partner organizations (see the map below). The environmental, socio-economic and spatial features of the chosen target areas has been studied and described. The areas are classified into transregional, regional and subregional. The area class last mentioned consists mainly of urban zones. As generally described, the targets are the activity area of the South Finland Regional Alliance, that of North Jutland, of Vejle County and of the metropolitan region of Hamburg.

Networking

The PSSD project tests a small part of the international MapBSR database. It is a question of drawing analysis maps in some target areas using both the MapBSR project data and the more exact national data. Besides this the PSSD project exchanges experiences mainly with the Bothnian Arch project, the Baltic Palette project, the Via Baltica Spatial Development Zone project and the E18 project. Every project mentioned is an Interreg II C BSR project.

Results

The methods and the applications resulting from this project will be gathered to form the so-called Planner's TOOLBOX – an interactive combination of WWW-pages, CD-ROM, web database and search engine. The product will be an open application to which users may add information and of which they can download parts for their own purposes. The Internet part of the Planner's TOOLBOX is offered free of charge for the Baltic Sea region's public authorities. The Planner's TOOLBOX and its main contents will be tested in practice mainly by the South Finland Regional Alliance and by the Region of North Jutland. Some self-tests by partners will also exist. Some partners may set demonstrative datasets available as a part of the Planner's TOOLBOX. Also, some partners are asked to maintain the PSSD information desks after the project. The PSSD introduction seminar for Baltic Countries is under consideration. Besides this the partners will present the PSSD results on several international forums and events during the years 2000 and 2001. The PSSD reports will be published on the PSSD webpage as PDF-files. The PSSD Summary Report will be delivered also as a printed copy together with the Planner's TOOLBOX CD-ROM disk. The PSSD webpage is open at http://www.pssdtoolbox.net.

Summary

The PSSD project has been positively instructive experience to all partners involved. It has been as much a study of the international co-operation than of the substance itself. As for the external limitations, one conclusion can be written already now: The effective use of grid methods requires a lot of good-quality data. It should be available for spatial planning organizations everywhere at decent price. Only after that there will be really equal possibilities to co-operate directly between regions within the fields of GIS. A lot of basic work is still to be done around the Baltic Sea to compile the necessary datasets.

The expected overall impact of the PSSD project is that the need, importance and usefulness of at least one common spatial planning method would be widely understood and agreed on within the Baltic Sea states and regions. If the results of this demonstrative project generate transnational or transregional debate — wider than at present — in the Baltic Sea region about ways of using GIS to compare, monitor and describe the spatial development of regions, it will have been successful enough. Anybody understands that it is impossible in one project with limited time and resources to create one common method, which would both suite and satisfy every organization involved in spatial planning around the Baltic Sea region. Therefore it should preferably

be the joint effort and the practical co-operation that counts when it will be time to estimate the PSSD results. It is to be hoped that also the PSSD project would be seen as a part of the general process toward common spatial understanding within the Baltic Sea region.

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Landscape ecological assessment in an urbanising environment

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Abstract

To achieve a sustainable development in land use, ecological impacts of infrastructure, urbanisation and other development must be considered on a landscape and regional scale. This will prevent that important decisions are taken on a strategic level in the planning process without a systematic evaluation of environmental impacts and alternatives. Landscape ecology can be used as a tool to assess the ecological consequences of processes like urbanisation on wildlife populations and to visualise the impacts of different planning scenarios. Our project concerns landscape ecological aspects of regional planning, especially in the built environment. The aim is to develop knowledge and methods for landscape-ecological planning and assessment in an urbanising environment, on landscape and regional scales.

The study area in Greater Stockholm embraces a gradient from the city centre to the outer suburbs, including 15 municipalities. Indicator animal species will be tested as measures of habitat quality and connectivity in the landscape. Methods based on geographic information systems (GIS) will be used, like landscape and scenario analysis involving prediction of presence of target species. A landscape ecological decision support system, based on habitat suitability, area requirements and dispersal for selected indicator species, will be used to assess the ecological consequences of planning alternatives, and to develop, restore or protect nature and biodiversity in combination with functions as urbanisation and other land use.

Introduction

Urbanisation is an ongoing process throughout the world, and a large part of the Swedish people now live in cities and towns. Most of the out-door recreation takes place within a few kilometres from people's homes. Together with the urbanisation process this puts a high pressure on the remaining areas of nature. The urban greenstructure is very important for recreation, which is emphasised in the government's environmental objectives concerning a good built-up environment (Prop. 1997/98:145). Furthermore, in cities, the remaining areas of natural and semi-natural vegetation are essential for maintaining biodiversity.

Several political decisions have been made that emphasise nature conservation and the preservation of green areas in planning, not at least in urban areas. In this context the need for monitoring and impact assessment is often highlighted, both at a national level and at a European level. Since 1985 the EU Directive requires an environmental impact assessment (EIA) for a large number of projects (Council Directive 97/11/EC). In

addition, a new Council Directive on Strategic Environmental Assessment (SEA) concerning the assessment of plans and programs, is in preparation (Common Position 2000/03/30). The new Directive will involve a general requirement for the assessment of impacts for development activities in urban areas.

According to the government's environmental objectives biodiversity is to be preserved and dispersal possibilities should be considered. This is also in line with the Convention on Biodiversity adopted by the 1992 UN Conference on the Environment and Development, which was an important milestone in the development of a strategy of sustainable development. To achieve a sustainable development in land use, ecological impacts of infrastructure, urbanisation and other development must be considered on a landscape and regional scale. For this purpose, there is a need to develop appropriate methodology.

Within research on SEA the need for development of adequate prediction methods has been emphasised. Due to the high level of abstraction of policies, plans and programs, the prediction of impacts is a major methodological problem in SEA (Hildén *et al.* [1]). These difficulties urge for tools which are able to provide reliable information on the impacts of a proposed decision. Here, scenario analysis and geographic decision support systems are often put forward as instruments to facilitate a systematic evaluation of environmental impacts.

In order to develop knowledge and methods for the prediction of ecological impacts, at a strategic level, a research project will be initiated. The project will apply ecological indicators and geographic information systems (GIS) in the evaluation of development scenarios for the Stockholm region. In this paper, the terms and means for a landscape ecological impact assessment will be discussed.

Landscape ecology

Planning decisions which alter the structure and nature of the physical landscape will affect the fauna and flora inhabiting the area. Loss and fragmentation of natural habitats due to human activities, and the effects on wildlife populations and on biodiversity, are studied in landscape ecology (e. g. Opdam *et al*. [2] and Farina [3]). Consequences of urbanisation like habitat fragmentation and disturbance effects have been explored by for example Bolger *et al.* [4], Sauvajot *et al.* [5] and Mörtberg [6], [7]. The results indicate that the responses to these impacts are species-specific and that in addition to effects of habitat loss, habitat quality, isolation and disturbance affect many species/groups. Ecological effects of infrastructure have been studied by Treweek and Veitch [8], Seiler and Eriksson [9], Seiler and Rydin [10] and Forman [11]. According to these studies, linear developments such as roads cause particular problems for ecological assessment, because they tend to affect many habitat types at a range of scales, influencing the functional integrity of habitats throughout whole regions as wells as having direct effects on individual sites. Damaging effects on wildlife may occur through habitat fragmentation and associated barrier effects on the movements of sensitive species (Seiler *et al*. [12], Karlström and Sjögren-Gulve [13]). As a result, apparently small impacts on individual sites can result in considerable cumulative effects on the availability of wildlife habitat in a region.

Landscape ecology can provide basic knowledge and principles for land-use planning with biodiversity objectives (Ahern [14], Hobbs [15], Harms *et al.*[16]). In Europe, the concept of ecological networks is often used as a modelling instrument in spatial and physical planning, based on target species' persistence, dispersal and geographical range, and consequently works on different levels (for example Kleyer [17]). In practice, a system is often identified, consisting of corridors, habitat patches and sometimes core areas surrounded by buffer zones, that can maintain a more spatially integrated, less fragmented landscape pattern (Forman and Collinge [18]). Examples of plans of this kind are the Nature Policy Plan in The Netherlands (Ministerie LNV [19]) on a national scale and the Greenstructure of Greater Stockholm (Office of Regonal Planning and Urban Transportation [20]) on a regional scale.

Within the research of biodiversity and landscape ecology, predictions and simulations of scenarios using GIS are growing fields (e.g. White *et al.* [21], Akçakaya and Raphael [22], Darr *et al.* [23] and Dettmers and Bart [24]). A prediction within these disciplines is based on an established relation between the occurrence of a species and environmental variables, describing it's suitable habitat. These environmental variables are used to predict potential sites for the species. Predictive habitat models can be applied over large areas and are useful in the conservation and management of ecosystems (Hunter [25], Swetnam *et al.* [26]).

Predictions of the presence of relatively common species have been used to study functions and properties of landscapes, like for example edge and fragmentation effects (Bolger *et al.* [4]) and connectivity (Villalba *et al.* [27]). Predictive models used as tools for assessing the impacts of alternative management plans that could alter or remove habitat for studied species or groups have been presented by for example Dettmers and Bart [24] and Natuhara and Imai [28].

Indicators

In their report on systems with indicators for planning with environmental objectives, the Swedish Environmental Protection Agency [29] pointed out that indicators for biodiversity objectives need to be developed. To select relevant ecological indicators in the form of single species, groups of species or other entities is fundamental but also difficult (Petry and Krönert [30]). Indicators of biodiversity are discussed in Hansson [31], where desirable characteristics of species that may serve as functional indicators are listed. For example they should be specialised on the ecosystem or landscape to be monitored, sensitive to artificial disturbance, having relatively large area and resource requirements and being fairly common and easily identified and sampled. Seiler and Eriksson [9] suggested that sensitive indicator species for evaluation of fragmentation effects could be found among larger mammals and should be characterised by low reproduction, low dispersal, and small population sizes. Individuals should have large home ranges and select various biotopes for different purposes. Sensitive indicator species for habitat quality and degradation effects were characterised as biotope specialists, dependent on late successional stages in vegetation or high rank position in trophic webs, and could be found among birds, insects and smaller mammals.

Ecological indicators have been used in several ecological network studies in Germany and the Netherlands (e.g. Wolfert *et al.* [32], Harms *et al*. [16]). Criteria that were described for the selection of species in these studies were: the species have to be relevant for nature policy and represent different spatial scale levels of the landscape such as: national, regional and local level. Further, the species have to represent different (clusters of) ecosystems such as water, marshlands, grasslands and forest, they should represent different systematic groups and, finally, they have to be sensitive for habitat fragmentation. In Sweden a landscape ecological analysis in an urban environment have been performed in the municipality of Stockholm, using amphibians as an indicator group of biodiversity (Löfvenhaft and Ihse [33]).

Scenario testing

Not only must current species distributions and abundances be linked to landscape characteristics (as in many previous studies), but how these species respond to alterations in the landscape must also be examined. Manipulation of landscapes in a GIS makes it possible to visualise the impacts of landscape changes and to assess the consequences for different species (e. g. White *et al*. [21] and Kliskey *et al*. [34]). The ecological and environmental advantages of a certain policy, plan or project can be demonstrated to be selected before other alternatives. This is a way to make knowledge about species distributions accessible to the planning process and ecological models in a mathematical form can be expressed spatially in a format suitable for scenario-testing (Swetnam *et al.* [26]).

Furthermore, several projects are carried out in Germany and the Netherlands in order to integrate land use and natural resources (Harms *et al.* [16], Petry and Krönert [30] and Knol and Verweij [35]). In the former study an example is described, where a landscape ecological decision support system were used to assess the ecological consequences of different planning alternatives in a study of the Dutch part of the North-western European Delta Metropolis called the Central City Belt. The aim was to combine nature conservation and development with functions like urbanisation and recreation. The scenario approach was introduced as a methodology to support the decision making on those spatial planning problems. These methods also have a great potential for assessing restoration and other mitigation measures.

Study area and methods

The study area of 3750 km^2 is located on the coast of the Baltic Sea, on the outlet of the Lake Mälaren, and the city centre (59 ^{o}20´N, 18^{o}05´E) is situated on small islands and on the shoreline. The study area embraces the city of Stockholm with suburbs, urban fringe and parts of the rural surroundings (Figure 1) including 15 municipalities, and has about 1.5 million inhabitants. A population increase of 25-50 % is expected in parts of the region within 30 years, which puts high demands on regional planning of land use, residential areas and infrastructure (Office of Regional Planning and Urban Transportation [36]). The Office of Regional Planning and Urban Transportation have

developed a SEA in the planning of the Stockholm region (Office of Regional Planning and Urban Transportation [37]). The national environmental objectives and indicators

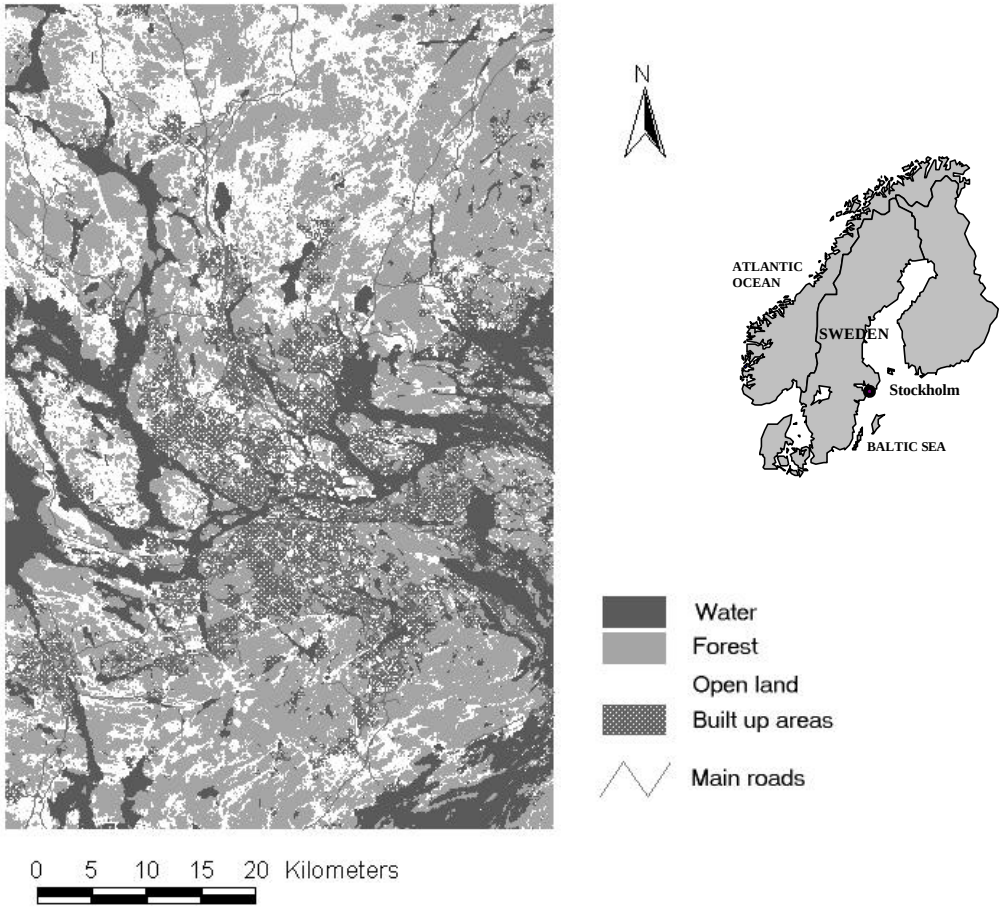

Figure 1. The study area of Greater Stockholm covering city centre, suburbs and parts of the rural surroundings.

are important features of this SEA.

The Landscape Ecological Decision and Evaluation Support System (LEDESS) will be tested (Knol *et al.* [38]). LEDESS is a deterministic knowledge-based system, which simulates the spatial and temporal development of vegetation and fauna. The Office of Regional Planning and Urban Transportation [39] has outlined three different scenarios for the urban growth of Greater Stockholm, characterised as diffuse or aggregated pattern or following the transportation lines. These scenarios were tested and the impacts on nature reserves and other restricted areas were estimated. For comparison, the same scenarios will now be tested in the LEDESS-model, with and without consideration of the Greenstructure of Greater Stockholm (Office of Regional Planning and Urban Transportation [20]), to assess the ecological consequences of regional planning scenarios. Other planned developments will also be run in the model. The results will be expressed in terms of increase or decrease of the three criteria of the

evaluation: habitat suitability, area requirements and accessability of selected indicator species.

Conclusions

The prediction of ecological impacts is an essential part of SEA, which is required throughout the planning process, to assess the potential impacts of planning and design options, to select those which minimise ecological risk and to plan measures for the mitigation of potential adverse impacts. In order to be able to make reliable predictions it is important to identify ecological indicators, which have proved to represent vital cause-impact relations in urban environments. It is however not yet fully understood what is demanded of a predictive model for these purposes, and what the consequences are of using one indicator (before another) on other aspects of biodiversity.

The ability to characterise the environment in such a way that potential ecological impacts can be both identified and quantified at different scales has also been considerably enhanced by the development of GIS. By developing methods for the preliminary ecological assessment of planning options, ecological considerations can be incorporated into the design and planning process for new developments at an earlier stage, making it possible to avoid cumulative impacts at the regional level, and to incorporate effective mitigation measures into the design of preferred options. This requires empirical studies, in which existing ecological knowledge is applied in ‘real’ planning situations.

The identification of appropriate indicators, and the development of adequate decision support systems will improve the quality of SEAs and ultimately contribute to sustainable planning and decision-making.

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Strategic Environmental Assessment and spatial planning in South Africa

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Abstract

This paper provides an overview of Strategic Environmental Assessment (SEA) and spatial planning in South Africa. The current conceptual approach to SEA in South Africa focuses on the capacity of the environment to sustain development, rather than the impact of development on the environment. South Africa has no legislation regarding SEA, however, guidelines have been drafted for application at the planning level. Principles for SEA application and key elements of an SEA process are outlined. The objective for SEA in the South African context is one, which is context-specific, integrated and sustainability-led. The conceptual approach developed for SEA in South Africa can lead to the integration of sustainability principles into plans and programmes. An overview is provided of South Africa's recently legislated planning systems and how they are promoting transformational change. South Africa's new planning systems focuses on facilitating development in a manner which corrects historically distorted, racially based settlement patterns and meets basic needs. This paper describes South Africa's attempts at integrating SEA and spatial planning.

Introduction

The approach to Strategic Environmental Assessment (SEA) varies in different parts of the world according to its scope, comprehensiveness, duration and links to either policy or planning (Sadler and Verheem [1]; Sadler and Baxter [2]; Dalal-Clayton and Sadler [3]; Tonk and Verheem [4]). The differences stem from the specific contexts in which SEA is used, e.g. in designing or evaluating policies, plans and programmes (PPPs) or incorporating sustainability principles in PPPs (Tonk and Verheem [4]). According to Thérivel [5], there is no one approach to SEA. It should be seen as a family of tools rather than one formal process or method (Goodland [6]; [7]; Buckley [8]; Thérivel [5]). Tonk and Verheem [5] advocate the development of a set of generally accepted SEA principles. Each country, political or economic system will, however, need to adopt the process and terminology most suitable to that context, in a way that is practical and responsive to integrative approaches towards sustainability goals (Thérivel and Partidário [9]). This article provides an overview of SEA and spatial planning in South Africa. The conceptual approach to SEA adopted in this country and its practical application is reviewed. An overview of South Africa's planning system is given. Elements of SEA that can be integrated and add value to planning processes are described. In this article the term *environment* incorporates social, economic and biophysical aspects.

The conceptual approach to SEA in South Africa

There is currently no internationally accepted definition of SEA. It is, however, commonly referred to as a process for assessing the environmental consequences of PPPs (Thérivel *et al*. [10]; Sadler and Verheem [4]; Thérivel and Partidário [9]). A notable problem with this focus is that it could imply that SEA is separate and reactive to the PPP process. However, in South Africa an approach to SEA, which is integrated, into existing legislative PPP processes is widely supported. The application of SEA in South Africa has a uniquely different focus to international theory and practice. The focus of SEA in South Africa is on the opportunities and constraints, which the environment places on PPPs (development), rather than on the impact (consequences) of PPPs on the environment (Figure 1). This includes the pro-active evaluation of the capacity of the environment to sustain various types of development.

Table 1 lists selected examples of South African SEA case studies. These examples show that most of the South African experience has been at the programmatic level.

Table 1. Selected examples of South African SEA case studies

Studies	Type	Scale	Tier
SEA for the KwaZulu-Natal Trade and Industry Policy (CSIR [11])	Industrial	Regional	Policy
SEA of the Cape Town 2004 Olympic Bid (Olympics Assessment Team [12])	Sport	Local	Programme
SEA of the proposed Industrial Development Zone at Coega (CSIR [13])	Industrial	Local	Programme
SEA of the East London Industrial Development Zone (CSIR [14])	Industrial	Local	Programme
SEA of the Cato Manor Draft Structure Plan (CSIR [15])	Development plan	Local	Plan
SEA of Forest Sector Development in the Eastern Cape (CSIR [16])	Forestry	Regional	Programme
Strategic Integrated Port Planning, Port of Saldanha (CSIR [17])	Port	Local	Programme
South Durban SEA (CSIR [18])	Industrial	Local	Programme

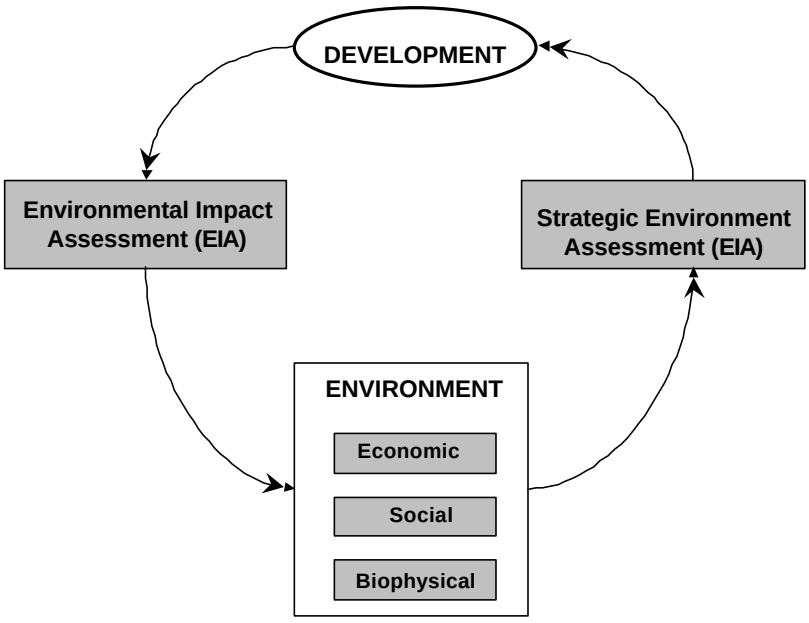

Figure 1. Environmental Impact Assessment (EIA) addresses the impact of development on the environment, whilst SEA focuses on the effect of the environment on development (CSIR [19]).

SEA is undertaken at the strategic level of PPP formulation, before specific project proposals are developed (Figure 2). The goal of SEA is the integration of social, biophysical and economic aspects into PPPs in a sustainable manner. In South Africa SEA was initiated in response to the limitations of project-specific EIA. Table 2 summarizes and compares the evolving differences in the way that EIA and SEA is being practiced in South Africa.

Table 2. The comparative differences of the application of SEA and EIA in South Africa

EIA	SEA
Is reactive to a development proposal	Is pro-active and informs development proposals
Assesses the effect of a proposed development on the environment	Assesses the effect of the environment on development needs and opportunities
Addresses a specific project	Addresses areas, regions or sectors of development
Has a well defined beginning and end	Is a continuing process aimed at providing information at the right time
Assesses direct impacts and benefits	Assesses cumulative impacts and identifies implications and issues for sustainable development
Focuses on the mitigation of impacts	Focuses on maintaining a chosen level of environmental quality
Narrow perspective and a high level of detail	Wide perspective and a low level of detail to provide a vision and overall framework
Focuses on project-specific impacts	Creates a framework against which impacts and benefits can be measured

Source: CSIR [19]

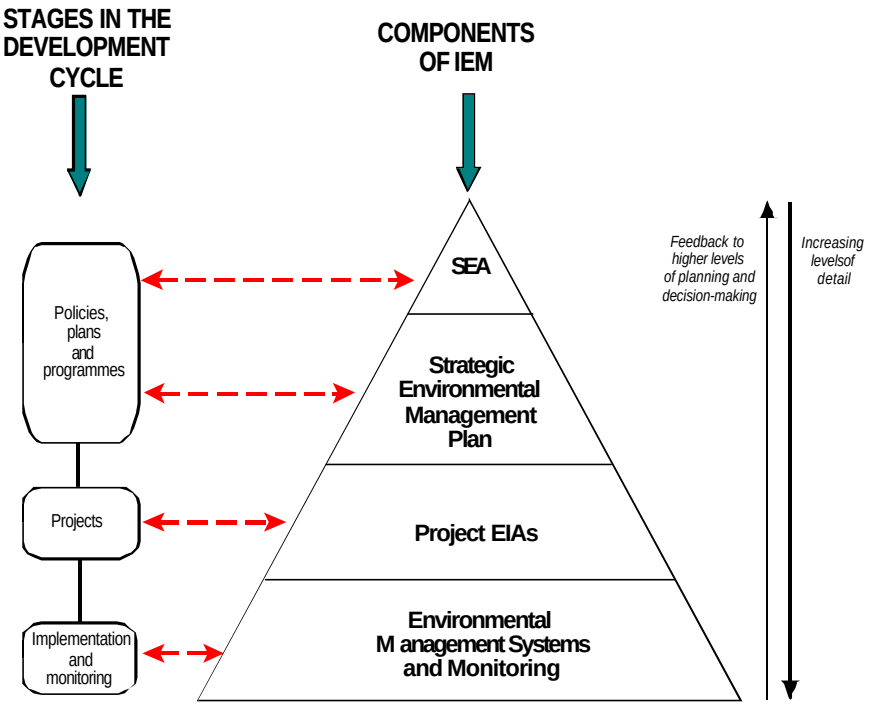

Figure 2. The tiered approach to SEA and EIA in South Africa (CSIR and DEAT [20]).

Based on the practical experience gained in conducting SEA, generic principles were developed as a step in the process of formulating a common approach to SEA in South Africa. These principles are listed and described in Table 3. The implications of each principle for the approach to SEA emerging in South Africa, are also outlined. The focus is on developing an approach to SEA, which reflects the socio-economic, biophysical and political context of the country and the lessons learnt to date in the implementation of SEA.

Table 3. Substantive and procedural principles for SEA in South Africa

Substantive principles	**Implications**
SEA is underpinned by sustainability	The focus of SEA is on integrating the concept of sustainability into the objectives and outcomes of PPPs. The sustainability objectives should be developed with the participation of interested and affected parties. Targets and measurement tools are defined to guide development towards sustainability.
SEA identifies the opportunities and constraints which the environment places on the development of PPPs	The environmental resources needed to achieve the sustainability objectives are identified. The environmental resources form the basis for the identification of opportunities and constraints, which guide the formulation of PPPs.
SEA sets the criteria for levels of environmental quality or limits of acceptable change.	The levels of acceptable change of the environmental resources are determined. This process reflects public views and scientific information.
The scope of SEA is defined within the wider context of environmental processes.	SEA is not limited to a particular site, but considers the local, regional and international linkages and contexts.
SEA is based on the principles of precaution and improvement.	Scientific uncertainty is inherent at the PPP level and this should be recognized. A risk-averse and cautious approach is applied, which recognizes the limitations of current knowledge about the consequences of decision-making. This approach should be linked to a commitment to continuous learning and improvement.
Procedural principles	**Implications**
SEA is set within the context of alternative scenarios.	Scenarios, visions and alternative PPP options are developed within a participatory process. Alternative scenarios are evaluated in terms of their ability to maintain and enhance the environmental resource identified.
SEA is a flexible process, which is adaptable to the PPP process.	SEA is integrated into existing processes for PPP formulation and implementation. SEA is not a single prescribed process to be used in all contexts. SEA interacts consistently with the PPP procedure in an iterative way, to integrate sustainability into decision-making.
SEA is a strategic process, which begins with the conceptualisation of the PPP.	SEA introduces sustainability goals at the earliest stage in the PPP process; from conceptualisation through to the many stages of decision-making.
SEA is part of tiered approach to environmental assessment and management.	SEA address higher levels of decision-making in order to provide the context for lower levels.
SEA is a participative process	The public participation process informs the scope and sustainability objectives of SEA. These processes are adapted to the specific socio-political context of the PPP.

Source: CSIR and DEAT [20]

The principle that SEA is underpinned by sustainability, is central to the vision for the further development of SEA. This vision is one of an integrated, flexible and sustainability-led approach; which is adaptable to the diverse range of needs and circumstances in South Africa. The focus is on proactively integrating sustainability into PPPs, rather than on addressing the limitations of project-specific EIA. Such an approach would facilitate the development of context-specific dimensions of sustainability; as well as the formulation and implementation of strategies to achieve this. An integrative approach to SEA aims to avoid the duplication of processes. The focus of an integrated approach to SEA, is on adding value to existing procedures and promoting the efficient use of resources.

An integrative approach to SEA allows for the development of flexible SEA procedures, which respond to context-specific conditions. This is particularly important in South Africa's diverse range of social, economic, biophysical, legislative and administrative conditions. A single SEA process has not been prescribed; rather key elements of an SEA have been identified to guide the development of context-specific processes. The key elements identified for an SEA process are illustrated in Figure 3 below.

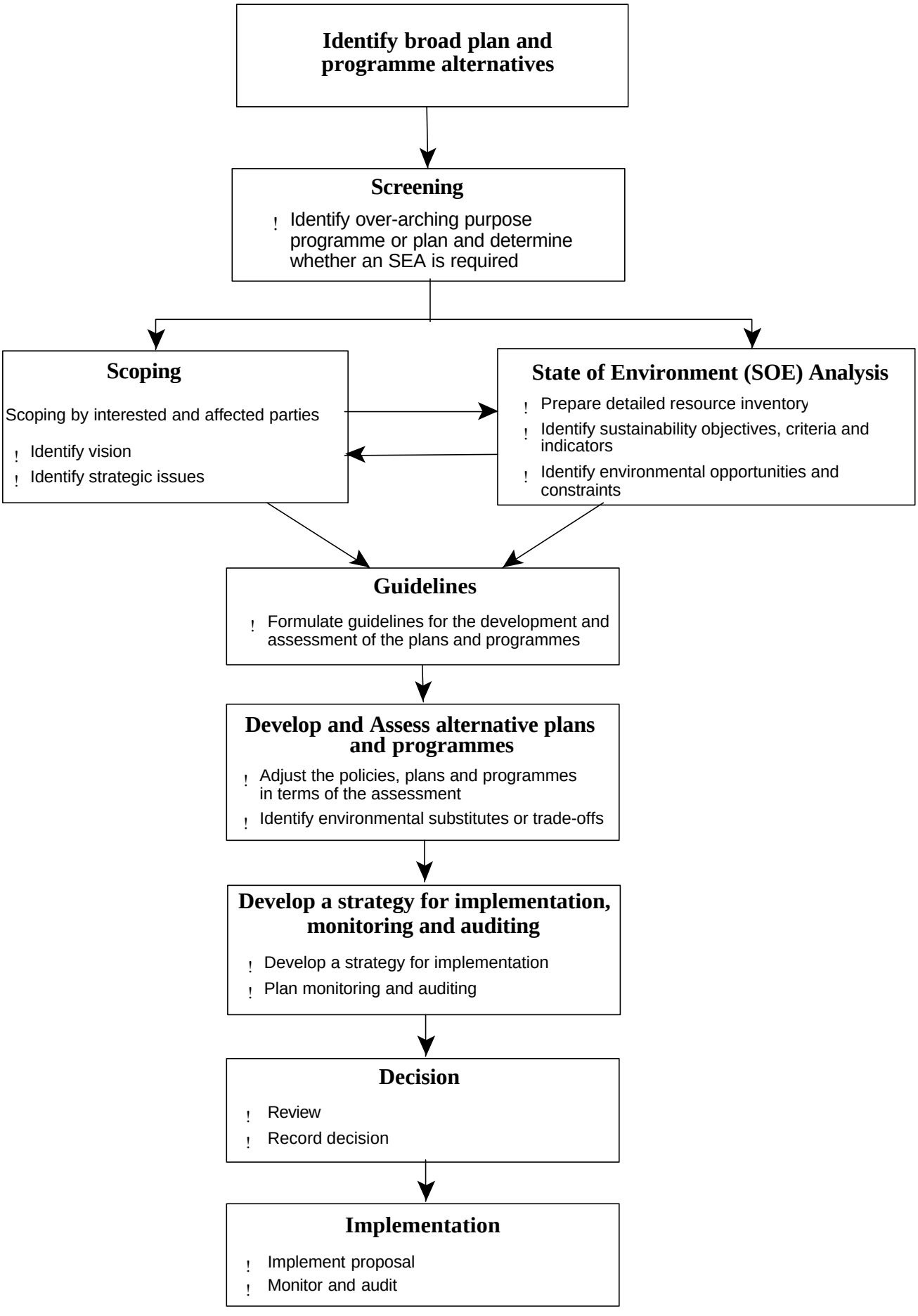

Figure 3. Key elements of an SEA process (CSIR and DEAT [20])

The elements of the SEA process illustrated in Figure 3 can add value to existing legislated procedures by providing the means of integrating the concept of sustainability. The elements of existing PPP processes should be identified and compared with the elements of the SEA process. This will highlight those elements that need not be repeated and those, which are complimentary. SEA can strengthen PPPs by incorporating a more holistic evaluation and thus ensuring a more sustainable outcome.

The aim of these elements is the integration of sustainability into PPPs. These elements can either be used independently to support existing PPP procedures or they can be combined into a stand-alone process (Figure 3).

The South African socio-economic and legislative context

South African cities are spatially segregated along racial and economic lines (Planact [21]). Most urban areas are racially fragmented with great spatial separations and disparities between towns and townships, resulting in inefficient and costly urban sprawl. This apartheid created spatial landscape has the following features:

- ? racial segregation of residential areas
- ? buffers zones between residential areas
- ? great disparities in the levels of service provided to different areas
- ? ineffective land use
- ? long distances between home and work place for the majority
- ? informal settlements on the urban fringe
- ? urban sprawl

The characteristics of the apartheid city pose special challenges for spatial planning. In addition to the formidable task of racial integration, the apartheid city legacy will effect:

- ? securing access for the poor to the economic and social benefits of the city
- ? cost of infrastructure to service a sprawled city
- ? transportation systems
- ? ability of municipalities to generate sufficient local sources of income

Spatial planning

Local governments face the challenge of contributing to the transformation of South Africa's distorted, inequitable settlement patterns (CDC, CSIR and GTZ [22]). Reconstructing apartheid cities requires a multi-pronged strategy, which should mobilise a vast range of resources and capacity. The new planning systems in South Africa aims to maximise the impact of scarce resources and limited capacity through planning development interventions in a strategic and holistic manner. The legislative context for planning is provided by the Local Government Transition Act (LGTA) and the Development Facilitation Act (DFA). The LGTA compels municipalities to develop negotiated Integrated Development Plans (IDPs) for their areas of authority. IDPs aim to integrate the development and management aspects of municipal areas. The DFA

requires local government to prepare Land Development Objectives (LDOs). LDOs aim to put in place extraordinary measures to facilitate the implementation of reconstruction and development. These measures include the fundamental transformation of planning processes, mechanisms and institutions, in order to facilitate the newly envisaged development role of local government. IDPs and LDOs are, however, recognised as roughly equivalent. A municipality is not required to engage in both processes (Planact [21]). In addition to these two pieces of legislation, a number of national departments have their own planning imperatives.

Some of these are:

- integrated transport plans (Department of Transport)
- SEAs (Department of Environmental Affairs and Tourism)
- catchment management plans (Department of Water Affairs and Forestry)

SEA

In South Africa, there are currently no legislated requirements for SEA to be undertaken. Initiation of SEAs would arise from the benefits it provides to decision-makers. This situation is similar to the early years of Integrated Environmental Management in South Africa. Then, as it is now, reservations exist about delays, duplication, appropriate procedures and methodologies. Nevertheless, a number of policy initiatives address the need for SEA. These include the White Paper on Environmental Management Policy for South Africa (DEAT [23]) and a discussion document entitled: *A National Strategy for Integrated Environmental Management (IEM) in South Africa* (DEAT [24]).

There is an opportunity in South Africa for SEA to play an important role in implementing much of the new planning and environmental legislation, using an integrated approach. A number of acts have recently been promulgated requiring strategic development and environmental plans, to facilitate sustainability. For example, the Development Facilitation Act (DFA) No 67 of 1995, makes provision for strategic, integrated planning which facilitates sustainable land development practices and processes (Republic of South Africa [25]).

South Africa's planning system and the promotion of change

South Africa's new planning system focuses on facilitating development in a manner which corrects historically distorted, racially based settlement patterns and meets basic needs in a sustainable way. The integration of social, economic, institutional and physical aspects of land development is promoted and public participation in planning is a basic principle. IDP is defined as: *A process to integrate economic, social, institutional and financial dimensions in order to support the optimal allocation of scarce resources between sectors and geographical areas and across the population, in a manner that provides sustainable growth, equity and empowerment of the poor* (DCD, CSIR and GTZ [22]).

IDP will find its foremost expression through the local government budget (Planact [21]). The process of formulating IDPs will involve:

- ? a close assessment of the current reality
- ? a determination of community needs
- ? an audit of available resources
- ? the prioritisation of needs
- ? the development of frameworks and goals to meet these needs
- ? the formulation of strategies to achieve goals within specific time frames
- ? the implementation of projects and timeframes to achieve key objectives; and
- ? the use of performance monitoring tools

The benefits of IDPs are that they:

- ? enable municipalities to align and direct their financial and institutional resources toward agreed policy objectives and programmes;
- ? are vital tools to ensure the integration of local government activities with other spheres of development planning at provincial, national and international levels;
- ? serve as a basis for engagement between local government and citizens;
- ? enable municipalities to assess their obligations and systematically prioritise programmes and resource allocations;
- ? assist local governments to focus on the environmental sustainability of their delivery and development strategies; and
- ? assist local government to develop a holistic strategy for poverty alleviation.

The IDP process has six main phases (CDC, CSIR and GTZ [223]). These phases are described below and illustrated in Figure 4.

Phase 1: Workplan
This phase documents how the local government body will implement the new system of planning. It deals with the allocation of government capacity and resources in support of the planning process. It is intended to serve as a framework or guideline of how the local government will carry out is mandate with regard to IDP.

Phase 2: Vision
A vision about the desired future of the area is developed. It describes the strategic intent and is based on the development priorities identified by local people. The purpose of the *Vision* is to link the current reality with the future.

Phase 3: Development Framework
A development framework provides general direction to guide strategy formulation and decision-making over a multi-year period. It is a set of principles, priorities, goals and ideas that are the framework within which decisions are made.

Phase 4: Development Strategies

Development strategies are specific plans that will be used to achieve a development goal by addressing the core issues. The strategies contribute to realising the stated vision. They are the means for either solving problems or maximising opportunities.

Phase 5: Operational Planning for Implementation

This phase involves putting appropriate financial and institutional arrangements in place. Operational planning for implementation focuses on developing detailed financial, institutional and communication implementation plans that all feed into drawing up annual budgets

Phase 6: Monitoring, Evaluation and Review

This phase makes up an ongoing system to periodically assess the performances of the municipality. Monitoring and evaluation are critical to:

- ensure the implementation of plans
- measure the development impact
- ensure the efficient use of resources

Performance and development indicators need to be developed and used as a yardstick to identify and rectify shortcomings.

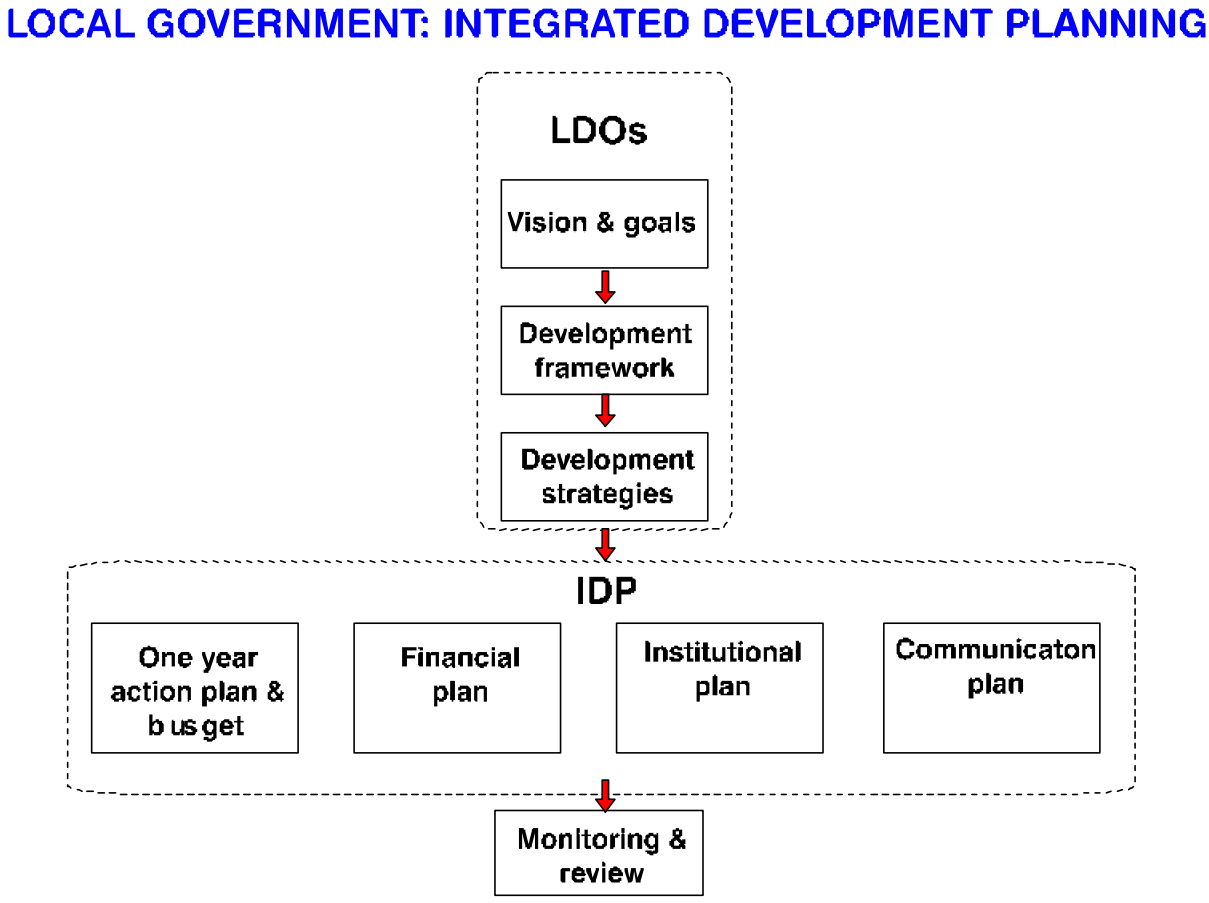

Figure 4. The process of Integrated Development Planning

Integrating SEA and spatial planning

SEA should not be separate to the IDP process but rather integrated into it. SEA can add value to the IDP process, by providing the means of integrating the concept of sustainability into planning. In the SEA process, limits of acceptable change are defined, which indicate the ability of the environment to sustain development. These limits may therefore be used as a guide in planning, to ensure that development does not degrade or deplete environmental resources. Environmental opportunities, which may be enhanced through appropriate planning, are also identified in the SEA process. The purpose of SEA is therefore to complement the planning process, by providing the information necessary to ensure that development maintains and enhances environmental resources. This is a practical means of implementing the concept of sustainability in planning. The SEA process should be adapted to the specific planning process, which is being undertaken. This can be accomplished by identifying the elements of SEA, which will add value to the planning process and therefore should be incorporated into it. An example of how SEA may be integrated into the IDP process is provided in Figure 4. This figure is a simplistic illustration of the IDP process, which indicates which key elements of SEA may be incorporated into the IDP process and which elements are already included and need not be repeated.

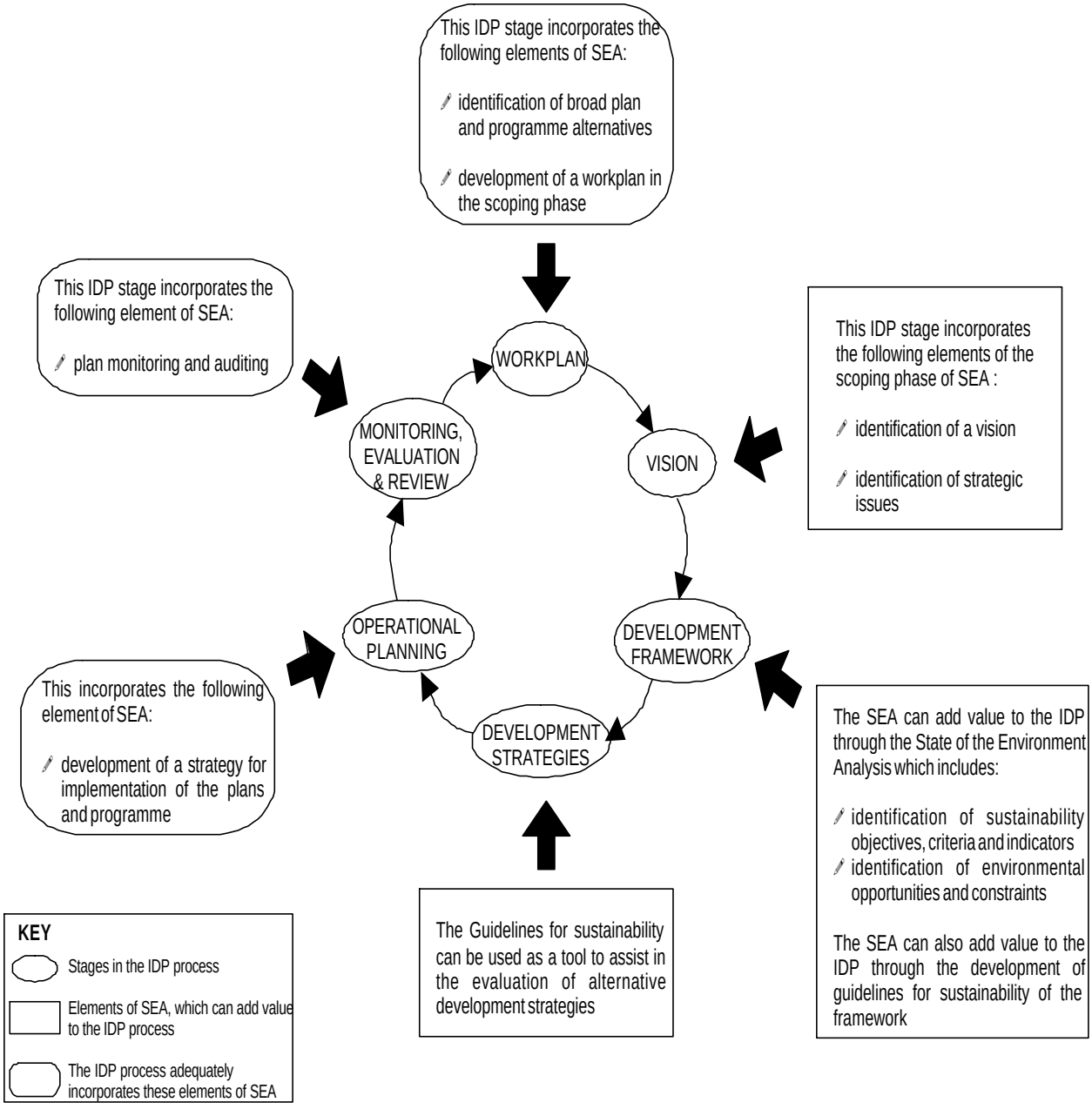

Figure 5: Integrating the IDP process and elements of SEA (CSIR and DEAT [20])

Conclusions

In South Africa, SEA was initially undertaken to address the cumulative and widespread impacts of development. This resulted mainly from the limitations of project-specific EIA. However, the opportunity now exists for SEA to play a role in integrating sustainability into plans and programmes, which are required in terms of recent legislation. The principles of sustainability are promoted in much of the new planning and environmental legislation. SEA is seen as a tool for operationalising these principles

and including environmental issues into strategic level decision-making. The SEA approach and guidelines developed for South Africa is intended for application at the planning level.

SEA is not intended to be a separate from the planning process. The flexible nature of the SEA process and principles aim to provide a basis for integrating sustainability into existing planning processes.

The key challenges for planning in South Africa are equity and empowerment. Planning should therefore be framed within social, racial and economic justice. The South African planning systems have been transformed to be more democratic, inclusive and equitable. However, there are two basic limitations of the planning processes. These are:

? Because they are issue-driven, planning is skewed toward addressing short-term socio-economic benefits and not long-term planning issues

? No framework for addressing cumulative effects of individual projects or programmes

SEAs main contribution to linking sustainability and planning is to:

- Identify the opportunities and constraints, which the environment places on development;
- Provide guidelines to ensure that development is within sustainable limits;
- Improve the way in which cumulative effects are dealt with, for example, through the use of thresholds and limits of acceptable change; and
- Focus on the maintenance and enhancement of a chosen level of environmental quality, rather than by minimising individual impacts.

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Environmental concerns in Coastal Planning on the Gulf of Finland Life Project 1997 - 1998

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Nature protection master plans

The objective of the Coastal Planning on the Gulf of Finland project was to promote master planning on the southern coast of Finland. Because of amendments to the Building Act, planning in the coastal zone was required, but the existing regional plans and master plans only partly covered the coastal areas, and did not guide building enough. Therefore, new plans were needed. Additionally, the new Nature Conservation Act specifies that nature must be taken carefully into account. The coastal area in the project included two national parks, several areas in the Natura 2000 network, nationally valuable protection areas and other nature protection areas. Building without good land use plans would be a threat to the coastal biodiversity. Of primary importance were making good nature and cultural heritage inventories, and determining the building rights of the present landowners. Other important recommendations for drawing up the plans were using archipelago zones as planning zones, encouraging interest group participation, applying environmental impact assessment, and developing planning reports. The plans should promote sustainable development and should encourage the development of the local economies of coastal and island areas.

Need for planning

Planning situation

The 1997 amendments to the Building Act stipulated that new development in coastal areas must be based on plans. Without a master plan or a more detailed plan, building was permitted only under exceptional circumstances and with prior permission. Granting of special permission was difficult, because regional plans should define the exceptional circumstances under which special permission can be granted, but regional plans do not cover the whole coast. The situation was worse on the coast west from Helsinki, where the regional plan proposals have not been ratified by the Ministry of the Environment. Because nature values, valuable landscapes, maintaining unbuilt coastlines, recreational needs, and also the development of the local economies in the coastal zone were not considered sufficiently in the plans. The existing master plans covered approximately one-quarter of the 9,075 kilometres coastline (including islands larger than one hectare) and about 140,000 hectares of the coastal zone. Additionally, some private landowners have drawn up more detailed plans. Therefore, master plans were needed for guiding construction in the coastal zone of southern Finland. In the Coastal Planning on the Gulf of Finland project, seven municipalities along the coast

jointly prepared master plans for their coastal zones in cooperation with the regional administration; regional councils and regional environment centres. A master plan is the most economical way of protecting nature. It can cover quite a large area, which facilitates good planning. More detailed plans would have been possible as well, but they do not take into account such extensive areas as a master plan does. Coastal master plans are crucial to preserving the still existing unbuilt coastline (which measured 2,733 kilometres ten years ago, or less than one-third of the total length of the southern coast) and to protecting nature and the valuable cultural heritage. One-fifth of Finland's population live along the southern coast. The dense population and, among other things, activities such as agriculture, industry, transport on land and water, and building, and the need for harbours pose a threat to nature and the cultural heritage. Since regional councils were also renewing and drawing up regional plans for the same areas, the need for discussions was obvious; preparing plans in close cooperation benefited both the municipalities and the regional administration.

Nature along the coast

Coastal zone nature is quite diverse. In many ways, Finland's southern coast is unique. The narrow strip where oaks can grow occurs only along Finland's southern coast, from south-west Finland to the Porvoo area, east from Helsinki. North of this strip are mostly coniferous trees. The salinity of the water along the coast is only about 0.5% - 0.7%. The water is brackish - a mixture of oceanic and inland waters. Organisms must be specially adapted to this type of water. Off of Finland´s southern coast is the archipelago - an extensive area of about 6,300 islands and islets - lying between the mainland and the open sea. Near the coast, islands are relatively large and the water areas are not so wide in between. The islands become smaller away from the coast, until finally on the brink of the open sea, there are mainly islets and the water areas are extensive. Plant and animal species vary depending on the parts of the archipelago they inhabit. The special nature of the southern coast of Finland is protected through the national parks of Tammisaari and the Eastern Gulf of Finland, national nature conservation programmes (e.g. conservation programmes for coastal zones or bird species, the Natura 2000 network) and other nature conservation areas.

The planning areas and project co-operation

The project comprised the municipalities of Tammisaari, Inkoo, Porvoo, Pernaja, Ruotsinpyhtää, Pyhtää and Virolahti, the Uusimaa Regional Council, the Regional Council of Itä-Uusimaa, the Regional Council of Kymenlaakso, the Southeast Finland. Regional Environment Centre and the Uusimaa Regional Environment Centre. The plans cover about 173,000 hectares of land and water areas, and approximately 2,330 kilometres of coastline, which is roughly a quarter of the total southern coastline of Finland. The municipalities were in charge of drawing up master plans; accordingly, the working method for the project focused on cooperation and discussions with the municipalities and the consultants. Several meetings, workshops and seminars were arranged to promote the cooperation and to discuss important issues. Authorities - for

example, the National Board of Antiquities, experts, and non-governmental organizations representing various fields - participated in the project. The project was a part of the European Commission's Integrated Coastal Zone Management (ICZM) Demonstration Programme (1996-1999), which was a joint initiative of Directorates-General XI (Environment), XIV (Fisheries) and XVI (Regional Policy and Cohesion). The ICZM programme was aimed at providing technical information on the factors and mechanisms, which either encourage or discourage sustainable management of coastal zones, stimulating broad debate and exchange of information among the various actors involved in the planning, and implementing coastal zone management. The debate should lead to appropriate measures to stimulate integrated management of European coastal zones. The European Commission wanted to become familiar with planning systems, methods, legislation, information and participation in EU different countries, as well as with the effects of the EU policies. This fact, along with LIFE financing, had an affect on the project goals - public participation and sustainable solutions were even more emphasised in the project.

Objectives of the joint project and the plans

The project team discussed the goals and contents of the plans, as well as the measures that will be used to produce quality plans promoting sustainable development in the coastal zone of the Gulf of Finland. Some questions asked were:

- How to protect the unique archipelago and promote sustainable development through master plans.
- How to implement the Building Act and the revisions to the building legislation and the Water Act, the new Nature Conservation Act, and the new Forest Act, on planning in coastal areas.
- How to use master planning as a tool in coastal zone management.

To answer these, the project aimed at:

- inventorying the flora and fauna and the cultural heritage while drawing up the plans, so that, for instance, sites named in the new Nature Conservation Act could be identified;
- establishing archipelago zones, based on the inventories and depending on the natural conditions, as the first step in planning;
- implementing the Natura 2000 network and assessing whether the planning options are in line with the provisions of the habitat and bird directives;
- promoting the use of geographical information systems (GIS) in the municipalities;
- maintaining the sustainability of the environment by using the natural environment to determine the building rights;
- encouraging the use of similar building regulations, especially for nature conservation areas and for water management and building rights in the various zones;

- ensuring equal treatment for all landowners and determining what building rights still remain (1959 was selected as a baseline year for the building rights study); encouraging efficient land use planning, especially strategic development of an area, which will allow for resources to be used in developing the villages and which will maintain traditional livelihoods (e.g. by promoting tourism and networks in coastal zones);
- cooperating and promoting participation in planning, so that anyone involved can influence planning decisions; and
- incorporating EIA into the planning process, so that the municipalities can assess several development options and their impacts on the natural environment, communities, cultural heritage and landscapes.

Fulfilling the goals in planning and in the plans

Master planning procedure

The new Land Use and Building Act came into force at the beginning of 2000. During the project, the old building legislation and its 1997 amendments were in force. The 1997 amendments stipulated that building was not permitted at the water´s edge without an approved land use plan. However, the new legislation was taken into account, too. In the new Land Use and Building Act, people are given even better opportunities for participation than before, particularly in the early stages of the planning. The Act calls for a special participation and assessment scheme to be drawn up when land use planning begins. The Land Use and Building Act also changed the enforcement procedure so that regional environmental centres do not enforce the plans anymore, but instead they provide guidance and cooperate in the planning. The planning process itself did not change much. The steps are as follows: Starting the planning, and drawing up the participation and assessment scheme; nature and cultural heritage inventories, collecting planning material and setting up databases; defining goals; planning options, draft plan; planning proposal; and approval by the municipal council.

Protecting nature

Archipelago zones as a basis for planning

One of the first steps in the planning was to establish archipelago zones based on the natural conditions. The geomorphology of the southern coast determines the various zones - mainland coast, inner archipelago zone, outer archipelago zone and marine zone. The mainland coast includes the coastline/shoreline and large islands. In the shallow marine bays the water is cloudy and common reed grows extensively along the shores. In the inner archipelago zone, islands are still covered by forest and surrounded by reed beds, and shallow bays and lakes isolated from the sea are typical. In the outer archipelago zone, among partially forested islands are small treeless islets and the shores are mainly composed of bedrock or piles of stones. In the marine zone there are bare rocky islets, and the sea is constantly in motion. There is little vegetation but many

nesting birds. Nature along the coast and in the inner archipelago zone is not so sensitive as on small rocky islands of the outer archipelago zone. The natural environment should determine the building rights in the various zones, that is, the sustainability of the environment must be maintained. Archipelago zones were defined by all municipalities and the zones were used in the planning process. Other matters, such as water supply, existing infrastructure, transport systems, boating routes or feasibility of the ground for building were considered in defining planning zones, as well.

Nature and cultural heritage inventories

Because of the new Land Use and Building Act, the new Nature Conservation Act and the Forest Act, new kinds of inventories are now required. The new Nature Conservation Act lists nine protected habitat types - wild woods rich in broad-leaved deciduous species; hazel woods; common alder woods; sandy shores in their natural state; coastal meadows; treeless or sparsely wooded sand dunes; juniper meadows; wooded meadows; and prominent single trees or group of trees in an open landscape. It is prohibited to alter any of the habitat types in such a way as to jeopardize the preservation of the characteristic features of the area. The new Forest Act protects other especially valuable forests types and habitats. Certain species are indicative of these protected habitat types, and the project team specified that nature inventories must be thoroughly conducted so that all the protected habitat types would be found. The inventories were also needed to determine the suitability of the coastlines for building. The cultural heritage and cultural landscape inventories were equally important. Finland's southern coast has long been inhabited and a versatile cultural heritage has developed over the centuries. The quality of the basic planning material was evaluated by senior advisers and nature protection experts at the regional environment centres, and also at the National Board of Antiquities.

Implementing nature protection in the plans

Inventories should be available at the beginning of the planning process. To get the most out of the inventories, the results must be presented clearly. GIS was useful tool for this and was used from the beginning. All results, such as valuable sites or cultural heritage landscapes, should be presented clearly on maps, and their features and values should be stored in databases. A report is also needed for presenting this information. The planner, and also others dealing with the plan, need to know how accurate the inventories are, what sources were used in making them, and when the inventories were made. The most essential part in carrying out the inventories and in compiling the results is to evaluate the value of the sites and give land use recommendations to the planner. The planner needs to know how to take into account, for example, the nesting period of birds and what should be the conditions for maintaining various sites. Planners are not usually experts in these matters; therefore, the biologists should evaluate the inventory results. The project team draws up recommendations for nature protection regulations which should be used or applied. Protected areas, and areas that belong to the national nature conservation programmes, should already be designated as

conservation areas or as areas to be protected under the Nature Conservation Act. The features of other valuable sites, such as habitat types named in the Nature Conservation Act, should be maintained and described in the planning report. Implementing the new legislation was a new aspect in the project. Additionally, for the first time, Natura 2000 network sites were included in planning. The project planning areas included many marine Natura 2000 network areas; therefore, protecting marine ecosystems was promoted. Finland´s proposal for its Natura 2000 network sites also includes measures for implementing the network. Together with the Nature Conservation Act, other means are used, too. The Water Act was mainly applied to water areas in the plans, but, for example, the national park of the eastern Gulf of Finland was designated as a nature conservation area on the basis of the Nature Conservation Act. All in all the plans include about 17,600 hectares of Natura 2000 network sites, areas protected under national conservation programmes or other nature conservation areas. All valuable sites found in the inventories cannot always be protected, however, because of the economic value of coastal land. The first measure for protecting areas in planning is to find a more suitable place for construction than a valuable site. This is not always possible - the landowners property might not be large enough for building rights to be sited any place else. In that case, the state should either allow building, pay compensation for conservation or buy the property. Large sums of money are used to finance nature protection in Finland this way. The landowner can, of course, choose to protect his own land, too, and this also happens quite often. Other valuable sites marked in the plan will remain the landowners' properties. If the protection causes economic loss to the landowner, full compensation must be paid.

Retaining the unbuilt coastline

One of the sustainability goals was to protect the unbuilt coastline as much as possible, as well as to establish areas for recreational use. In Finland, landowners' building rights depend mainly on the size of the land they own. The project planning areas were delimited as large as possible to ensure the possibility of siting building rights away from the coast to more suitable places inland, and to preserve valuable nature sites. When the project started, 1,270 kilometres of the 2,330 kilometres of coastline in the municipalities was unbuilt. The plans will preserve 1,030 kilometres of the unbuilt portion. Overall, a considerable amount of unbuilt coastline is protected. Additionally, roughly 850 hectares are set aside in the plans for recreation.

Guiding development

Protecting nature and the cultural heritage were of primary importance, as well as equal treatment of all landowners while determining what building rights still remained. In order to guarantee that all landowners were given equal treatment, 1959 was selected as a baseline year for the building rights study. The study looked at how many landowners had already used their building rights. If the building rights were already used, new development was not allowed on their property. Those landowners who had not built on their property or sold their property were guaranteed their rights. In any case. the sustainability had to be maintained. Thorough evaluation of the property rights, together

with inventories of the biodiversity and the cultural heritage, gave a good basis for defining building rights and for protecting nature. However, discussions of the building rights and defining the rights in the various zones were very demanding tasks, because landowners were concerned for the value of their property. In the areas where development was allowed in the plans, special attention was paid to adopting building regulations that will protect the surrounding environment. The project team discussed changing holiday houses to year-round houses, water management, sewerage, and developing the means of making a living. Permanent housing and work places were usually restricted to existing villages, and sustainable solutions were looked for in water management and sewerage. For example composting toilets were recommended for holiday housing areas to avoid contaminating the thin soil layer.

GIS

All information was saved in geographical information system (GIS) databases (e.g. ArcView and MapInfo). GIS was used as a tool in carrying out the planning work and was a good means for presenting visual material to the public. Visual aids make it easier for the public to get involved, too. In one of the project municipalities, Inkoo, all inventories and planning materials were saved in GIS databases, to which the public had access. Maps were used to present the results of the inventories, and landowners were able to see what was found on their properties, and if the information on the properties was correct. By using GIS the inventories can be comprehensively presented, the public can become more involved in planning, and good maps and other visual aids can be produced for various purposes.

Development strategies, planning options and EIA

Strategic development in coastal areas is difficult because they are on the periphery of most municipal boundaries, the inhabitants tend to be elderly, and most of the new construction is for holiday houses. Public services in coastal areas are expensive for municipalities to provide, although money spent by visitors in local shops partly compensates for some of the costs. Municipalities and landowners have traditionally allowed construction of summer cottages along coasts because it has been the only way to develop areas and local economies, and landowners seldom have any other opportunities for earning money from their valuable coastal properties than to sell land or to build summer cottages. The need for strategic development in coastal areas is obvious. The municipalities and regions should draw up development strategies for the coastal zones and define the development aims to be realized by land use plans. Drawing up and evaluating various planning alternatives was promoted. Both the reasoning behind the decisions made during planning, and environment impact assessment were to be integrated into the planning process and presented in the planning reports. The project team discussed the development of tourism, boating routes and harbour networks, and changing holiday houses to year-round houses, among other development aims. A drawing competition for local schoolchildren was also arranged to encourage everyone to participate in planning, and to generate discussion on

development. However, rather than express their opinions at a large public meeting, people seemed to prefer private discussions with the planner. The drawings did stimulate discussions on the development of the coast and islands in all municipalities in the project. One main result of those discussions was that swimming places, which children had requested, became a part of the master plans. This kind of procedure is quite new in coastal master planning, but, in general, good progress was made in integrating EIA into coastal land use planning. During the planning process, various planning alternatives were discussed, and finally one alternative was chosen for a draft plan, and the impacts on the environment were evaluated. Environment impact assessments were supplemented with evaluation of the affects on species in the Natura 2000 network areas that are listed in the habitat and bird directives, which was also a completely new factor in planning.

Conclusions

The project could considerably extend master planning on Finland´s southern coast and on islands. The plans will support the development of the areas, and allow protection of nature values and the cultural heritage. As expected, master plans are the most economical tools for protecting nature. By means of these plans, the protection of several areas identified in Finnish nature conservation programmes and also areas selected for the Natura 2000 network can be carried out more economically than without plans. The plans will also promote efficient land use by guiding development in areas in a wider context, that is, in large coastal areas. These master plans were drawn up in a new situation, new legislation was to be implemented, and, additionally, the LIFE financing and the European Union's ICZM demonstration programme set high standards for planning. Sustainable development is promoted in the plans; construction is directed towards more sustainable areas, for example, to the villages. The unbuilt coastline, nature, recreational areas and complete forest units are preserved in the plans. The planning regulations also support sustainable development. Close cooperation between many parties was emphasised in the project. The participants gained good experiences from disseminating and exchanging information, implementing new legislation and new ideas in planning, working together and especially including children in the planning. This was the first time in Finland that coastal master planning was done under such wide cooperation. The municipalities had the opportunity to familiarize themselves with the planning methods applied in other municipalities, and to compare experiences. The project team concluded that discussions and joint efforts had broadened the municipalities knowledge, and had given support to their own decisions. When the municipalities became familiar with nature and the geography in various parts of the Gulf of Finland, it helped them to identify the development prospects of their own coasts. Working together in drawing up the plans was clearly synergistic, and cooperation also in the future in land use planning would be important.

Mapping of Register data, using standard GIS

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Abstract

Using the Danish Building and Dwelling Register (Danish Abbreviation: BBR) we will try to classify a given urban area. In a Geographical Information System (GIS) the BBR becomes a swarm of points, each representing the position of one building. Together with each point are stored information concerning building-usage, floor-area, etc.

Using a grid of 100 by 100 meters squares, which is superimposed upon the BBR points, a classification is made. The resulting output is associated with the grid cell, i.e. each grid cell are given a value.

In the present state the project produces output grids of 'Land Use Classification', 'Urban Density Classification' and 'Majority Heating Type Classification'. Only availability of input data sets the limits for what can be aggregated and mapped.

This type of data of course provides a coarsened and broad view of an urban area. Despite the lack of detail this type of information have been a requested resource for urban planning. Many parameters can be aggregated into area information and then provide an easy accessible data fundament for various types of statistics, as well as making suitable input to computer models looking for development patterns.

Background

The increased focus on parameterisation of sustainability and the following demand for parameters and monitoring systems, have also create a need for getting a general view of certain parameters. Geographical Information Systems (GIS) are suitable for quickly producing and updating maps, and suitable for getting a general view of things, since they enable us to overlay multiple information layers and thereby create new understandings of our surroundings.

The data presented here are part of the Danish "Area Information System" (AIS) as the described system provides information on urban land use for AIS. The development is also associated with the Interreg IIC project "Planing Systems for Sustainable Development" (PSSD) who have provided much of the theory behind the classification system and the parameterisation of urban land use. The results will also be included in works done by the Danish Ministry of Environment and Energy's Topic center for Urban Environment, as well as the European Environment Agencies (EEA) national resource center for Urban Environment in Denmark.

Overview

The core of the present work is the initially simple task of aggregating point information into area information, i.e. identifying all the points in a given parcel, subtracting and evaluating the information associated with those points, and finally assigning the result to the parcel.

This can be handled as tree separate steps. The first subtask is selecting all points inside a given parcel, and the last subtask is assigning the results to the parcel. These are classic functionality found in most GIS. The non-trivial part is, evaluating a number of information and creating a single-value result. The details in that of course depend on the nature of the actual assignment. The present case study is only one example.

The case

The case was taken from an actual assignment ”Create a map of Urban Land Use, using data found in the Building and Dwelling Register”.

The Danish Building and Dwelling Register (Danish abbreviation: BBR) holds information about each of the approximately 2.5 mill. buildings in Denmark. The informations used are ”Address”, ”Usage Code” and ”Building Area”. The address is used to identify the location of the building, since the BBR holds no geographical coordinates. The usage code is used to determine the usage of the individual building. The building area is used to ensure that, e.g. two small family houses not outweighs one huge factory. This is done by comparing building usage by accumulated square meters rather than simple count of buildings.

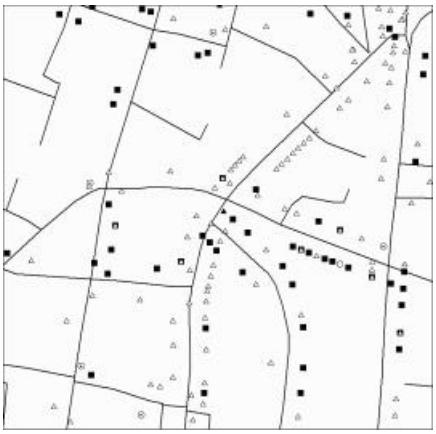
Register data

Register data are in this case considered to be data maintained in table or database registers. Specifically it is data without x, y coordinates. Many publicly collected and maintained registers lack information on precise location, and then become impractical, if not impossible, to convert to maps. An overview of the spatial distribution of a given parameter is then lost. Many register data holds some sort of identifier that enables us to position it in the landscape, this could be address, municipally number, building ID codes or other information that can be linked to a single location. This process may involve several different registers, and can usually be performed using standard database software.

Adresse	Anvk	Opført år	Bygareal
Alpevej 17	120	1968	178
Alpevej 1	120	1965	100
Alpevej 5	120	1967	188
Alrøesvej 6	120	1996	168
Alrøesvej 8	510	1943	80
Alrøesvej 10	120	1936	86
Alrøesvej 4	120	1926	120
Anchersvej 1	230	1963	200
Anchersvej 2	120	1959	94
Anchersvej 3	120	1949	100

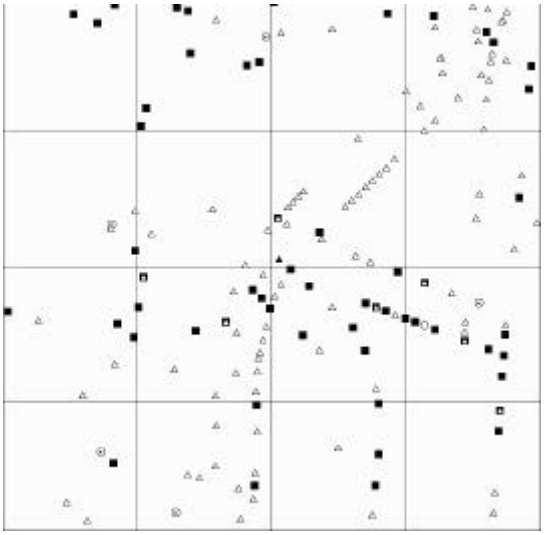
Geocoding

The process of geocoding, is generally the process of associating each item in a data set with geographical coordinates. In this case the information in the data set that allows us to perform a geocoding, is the present of a street address on each building. Using a digital street network we can locate a point for each address and thereby allocate geographical coordinates to the building. Standard geocoding associates each point with a given street by matching the street names. After having identified the correct street, linear interpolation is used to position the buildings equally spaced along the street. A standard geocoding would place the buildings in the middle of the road, here each building is pulled back 15m from the road. This is believed to give a more realistic position of the individual building. Though standard in most GIS, geocoding is a far from trivial process. In many cases, including this, geocoding is a potential source of inaccuracies. The map shows downtown Vejle in Denmark. The building have been iconised according to their usage with square for residential, dark triangle for industry, light triangle for shop and office, circled dot for cultural activities and finally open circle for leisure.



Area polygons / Cells

The parcels used for the aggregating of information have to be selected with caution. Using different aggregation polygons can produce rather different results. One possibility could be plots of land as identified by the land registry, another could be areas laid out by local planners. Such selections would likely produce comparatively homogeneous areas, with respect to land use, while more randomly selected stratification might introduce unnatural mixes. Though, to meet requirements of reproducibility and to ensure cross-national comparability the present case was completed using square grid cells. An investigation in different cell sizes lead to the conclusion that larger cells gave few clean cells that holds only one type of buildings, while smaller cells leave more areas undeveloped, i.e. fall between buildings. Pre-processing the output data can to some degree compensate this latter problem. This pre-processing would have to include some sort of intelligent ‘filling in the blanks’. Different types of pre-processing still have to be investigated. For the present case, cells of 100m by 100m were selected



as a suitable compromise, for Danish conditions, and no pre-processing was applied. The GIS-tools implemented can work with any kind of parcels, but the result may be influenced by the chosen size.

Class hierarchy

The result of an evaluation of a parcel is a single value. This value does, in this case indicate a type of urban land use. The class hierarchy contains the possible legal values. The subset of classes, which are present in this case, are shown in the box. Though these classes look identical to the usage classes for the individual building, it is important to stress that they are not. Best illustrated by the mixed classes, which are legal for parcels, but not for a single building. It will often be necessary to operate with different classes for the input and output date, except when dealing with basic statistical analysis like average. Calculating for example average household income, or most frequent type of heating source will have the same legal values for input and output data sets, while this case of land use will require the possibility of mixed classes or even totally new classes like 'city center'.

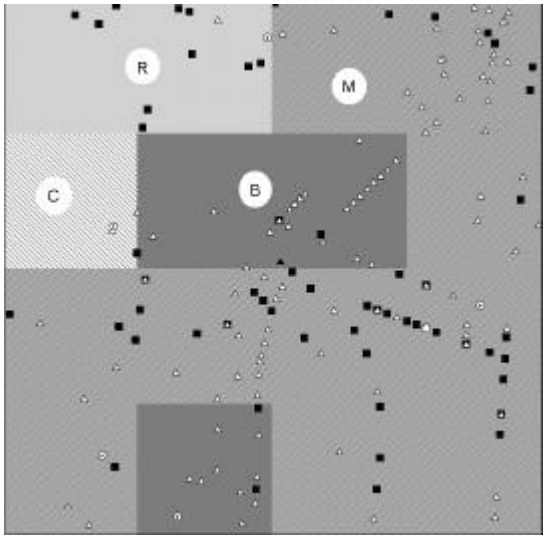
Residential area
Business area
- Manufacturing, Industry and storage
- Retail/shopping, Office
- Culture (museum. cinema. church. etc.)

Mixed Residential and Business area
- Mix Residential with Service, office, hotel and restaurant
- Mix Residential with Industry

Recreation and leisure activities

Aggregating

The process off aggregating is a process of collecting all points in each grid cell, evaluating the points and creating a single-value result. This result becomes the attribute value of the grid cell. This process can, as earlier mentioned, utilise standard statistical routines. Though more complex decision processes can be necessary. In the present case we have created rules for which mixes of building are allowed in a given output class, e.g. how many shops should be allowed in a residential area before it becomes 'mixed residential and business'. In this type of cases we will have to take into consideration the nature and purpose of the analysis. On the figure are indicated four different area types Residential (R), Business (B), Cultural (C) and Mixed residential and business (M). A general aggregation tool would have to allow the user to input thresholds or better entire schemes on which the decision process are to be based. The present tool have been specially designed for analysing urban land use, but it is the



intention to conduct further developments and hopefully make the methods general enough to be able to handle many different scenarios.

Feature perspectives

This general-purpose tool wais created to meet demands in aggregation data for analysis and generalisation. In the case presented here the tool has been used to aggregate information about single buildings, in order to create a more general view of the land use in an urban area.

The Ministry of Environment and Energy's Topic center for Urban Environment are using this tool to generate status quo maps of different environmental and urban indicators. Some of these works are utilised by national publications and national statistics on the subject. Feature data sets in the collection will be, e.g. average age of the housing stock, the urban density, frequency of different heating types, etc.

It is the intention to add modules to the package as demands for new thematic mapping arises.

The National Biodiversity Mapping Programme in Norway

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Abstract

A national biodiversity-mapping programme is being undertaken in Norway. The municipalities are responsible for the actual mapping, and they receive support and advice from the various county governor officers. The Directorate for Nature Management has prepared manuals to guide the mapping. Each local authority can apply for a one-off government grant of approximately NOK 50,000.00. Information generated by this mapping is first and foremost intended to be used in the local authorities' own land-use management work, but will also be fed into national data bases. A system for determining the value of biological diversity has been drawn up so that each local authority will be able to prepare a map showing its most important areas for biodiversity. The way this valuation is performed is described in DN Manual 13-1999 (1) and is briefly outlined here. It is based on three manuals that give guidelines on the mapping of, respectively, habitats, species of wild animals and where they function, and freshwater localities. In addition, directions are given on how to merge the categories in the Norwegian Red Data List of endangered and vulnerable species (5) into two divisions. Instructions on how to allocate localities for biodiversity to one of two categories, A areas (extremely important) and B areas (important) are also given. The programme started in 1999 and a national political target requires every municipality in the country to map the biodiversity within their boundaries by the end of 2003. This mapping programme is a follow-up of the Rio Convention on Biological Diversity. A total of 83 municipalities began their mapping effort in 1999, and a similar number will start this year.

Background

The Norwegian Country Study on Biological Diversity was carried out in 1992 (DN report 1992:5b) (2). Norway has subsequently followed up the Rio Convention on Biological Diversity by way of several national political documents and reports:

- St. meld. No. 13, 1992-93 om FN konferansen om miljø og utvikling i Rio de Janeiro (UN conference on environment and development in Rio de Janeiro).
- St. meld. No. .29 (1996-97) om Den regionale planlegging og arealpolitikken (Regional planning and land-use policy).
- St. meld. No. 58, 1996-97 om Miljøvernpolitikk for en bærekraftig utvikling. Dugnad for fremtida. (Environmental Policy for a Sustainable Development).

The third of these White Papers (St. meld. no. 58, 1996-97) expresses the political aim that all municipalities in Norway will have mapped the biological diversity within their boundaries before 2004. Since 1999, each municipality has been able to apply for a government grant for this mapping. The Directorate for Nature Management, on behalf of the Government, has prepared manuals for it. The regional nature management officers employed in the offices of the county governors have the task of providing the local authorities with advice on the mapping. The purpose of the project is that the local authorities will be able to acquire a good survey of their most important areas for biodiversity to take them into account during their land-use planning. Information gained from the mapping will, moreover, be fed into national databases to form a basis for national land-use statistics.

Organisation

The actual mapping is being performed by the local authorities, which can apply for government grants to defray expenses. Some have adequate expertise to do the work themselves, but most will engage consultants. The county governors office are obliged to supply each municipality with all the information they have on precisely located information on biodiversity within its boundaries. The county officers will also help the local authorities to quality assure the information they acquire, and will have an important quality assurance role to play when the information from the mapping is being fed into the national database (Naturbase). The Directorate for Nature Management allocates to the various counties the sum available for grants, and ensures that manuals and methodology are prepared to provide guidance for the mapping.

Mapping manuals

The great variation found in the scenery and wildlife in Norway is striking compared to the other Nordic countries. Its long, narrow shape, and location at the western extremity of a large continent, along with the influence of the warm Gulf Stream, provides Norway with a humid climate with relatively mild winters. High mountains and a diversity of landscape forms, topography and geology results in considerable local variations in climate and corresponding variations in flora and fauna. Consequently, plants and animals that are rare at one place in Norway may be very common in another place. As far as possible, this variation is taken into account when the manuals for recording biodiversity were prepared.

Many municipalities in Norway have already mapped important biological localities within their boundaries. However, apart from preparing maps of important areas for wild animals, they have not systematically mapped important areas for biodiversity using the same methods. A number have prepared maps showing biodiversity, but their content and the methods used differ from one municipality to another.

Some standard manuals for recording information have now been prepared for use in a national biodiversity-mapping programme in which the municipalities themselves are responsible for the actual mapping.

- Manual for mapping habitats (DN Manual 13 - 1996) (1)
- Manual for mapping areas for wild animals (DN Manual 11 - 1996) (2)
- Manual for mapping important freshwater localities (DN Manual 14 - 1999 (in press)) (4)

In addition, the local authorities are requested to produce precise map localities for species on the Red Data List within their boundaries, based on the national Red Data List (DN Report 3 - 1999) (5).

The manual on habitats (synonymous for nature type) describes 56 habitats that are believed to be particularly important for biodiversity. The habitats being mapped contain elements of vegetation, geology, zoology and landscape, and are a kind of common multiple where an attempt is made to acquire knowledge about all the most important variations at the ecosystem level. The habitats are grouped into seven main categories, or primary ecosystems. The following set of criteria was used when selecting the habitats.

- occurrence of Red Data List species
- areas of continuity
- habitats rich in species
- rare habitats
- important biological function
- specialised species and communities
- habitats with high production
- serious decline

As some of the habitats that are to be recorded cover large areas, criteria have also been given for how localities with the same habitat may be mutually ranked. The most important criteria used then are size and the extent of physical disturbance. Such criteria are used to enable localities to be ranked in two categories of value: important and extremely important. In fact, all the habitats selected are important in a biodiversity context, but there is nevertheless a need to be able to achieve a ranking. In broad terms, it can then be said that the category *extremely important* implies national value and that of *important* corresponds to regional value. The local authorities will, in addition, be able to map habitats, which they themselves consider important, but which are not so important when assessed regionally or nationally.

Table 1. Selected habitats that are being mapped

Mires and bogs	Scree, rocks and woodland	Alpine areas	Cultural landscape	Freshwater/ Wetland	Forest	Coast and Seashore
Intact lowland mire	South exposed rocks and screes	Calcareous alpine areas	Hay meadows	Delta areas	Rich broadleaved forest	Shallow streams
Intact raised bog	Woodland border scrub		Hay fen	Mud flats	Old broadleaved forest	Seaweed vegetation
Blanket bog			Road embankments with high diversity of species	Oxbow lakes, temporary ponds and meandering rivers	Calcareous forest	Sand dunes
Palsa bog			Pastures	Larger river-banks	Birch forest with tall herbs	Sandy banks
Rich fen			Wooded meadow	Waterfall spray-zones	Grey alder-bird cherry woodland	Shore meadows and shore swamps
Spring and spring stream			Wooded pastures	Important stream systems	Rich swamp woodland	Drift lines
			Coastal heath	Calcareous lakes	Old deciduous woodland	Brackish deltas
			Calcareous meadows	Rich lakes in the cultural landscape	Primary forest/ old conferous forest	Coastal lagoons
			Damp meadows	Dams	Brooks clefts	Calcareous rocky shores
			Small refugies	Lakes and ponds with natural absence of fish	Burned fields	
			Large old trees	Non-acid polluted refugies	Coastal spruce forest	
			Park landscape		Coastal pine forest	
			Replacement habitats			
			Urban disturbed sites			
			Caves/mines			

In 1996, the Directorate for Nature Management prepared a manual for the mapping of important areas for wild animals (3). The majority of municipalities in Norway have now mapped wild animals using the method described there. This mapping is based on the individual species and its habitat. The species selected are based on criteria like how endangered or vulnerable they are, whether Norway has a responsibility for them and whether they may be hunted. The manual also contains a system for determining values, where the individual species and the areas in which they function are allocated a generalised and fixed value from 1 to 5. Hence, for example, an area where arctic foxes have cubs is given a value of 4 or 5, whereas a breeding area for willow grouse is

allocated from 1 to 3. These possibilities for applying different values are intended to facilitate the application of local assessments of an individual locality.

The manual for freshwater localities (4) is based on freshwater species and the area in which they function, in the same way as that for wild animals.

Determining values

To facilitate the handling of large quantities of data on various topics, a method has been drawn up to show how values may be determined and how different kinds of data can be combined. In the manuals described above, and for the Red Data List species, criteria have been given for how to distinguish between:

- **A** - extremely important areas
- **B** - important areas

Assessing the importance of individual species in relation to habitats, and occurrences of Red Data List species in relation to the functioning areas of wild animals, is obviously difficult, but a method has nevertheless been worked out for doing this in practice to be able to produce a biodiversity map for land-use planning. This method is outlined below:

RED DATA LIST SPECIES	**A** - covers E (extinct), V (vulnerable), R (rare) **B** - covers DC (declining), DM (declining, monitor species)
MAPPING WILD ANIMALS	**A** - species and functioning area with weightings 4 and 5 (3) **B** - species and functioning area with weightings 2 and 3 (3)
HABITATS	**A** - habitats assessed as *extremely important* in DN manual (1) **B** - habitats assessed as *important* in DN manual (1)
FRESHWATER	**A** - localities with national value in DN manual (4) **B** - localities with regional value in DN manual (4)

The use of this method enables a map to be produced that provides a survey of the parts of the municipality area that are extremely important (A areas) and important (B areas) in a biodiversity context. The municipality of Ringsaker has in cooperation with the Directorate for Nature Management and Asplan Viak, produced a CD containing a map of the municipality using this method. This CD is available from the Directorate for Nature Management. The CD have installed Arc Explorer viewing tool, but the maps on it will work better with the ArcView GIS tool. The majority of municipalities are expected to produce digital maps of biodiversity.

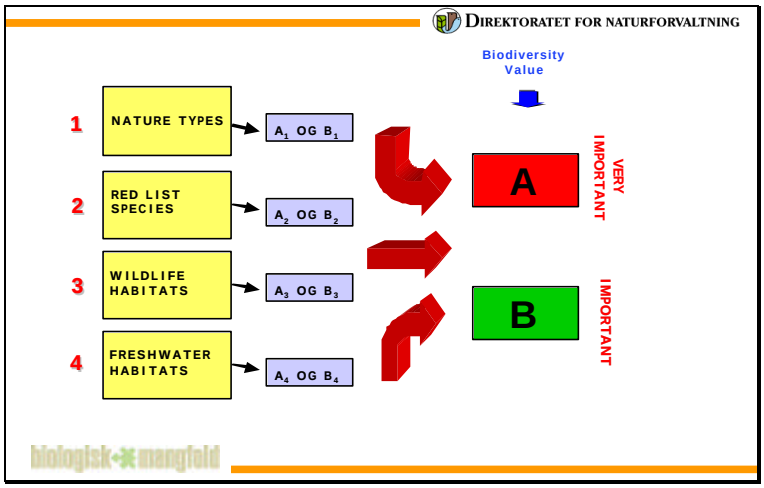

Figure 1. Determining the value of biodiversity

Data bases and linking to other systems

Information generated by this local mapping programme will be fed into Naturbase, the national database. Biodiversity is not a separate theme in Naturbase today, but will be represented by the existing modules on species and important areas. This database is operated by the Directorate for Nature Management and contains various themes relevant in nature management. Information in the database is intended to provide data to the Natur (Nature) theme in the national land-use information system AREALIS. AREALIS provides GIS-data from different public owners of these sets of data, for use in land-use planning in Norwegian municipalities. It is also a request that all sectors and management bodies involved in the planning and management of areas of land and water will take this system in use. For information about AREALIS, please contact the Norwegian Mapping Authority, or refer to its home page on the Internet (http://www.statkart.no/arealis/). Fig. 2 shows how those databases are interconnected.

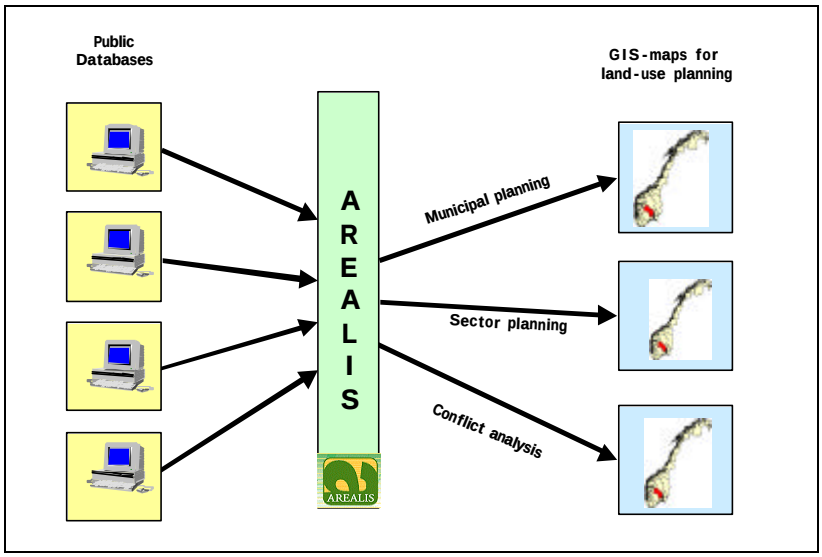

Fig. 2. The interconnection between Naturbase and AREALIS, the national land-use information system,

Application of biodiversity data

The principal objective of the biodiversity mapping is to provide local authorities with a tool that enables them to take account of biodiversity when they are carrying out land-use planning. The areas mapped do not automatically attain a formal status, such as conservation areas, but work is being done on separate guidelines for a national policy on biodiversity. National policy guidelines are a possible way to make claims towards planning authorities and developers. Such claims may be connected to use and gathering knowledge, principles for consideration and restoring damages. The areas mapped here will anyway be a basis for the municipalities own land-use planning, based on the Planning and Building Act.

The results from the biodiversity-mapping programme will also be able to be used in reports submitted by Norway to the international community regarding its follow-up of the Rio Convention, and also in its follow-up of other international conventions.

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Urban Environmental Indicators in Denmark

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Urban environmental indicators has achieved attention in national and international policies as a tool to indicate the state of the environment in our cities, but also to show how we should proceed in order to improve the urban environment. In Denmark both national, regional and local authorities are working with environmental indicators of some sort. There is a diversity in the choice of indicators depending on the data available and the purpose of the use of indicators. Here the some of the national used urban environmental indicators will be presented, with respect to purpose, choice and development of indicators.

The development of urban environmental indicators at national level in Denmark

The Ministry of Environment and Energy has published a yearly report on the state of the environment during the past decade. The urban environment has been one of the subjects of this report. The urban environment is an important part of Danish environmental policies due to the fact that the state of the environment is vital for most Danish citizen, thus 85% of them live there. Second, the urban environment, understood as the sum of urban structure, form and environmental state, is major component in the pressure on the environment in general, but at the same time the city is a potential for solving many environmental problems by collective means.

Since 1996 the National Topic Centre for the Urban Environment at Danish Forest and Landscape Research Institute has been involved in developing urban environmental indicators which can be used in relation to the different work of the Ministry of Environment and Energy. The main purpose of the indicators at national level is to illustrate the state of the urban environment. At the same time it has been important to illustrate that decisions taken in relation to urban planning influence the environment.

Criteria for indicators on the urban environment

We found two main criteria for selection of indicators. First they have to be relevant for policies, in order to measure some sort of performance of national policies in the field. Second data have to be:

- Available:
- Comparable
- Updated frequently

- Geographically defined to the urban zone

Data on the state of the urban environment has shown to be a major problem, mainly due to the lack of statistics. But it has been difficult to find data which could match the criteria above.

Thus an important component in the development of indicators has been the use of GIS. With this tool, it will be easier to describe in a comparable way, for example the development in land use in urban areas, or how large a proportion of the building stock is connected to the district heating system.

Urban form and structure as the driving force for the state of the urban environment

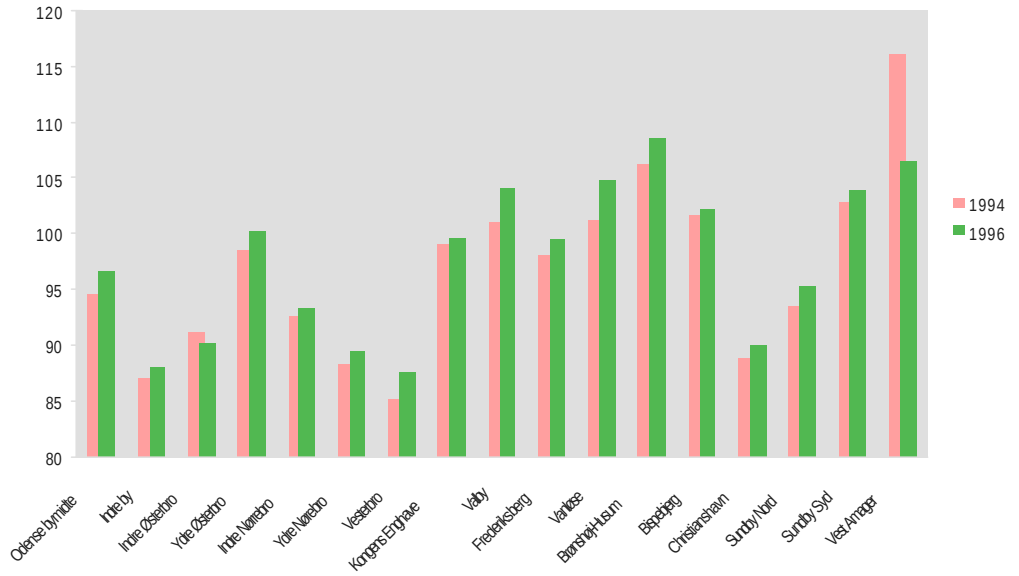
The indicators has been developed using the DPSIR (driving forces-pressures-state-impact-responses) model, where the urban form and structure is seen as driving forces putting pressure on the state of the urban environment. In the recent publication "The environment in Denmark – selected indicators", it has been essential to illustrate the responses used in Danish urban policy, where urban form and structure is part of the responses to problems in the urban environment.

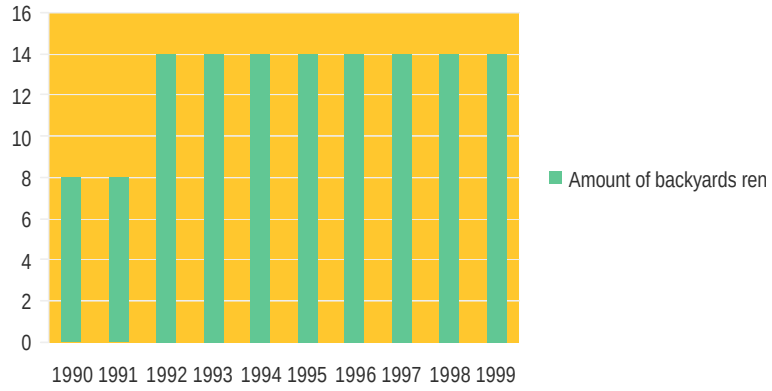
It has been difficult to illustrate the state of the urban environment in Danish cities in general. Thus in the 1999 edition of "The environment in Denmark – selected indicators", two cities were chosen to illustrate the state of the urban environment Copenhagen and Odense. Two of the indicator set is illustrated below.

Selected indicators on the urban environment

Using satellite photos the development of green areas and vegetation in the urban area has been measured. By using a simple method (NDVI), it is possible to show how more or less green (on the picture; white) the urban area has become. The indicator illustrates the development in "greenness" in Copenhagen urban district from 1994 to 1996. Greenness can be seen as an indicator telling us something about the state of the urban environment in relation to bio-diversity and recreation, but can also be an indicator on land use and thus the pressure on the urban environment. The corresponding response indicator used here is the amount of backyards being redeveloped as green areas. The Danish Governments National policy on the Environment has emphasised the importance of securing green areas in the urban fabric. By using this method, it is

possible to measure the development in terms of figures, but also to point at where in the urban area, the development is going in the wrong direction, i.e. which urban districts are under pressure.

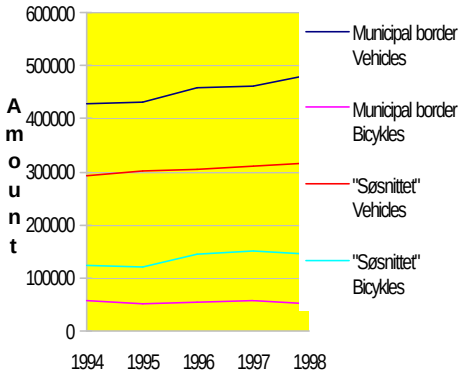


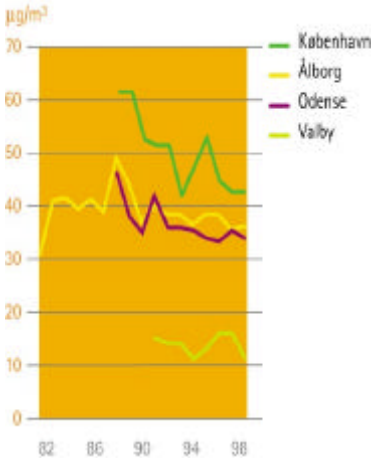


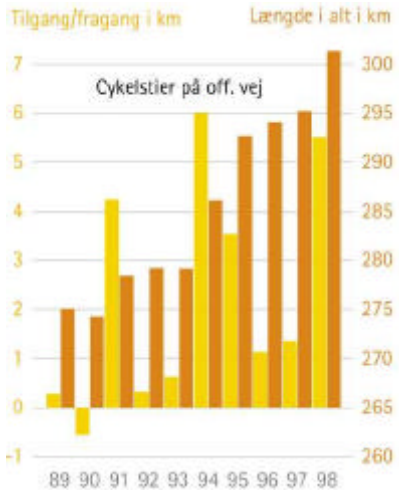
Set of indicators: On satellite photo: Red illustrates decrease in "greenness" and green illustrates increase in "greenness". The figure illustrates the measured de- or increase in "greenness" in Copenhagen urban districts. In most districts the amount of "green" has increased. The response indicator is the amount of urban backyards which have been renewed as local green areas

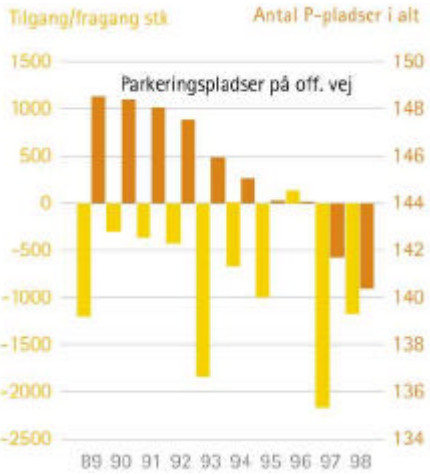
The development in the transport sector is a special problem in an urban context. Noise and pollution are concentrated in the city, if other measures are not taken. The national policies in this field is to improve air quality, provide the possibility of using other transport modes than private car and in a long term to decrease the emission of carbon

dioxide from the transport sector. This indicator set is aimed at illustrating the development in the level of transport in the city, the air quality, and possible responses taken by local government in order to provide alternatives to the use of private car. The indicators chosen was the level of transport, air quality, development of bicycle lanes and the de- or increase in the number of parking lots.









Set of indicators: Vehicles across two counting sections in Copenhagen, Nitrogen dioxide concentration in city air, Total length of bicycle lanes and the yearly increase in bicycle lanes in Copenhagen and finallyTotal amount of Parking possibilities and the yearly decrease in parking possibilities in Copenhagen.

Future development in the indicators at national level

In future GIS will have an increasing role to play in relation to the indicators developed in the National Topic Centre for the Urban Environment. Based on the Danish Building and Dwelling Register (BBR) we can illustrate the development in dwellings connected to district heating, as an indicator on the efficiency in the urban use of energy. Or the development in the density of an urban district, as an indicator on land use and urban densification. Furthermore, by combining data from local authorities on noise levels, air quality, etc., with the BBR and digital roadmaps it is possible to produce precise estimations on for example the amount of dwellings exposed to a noise level exceeding 65 dB(A) or located in streets with an air pollution exceeding accepted levels.

Strategic Environmental Assessment and Environmental Quality Objectives: Methodology applied to a Regional Programme

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Abstract
A pilot project was carried out in the federal province of Salzburg (Austria) applying strategic environmental assessment (SEA) to the Tennengau Regional Programme on a voluntary basis. It was based on the Proposal for the Council Directive on the assessment of the effects of certain plans and programmes on the environment (Com (96), 511 fin.). One of the main objectives of this project was to gain practical SEA experience and to find out how SEA can be integrated into the existing planning process. It was intended to integrate the requirements of the Proposal into the planning procedure since some of the SEA aspects were already covered by the relevant planning act.

The impacts of the regional programme on the environment were assessed systematically and comprehensively, using the means of matrices. A system of environmental quality objectives, standards and indicators was established. In order to assess the impacts a nominal scale with five levels was used by the different experts concerned. This was an essential prerequisite for the final step of an integrative assessment.

The main outcome of the pilot project is that SEA can be easily integrated into the existing planning process without much additional time and costs and that the system of environmental quality objectives, standards and indicators enabled a systematic and transparent assessment. The benefits of the SEA for the environment and for the decision-making authority justified the additional efforts that had been necessary.

Introduction
So far, two SEA pilot projects based on the SEA Proposal were carried out in the sector of spatial planning in Austria. One of them was the Tennengau Regional Programme.

Objectives
The main objectives of the pilot project were to gain practical SEA experience and to find out which objectives and steps of the SEA Proposal were already covered by the existing land use procedure.

The key elements of the design of the project were

- to use the experience from strategic environmental assessments conducted abroad
- to find simple and transparent methodology for assessing environmental impacts
- to look at least at two alternatives
- not to prolong planning time
- to keep additional costs reasonable
- to apply a process oriented model including participation of all relevant persons concerned
- to use the gained experience (methods and process) for future strategic environmental assessments.

Land Use Planning

In Austria land use planning is partly the responsibility of the federation, but mostly the responsibility of the nine federal provinces. The provinces are responsible for legislation and for implementing plans regarding the future use of an area. This planning is carried out with planning instruments at the provincial and local level. The planning responsibilities of the provinces are restricted by the planning responsibilities of the federation, e.g. for the sectors water resource management, forestry, determining federal roads or railroads.

The respective provincial land use developing and planning acts specify the land use planning instruments and the procedures for adopting the plans and programmes. Most of the plans and programmes are administrative acts and legally binding. The plans and programmes of the higher strategic levels influence and determine the plans and programmes of the lower levels.

Regional Programmes in the federal province of Salzburg

Regional programmes in the federal province of Salzburg establish goals and measures for certain regions. They are binding programmes which also contain non-binding recommendations and solutions for regional spatial problems for a time schedule of 15 years. The municipalities of such a region have to implement the binding measures by means of the following local planning instruments: local development concept, land use plan and building plan.

The key principles of the regional programmes in Salzburg are laid down in the so-called model of development which comprises commitments concerning the pattern of open space and settlements. The pattern of settlements is based on the determination of axes of development and centres with regard to housing, working and supply. Additionally to the determination of axes, different binding measures are part of the programme, e.g. determination of settlement centres or priority areas for trade and industry (settlement pattern) and ecological priority areas or areas suitable for agricultural use (pattern of open space).

Strategic Environmental Assessment

In Austria, discussions on SEA began during negotiations concerning the Act on Environmental Impact Assessment and Public Participation between 1991 and 1993. Representatives of various organisations demanded environmental impact assessment not only for specific projects but also on a strategic level. The Austrian Act on Environmental Impact Assessment and Public Participation finally was enacted without SEA provisions on July 1, 1994. Currently, there is no explicit SEA procedure for assessing the environmental impacts of certain plans and programmes.

In practice, some typical SEA steps can be found in existing legislation or are sometimes used on a voluntary basis during the procedures for adopting plans or programmes. The legal requirements for adopting land use plans or programmes establish environmental goals besides other targets which have to be taken into account during the planning. The land use planning acts do not provide for a binding examination of alternatives or for elaboration of an SEA report. Nevertheless, the authority working out the plan or programme is obliged to prepare a documentation which usually considers environmental aspects. In general, the environmental authorities are consulted during the planning process. Public participation also takes place in land use planning procedures, i.e. the concerned public is invited to make comments on the plan or programme drafts.

SEA of the Tennengau Regional Programme

The Tennengau region is a rural area with 13 small municipalities in the federal province of Salzburg, Austria. According to the Salzburg Spatial Planning Act of 1992, the regional programme is to be drawn by the Regional Planning Association which is the association of the municipalities of the region.

In the end of 1997 the Tennengau Regional Planning Association decided to apply SEA according to the SEA Proposal to the Tennengau Regional Programme on a voluntary basis. The Salzburg Institute of Regional Planning and Housing was commissioned by the Tennengau Regional Planning Association to work out the regional programme and by the Federal Ministry of Environment to carry out the SEA. The planning and the SEA procedures were done in close co-operation with the department of environmental protection of the Provincial Government of Salzburg. This department took over the part of the environmental authority according to the Proposal.

As mentioned above, the requirements of the Proposal were integrated into the existing planning procedure since some of the SEA aspects were already covered. Additionally, it was assumed that integrating SEA into planning would improve the planning process and bring the whole programme a step towards sustainability. Therefore, it was aimed by all relevant planning and SEA actors to integrate environmental aspects from the very starting point. It was of prime importance to broaden the SEA from an “assessing” to an integrating instrument.

By the beginning of the year 2000, the SEA was finished and the regional programme was adopted by the Tennengau Regional Planning Association in March.

Methodology

For the systematic and comprehensive assessment of possible environmental impacts of the regional programme, some of the existing experiences with environmental impact assessments were applied. The following main steps were carried out:

Alternatives

For each binding planning measure three alternatives were considered: two planning and a zero alternative. The two planning alternatives were not designed as extreme options. Both were realistic possibilities with different levels of compromises concerning environmental protection.

Scoping

The framework of the analyses was determined at the beginning of the planning process and included human beings, fauna, flora, soil, water, air, climate, landscape, material assets and cultural heritage.

Environmental report

An environmental report was prepared by the Salzburg Institute of Regional Planning and Housing in close co-operation with the department of environmental protection of the Provincial Government. This department co-ordinated various experts from the Provincial Government of Salzburg. These experts were consulted and had the possibility to express their opinions concerning the report. The report contains information referred to in the Annex of the SEA Proposal. Of special interest are the following issues:

Environmental Quality Objectives

In addition to the spatial planning objectives, e.g. listed in the Salzburg Spatial Planning Act, also environmental objectives were established. A system of environmental quality objectives was elaborated containing objectives and standards for the environmental quality as well as environmental indicators. These environmental quality objectives were adopted by the Tennengau Regional Planning Association and became part of the assessment.

Framework for Impact Assessments

For each environmental quality objective the possible evolution of the indicators was described and the possibilities for the assessment were defined by a nominal scale with five levels, i.e. it was defined whether an evolution was to be judged as very negative, negative, with no effect, positive or very positive.

Assessment

For each planning measure and the alternatives the assessment included the primary and secondary, positive and negative effects on the different factors determined by the scoping. It was carried out by means of matrices and based on the system of environmental quality objectives and on the framework for the environmental impact assessment mentioned above. This was an essential prerequisite for the final step of an integrative assessment.

The assessment was carried out by numerous experts covering the different required domains. The experts were co-ordinated by the department of environmental protection. Furthermore, mitigation measures were worked out and documented for each planning measure.

Integrated Approach

In addition to the sectoral assessments by the experts, for each planning measure an integrated assessment was carried out considering for example interactions, the probability, duration, frequency and reversibility of the effects or the cumulative nature of the effects. A questionnaire was worked out to support integrated assessment.

On the basis of the sectoral and integrated assessment the environmental authority worked out a matrix giving an overview of the outcome, i.e. the assessments of the planning measures including the alternatives. It illustrated each planning measure and its impacts on the different factors assessed with very negative, negative, with no effect, positive or very positive (-2 until +2). Reading the matrix one could easily see

- which measures had possible impacts on which assets and how they corresponded to the environmental quality objectives
- for which measures particular precaution was necessary
- whether measures had rather widespread or rather selective impacts
- the most negative effects on the environment
- the significant differences of the two planning alternatives.

Based on these assessments, either one of the planning alternatives or a new planning alternative, containing different elements of the assessed alternatives, was recommended.

Results

First of all, the pilot project showed that the required SEA steps of the SEA Proposal which were not covered by the existing planning act could easily be integrated into the planning procedure. The process oriented model which enabled the participation and co-ordination of all relevant actors concerned right from the beginning was necessary and an important prerequisite for an effective and successful SEA.

This process oriented model also strengthened the role of the SEA itself and supported the integrative aspect of SEA. The municipalities and experts from the environmental authority who took actively part in this process oriented model used the progress to present their arguments and to solve conflicts. Maybe this process was also one of the reasons why not one single negative remark on the SEA procedure and on the results of the SEA was put forward.

Furthermore, the system of environmental quality objectives enabled a transparent and comprehensive assessment which supported the integration of environmental aspects into the planning. SEA improved the quality of the alternatives for the binding measures. In addition, due to their early involvement, some very helpful

recommendations by the environmental experts became part of the regional programme. Finally, SEA could be carried out without additional time and with reasonable financial and human resources.

Concerning the relevant SEA requirements due to the SEA Proposal the following additional steps were carried out:

Scoping
The scoping gained considerable importance due to the SEA. The scope was enlarged in comparison with the usual structural analysis carried out for a regional programme. Another consequence was that the contents of the analysis was co-ordinated at an early stage with the environmental authority. The early involvement of the environmental authority and the extended scope improved the quality of the considered planning alternatives.

Alternatives
The establishment and assessment of three planning alternatives was a new step due to the SEA. It turned out to be crucial for the consideration of these alternatives that no extreme options were chosen but realistic planning alternatives. The results clearly showed that implementing both alternatives brought better results for the environment. The elaboration of the planning alternatives and their assessment represented the major part of additional work due to the SEA.

Environmental report
The environmental report with the systematic and comprehensive information about the possible impacts included definitely more information than the usual documentation for a regional programme. The additional information concerning environmental aspects provided more balanced information to the relevant SEA actors. It was of great importance that the main conclusions of the environmental report were summarised in a readable form.

Environmental quality objectives
The system of environmental quality objectives, standards and indicators was an additional step that allowed a comprehensible assessment of the impacts of all planning alternatives. Due to this system the planner was forced to consider additional environmental aspects during the planning of the alternatives. In the future environmental quality objectives should become part of the programmes. This would enhance the integration of environmental aspects and strengthen the assessment.

Assessment
The systematic and comprehensive assessment based on the system of environmental quality objectives and, in particular, the integrative assessment of the possible impacts provided new and additional information. Although it has to be said that at this planning level not always enough information exists - since it is not clear which projects or activities will be carried out in the future. Therefore, it was sometimes difficult to

predict the possible environmental impacts. As a consequence, mainly indirect impacts were assessed.

Problems

The main problems were:

1. The lack of experience, in particular with respect to the methodology.
2. The lack of time for the assessment, in particular the co-ordination of the numerous experts involved made problems.
3. The partly rather abstract and general descriptions of alternative measures - which are inherent at this level of planning – made it sometimes difficult to assess their possible impacts in a satisfactory way.
4. The public showed no interest in the SEA.

Benefits

The SEA integrated into a spatial programme signified an improvement concerning environmental protection. Furthermore, a number of advantages for the planning and for the decision-making authority resulted from this process.

The most important benefits for the Tennengau Regional Programme were:

1. The communities themselves determined the objectives of environmental protection which became part of the SEA and the environmental report.
2. The possible impacts of the regional programme on the environment were studied in a systematic and comprehensive way and therefore, SEA helped to prevent environmental conflicts.
3. The necessary experts were involved at an early stage in the process.
4. The consideration of planning alternatives raised the quality of planning.
5. The planning process including the assessment of possible impacts was more transparent.
6. Negative effects could be reduced because measures of the regional programme could be modified.

Conclusions

The introduction of SEA within the framework of the regional programme improved the quality in terms of environmental protection considerably. It definitely contributed to a better integration of environmental aspects into spatial planning. Furthermore, it improved the basis for the decisions to be taken by the municipalities.

The elaboration of a regional programme usually takes approximately two years. Even with the additional SEA, it was possible to keep the initial schedule.

As mentioned above, public participation is already an element of the procedure for a regional programme in the federal province of Salzburg. The municipalities concerned, neighbouring municipalities (including Germany) and different local

agencies and authorities are involved as well as the public concerned in general. Thus, the additional effort due to the SEA was little.

In the case of the regional programmes in the federal province of Salzburg the integration of SEA into the existing planning procedure is favoured to SEA as an additional procedure.

SEA brought benefits for the decision-making authority and for the environment. In particular, the system of environmental quality objectives influenced the programme and the assessment. The difficulties in the pilot project resulted from the lack of SEA experience. This will change in the future. It can already be said that SEA in general and environmental quality objectives in particular will play an important role for integrating environmental aspects into planning and promoting sustainable development.

Environmental Objectives and Indicators in Spatial Planning and Strategic Environmental Assessment – eight case studies

1. Burlöv municipality – case study
Indicators for a good living environment

Burlöv is a small municipality on the outskirts of Malmö. This means that Burlöv has many of the problems associated with big cities. The built-up areas of the municipality are split in halves by the two railway tracks of one of Sweden's trunk lines. The Swedish National Rail Administration is currently investigating the possibility of expanding from two to four tracks. This possible expansion is one of the major concerns for the citizens of Burlöv.

The environmental problems of Burlöv are in large part due to the geographical location of the municipality and the heavy traffic on the thoroughfares. These problems will no doubt increase when the Öresund Link is opened during the summer of 2000.

The connection to the Öresund Link and the three motorways the E6, the E6.01 and the E22 create barriers in the landscape. The railways also create substantial barriers splitting the built-up areas of Arlöv and Åkarp in two.

The long-term objective is to create a good living environment for the citizens of Burlöv . The case study focuses on ecologic, social and economic factors. The main efforts have been aimed at identifying relevant environmental indicators and at assessing the effects suggested changes might have on the quality of the living environment. In the autumn of 1998 the municipality of Burlöv approved its second comprehensive plan and work will continue with creating more detailed plans for the built-up areas of Arlöv and Åkarp.

The case study has been centered around the PICABUE-method which is based on the concept of round table discussions. In addition to the case study five more studies have been carried out. These have proved very significant since they have provided both inspiration and further insight.

The work of the PICABUE-group resulted in 37 plan- and field-indicators which were analysed according to Agenda 21 principles. Out of these indicators the group settled for the following:

- Areas with undisturbed environment
- Built-up zones with valuable landscape or recreational areas
- Housing areas with a 400 m distance to the closest green land
- The proportion of citizens within a 5, 10 or 15 minute distance of green land
- Green open spaces/land required for traffic purposes
- Proportion of citizens exposed to air pollution
- Noise

Small municipalities with an extensive infrastructure, such as Burlöv, cannot single-handedly act to create a sustainable development. This makes it very important that the intensified cooperation between different authorities can continue and develop even further. The SAMS-project has created a sense of optimism and positive visions for the future. The case study has also led to intensified contacts with the University of Agriculture in Alnarp and Lund University.

2. Helsingborg municipality – case study
Objectives and indicators for an environmentally sound transport system

The Helsingborg case study is related to the city's current comprehensive plan (**Comprehensive Plan 97**) and the development of an **environmentally sound transport system**. In view of the limited resources available, an area inhabited by about 10% of the population in the north-eastern part of city was selected for a substudy in the form of a prototype for future work on Geographic Information Technology (GIT).

The purpose of the case study is to investigate ways and means of increasing the proportion of travel by bicycle and public transport by improving **accessibility** and to prepare **indicators**, which describe this process. It must also be possible to use the indicators in an environment based on GIT.

Although accessibility is a significant factor for the choice of means of transport, **external factors** carry most weight. These consist of politics, economics, opinions, traditions, culture, attitudes etc. There may also be a great difference between people's intentions and how they behave in practice. Convenience is often a more important factor for behaviour than environmental concerns, and it is therefore important to assure quality at all stages of planning. In the last analysis, far-sighted planning, which ensures good accessibility, may be the determining factor when it comes to the proportion of journeys made by bicycle and public transport when certain external factors change. The immediate objective, then, is to ensure that the plans we produce now are of high quality.

The case study analyses **three planning situations**: the present situation and two future scenarios. The scenarios are projected 20-30 years into the future and are based on Comprehensive Plan 97. The main difference between them is that one of them – the **Active Comprehensive Plan** – contains measures prioritizing bicycle and public transport. The **Zero Comprehensive Plan**, on the other hand, would lead to conventional development in accordance with current practice. Apart from bicycle and public transport, interchange points are being studied as a significant component of the traffic system.

As regards **interchange points**, we have identified **location** and **design** as important factors in determining appropriate **indicators**. Location is determined by the **accessibility** of the interchange point, i.e. its geographical position. Locations are studied in relation to the use of the adjoining land and to important destinations, as well as to the number of inhabitants within walking distance. The study should include both the day and the night population. A start has also been made on comparisons of the ranges of various interchange points with the help of isochrons. Design has to do with **accessibility within** the interchange point. In this case accessibility is measured mainly by recording the distance between parking spaces, platforms etc. and between stops within the interchange point. A third factor that is being studied is the number of possible changes within the interchange point, i.e. how many different transport categories, including public transport services of varying frequency, meet at the interchange point.

Both quantitative and qualitative factors in the case study's bicycle network have been listed and analysed in order to identify the most relevant **indicators** for **the promotion of bicycle traffic**. **Directness, ease of orientation, barriers** and **continuous systems** have been established as some of the most important general factors for an increase in the use of bicycles. We have therefore identified planning indicators with these four factors in mind. This applies at thoroughfare level. A further 13 factors/criteria were identified at link level and ranked by difficulty of implementation (from maintenance matters to a new detailed development plan). Our method of studying, analysing and finally estimating the volume of bicycle traffic is one example. It shows that under the **Zero Comprehensive Plan** bicycle traffic would increase by just over ***10%*** compared with now, while under the **Active Comprehensive Plan** the increase would be as much as ***44%***.

An important factor when it comes to the use of **public transport** is **physical accessibility**. This is also an important planning issue. The indicators we focus on in the public transport study deal with accessibility, travel inconvenience and the effects of congestion. The average **walking distance** to the nearest bus stop or railway station for potential travellers can be used as an indicator of accessibility.

Accessibility also has to do with the **frequency of services** and good **interchange facilities**. Both these parameters are significant for the measurable **travel inconvenience** associated with various alternatives for route networks and timetables. The **inconvenience** factor was combined with a relevant value for elasticity of travel, and the conclusion was that public transport journeys would increase by not more than **5%** in the Zero Comprehensive Plan and not more than **10%** in the Active Comprehensive Plan. This corresponds to a 0.5-1% increase in public transport as a percentage of the total transport volume.

Lastly, the effects of congestion are described. The area efficiency of public transport vastly exceeds that of motor traffic. This applies particularly to rush hour traffic, when public transport only occupies a fraction of the surface area that would be required if everyone used their own cars. Motor traffic requires large spaces for parking around new attractive destinations, which is not the case for public transport. Railroad traffic, furthermore, releases capacity on streets and roads.

The environmental impact of changes in the transport system was calculated by a simplified method. It was assumed that if no measures were taken to promote bicycle and public transport in the area current trends would continue. Taking into account the existing traffic forecasts, the project concluded that, if no measures were taken, passenger transport would increase by about 40% during the 25 years between 1995 and 2020.

With the measures proposed in the Active Comprehensive Plan, there might be an increase of 44% in bicycle traffic and 10% in public transport. The combined effect of the measures, including improvement of interchange points, would probably deliver synergies. These were assumed to account for a further 5% of bicycle and public transport. Altogether, it was estimated that bicycle and public transport might increase

by about 15,500 pkm/day, or that motor traffic could be reduced by about 85% of that figure. It was assumed that the remaining 15% of the increase would consist of journeys that would not otherwise have been made without the measures taken to increase the use of bicycles and public transport.

Such a reduction in motor traffic would achieve the following **reductions in exhaust emissions** (kg/day) and **energy consumption** (kWh/day) in the area covered by the study:

Substance	NOx	HC	CO	CO_2	Energy
Qty/pkm	1,0 g	2,0 g	13,1 g	239 g	0,7 kWh
Total	13 kg	26 kg	167 kg	3,050 kg	7,200 kWh

On the basis of our own assessments and analyses of today's **accessibility**, trends, comparisons over time and space, as well as extensive study of the literature on the subject, it is plain that indicators of the type referred to here will definitely help to measure and assess the effects of various measures. However, we cannot ignore the possibility that planning tools will only have a minor impact on travel behaviour unless and until external factors change.

3. Trollhättan municipality – case study

a) Ecological footprints in the context of food and energy consumption
b) Local objectives and indicators for A Good Urban Environment

This report consists of two substudies. The first of these is a study of interaction between town and country which investigates the concept of ecological footprints in the context of food and energy consumption. The other study deals with a method for breaking down national environmental objectives at the local level, using the objective *A Good Urban Environment* as an example.

Town and Country substudy

Ecological footprints are used internationally to assess the land area needed to maintain present levels of consumption. In this study we have used the concept specifically for two aspects of consumption, i.e. food and energy. Footprints are useful as a pedagogical tool for making international comparisons in the context of development towards a sustainable and just society. They can also be used in the context of indicative tests of how footprints can be reduced.

The next question was: do we need a map for comprehensive planning purposes that specifies areas, which are suitable or unsuitable for energy forests? The conclusion of this study is that this is not a relevant planning task for the municipality either now or in the foreseeable future.

GIS can be used to support a municipality's energy planning by:

- indicating areas within which the transport of biofuels is an economic proposition
- identifying areas that are suitable/unsuitable for the incorporation of ash
- identifying land that is suitable/unsuitable for harvesting branches and tops.

Substudy on *A Good Urban Environment*

We have made frequent use of roundtable talks for the purpose of translating environmental objectives to the local level and identifying useful indicators. A number of associations, interested parties and administrative departments were invited to these talks. We started with two large meetings for representatives of various fields, where we discussed objectives and targets in general terms. We then continued these talks in smaller groups, specializing in the seven targets. These seven groups discussed the targets in greater detail, including their implications and indicators that may be suitable in this context.

We designed a readily comprehensible model for recording results and linking each indicator directly to the relevant objective.

Formulation of objectives
•To ……
⇨Objective defined
✳ indicator

We now intend to launch a review process for the environmental objective, including targets and indicators, which will subsequently be incorporated into the Comprehensive Plan 2000 process and later adopted by the municipal council. The plan is to reduce the number of targets and indicators still further on the basis of the comments submitted by the review bodies. The number should be as low as possible, and the important thing is to adopt indicators which:

- can be measured without great effort
- are clearly linked to the objective
- can be used for several environmental objectives.

4. Stockholm municipality – case study 1
Preserving biodiversity in the urban landscape by means of spatial planning

This case study deals with ways of preserving and enhancing biodiversity in the urban landscape by means of spatial planning. It was the result of collaboration between the Stockholm Town Planning Department and the Department of Physical Geography at Stockholm University. The subject of the study is the Stockholm National Urban Park; work has started on a detailed comprehensive plan for this area.

The national environmental quality objective *A Good Urban Environment* also comprises biodiversity in urban areas. In order to translate this objective into planning terms, the municipalities must produce data that can be used for planning purposes. The case study uses a model based on a habitat map produced for Stockholm's urban environment, which is designed to provide planning tools that will facilitate the integration of biodiversity. This "Stockholm model" applies an ecological geographical approach. The model is being tried for the purposes of the case study within the framework of a concrete planning situation and is linked, inter alia, to planning and field indicators as used in the SAMS project.

Identifying and designing relevant indicators for spatial planning is complicated, but there is a great demand for them, especially among decision-makers. More development work and research are needed. The case study tests the relevance of planning indicators as tools for identifying urban landscapes that are especially vulnerable or valuable and assessing the impact of previous and future development. The focus is on developments between and around the city's green areas that represent significant dispersal and buffer zones. The results show that individual indicators are not sufficient for planning purposes. There is a need to take into account the spatial aspects of biodiversity on the basis of the distribution of habitats and landscape-specific ecological zones both in comprehensive and detailed planning.

The choice of planning indicators must be based on reliable data and must be adapted to the planning process. Rather than isolated indicators and measures there is a need for several carefully chosen planning indicators for the purpose of assessing the ecological impact of changes. Such a system of supporting indicators should be sufficiently flexible for adaptation to the conditions in each individual area and planning situation. It should also be possible to use planning indicators as field indicators for evaluations of the implementation of decisions. To assure the quality of subsequent planning, it must be possible to translate indicators into legally binding provisions.

The experience gained so far of using planning data and indicators in the first phase of the study of the National Urban Park is encouraging. They have, for one thing, improved planners' understanding of ecological causes and effects and how to deal with them. The study shows that the environmental quality objective relating to biodiversity can be reformulated for planning purposes and integrated into the planning process by means of indicators. The use of scenarios can provide additional material for exchanges of information and discussions. The lessons learned from the case study will be applied in future planning and in the ongoing research project "Biodiversity and Spatial Planning" at Stockholm University.

5. Stockholm municipality – case study 2
Environmental assessments in spatial planning

This case study was carried out within the framework of the SAMS project (*Community Planning with Environmental Objectives in Sweden)* being implemented by the Swedish Environmental Protection Agency and the National Board of Housing, Building and Planning. The study was a joint project between the Town Planning and Environmental Departments in Stockholm.

The aim of the study was to develop environmental assessment methods at the area and detailed development planning level. It was divided into three components, which were dealt with in substudies: Identifying indicators, Strategic environmental assessment processes and Designing an integrated detailed development planning and environmental impact assessment process. The focus was on identifying indicators that facilitate spatial planning by capturing the effects of planned changes, i.e. planning indicators.

There is one major problem when it comes to using planning indicators, and that is that a spatial plan can only provide a very approximate framework, which may have to be modified substantially in the light of actual events. This framework allows desirable freedom of manoeuvre, but it makes it very difficult to predict outcomes and their impacts. There is also a risk involved in focusing on measurable factors to the exclusion of other important aspects that can be described in qualitative terms. Consequently, indicators must never be the only tool used to assess whether a plan indicates development in an environmentally desirable direction.

Nevertheless, the substudies that dealt with planning indicators identified a number of indicators that should be useful for the purpose of making certain predictions about the effects of implementing a specific plan. The indicators that were considered most useful are: Proportion of green space, Distance between residential units and green spaces, Length in metres of footpaths and cycle tracks, Proportion of the built environment on brownfield sites, Impact on ecological corridors and Proportion of contaminated land. The identified indicators were not tried out in practical tests but should be regarded as hypotheses that will have to be tested in the municipality’s future area planning.

However, a set of general indicators will probably never cover all the possible environmental issues related to a planning project. In each case, therefore, consideration must always be given to which additional indicators are needed in order to cover all significant aspects. But perhaps the most important thing is not the precision of the planning indicators that are used, or where they constitute a good set, but the process within which the indicators are identified, in other words, the process of understanding environmental issues and the effects of spatial planning. It is therefore important that local indicators are generated as a result of collaboration between as many stakeholders as possible to ensure a broad consensus on the selection.

One of the substudies investigated the need for appropriate environmental assessment tools at the area level. Although this level presents a number of problems, particularly when it comes to defining suitable functional areas and keeping area plans

up to date in view of the constant stream of small changes that are being made in the Stockholm region, the study concludes that the area level is an important level for sound environmental management.

The substudy presented an outline process and organization for environmental assessments as an integral part of area programming in Stockholm. Two proposals that are presented in this model, which are undoubtedly crucial for a satisfactory result, are the appointment of an external group of experts, which should preferably be as independent as possible, and encouragement of greater participation from the local inhabitants.

A manual for an integrated environmental impact assessment and detailed development planning process was produced in order to improve environmental action at the detailed planning level. The manual presents a practical and manageable method in which environmental issues are introduced at the initial stage and then influence planning throughout the process. A guide to environmental issues in the context of planning in the Stockholm area and a draft environmental impact assessment structure were issued together with the manual. The manual and the guide are available on the Environmental Department's website: www.miljoporten.stockholm.se.

6. Falun-Borlänge municipalities – a joint case study
Environmental objectives in forest and agricultural areas

So far, municipal comprehensive planning has largely been a question of preparing development projects, i.e. the location of structures and facilities of various kinds. In future, there should be greater emphasis on managing and developing existing resources, both natural resources and the built environment. This means that municipalities will have to play a more active part in the development of forest and agricultural areas. Comprehensive plans are a suitable vehicle for the municipalities' intentions in this respect.

The case study was carried out jointly by the Environmental and Urban Planning Departments in Falun and Borlänge.

The aims of the study are summarized below. The main conclusions are presented under each item.

1. To investigate the municipalities' scope for influencing the development of forest and agricultural areas and the role of comprehensive plans in this context.

- At present, municipalities have a small and ill-defined role when it comes to efforts to achieve environmental objectives.
- Close cooperation between several players is necessary in order to strengthen the function of comprehensive plans as tools for achieving environmental objectives.
- Legislative amendments may be necessary in order to strengthen the function of comprehensive plans as tools for achieving environmental objectives.
- The implementation of EU aids is crucial to the achievement of environmental objectives in agricultural areas.
- Greater involvement by municipalities in the achievement of environmental objectives will require increased resources. The greatest needs often exist in municipalities with the smallest populations, which also have the smallest resources.

2. To identify indicators that can be used to monitor progress on environmental objectives in forest and agricultural areas, respectively.

- Large quantities of data are required to describe current states and changes in forest and agricultural areas. In view of their limited resources, municipalities are therefore obliged to consider indicators based on data that have already been collected for other purposes.
- More data are available for indicators relating to agricultural areas than to forest areas.
- Several indicators have been proposed and are presented in the case study report.

3. To demonstrate how planning data and documents for comprehensive plans can be developed for the management of environmental objectives, in particular with the help of GIS, and to discuss the responsibility for information services.

- The "block maps" used for the purposes of EU aids, economic maps, cultural and historical maps and satellite images have potential as useful planning input, but such material must be developed before it can be used for municipal planning purposes.

- GIS is a virtually indispensable tool for rational management of information about agricultural and forest areas.

- The planning data that are needed for the purposes of indicators should be produced by central government rather than by individual municipalities, both for reasons of efficiency and because most municipalities lack the necessary resources and know-how.

- The need of general maps with built-in intelligence, for example maps incorporating environmental characteristics, is likely to increase as the management element of municipal planning increases.

- Enhancing land use map layers, especially in economic maps, would make such maps more useful in the context of spatial planning.

7. Storuman municipality – case study
Objectives and indicators for sustainable development in sparsely populated areas

Storuman municipality has carried out a case study within the SAMS project framework that was chosen with reference to the potential and problems associated with sparsely populated areas. Its main themes were communications, energy and industry. The study was designed to contribute significant and relevant data for the municipality's comprehensive planning.

The municipality elected to carry out the case study in the form of a scenario project. There is so much uncertainty about the future of the region that this method, based on comparisons of various futures, was considered the most appropriate approach to finding sustainable solutions, both in ecological, economic and social terms, as a basis for municipal planning.

The study involved the participation of a large number of local inhabitants who were selected as representing a broad cross-section of industry and business, community life, politics and other social activities. They also represent the different geographical areas of which the municipality is made up.

The scenarios were modelled on the Swedish Environmental Protection Agency's futures study *Sweden in 2021*. Using two contrasting and simplified futures – the Full Speed Ahead scenario and the Pathfinder scenario – the aim was to formulate, on the basis of the insights gained during the process, a third future adapted to real life in Storuman today that would incorporate well-reasoned alternatives leading to the development of a more sustainable society.

The Full Speed Ahead scenario focused on large isolated infrastructure projects. Extension of the charter airfield in Hemavan, with a new tunnel link to Norway and the free port of Mo i Rana, was considered a good subject for the case study, with scope for large-scale, technically advanced, comprehensive environmental solutions. The E12 European highway is a thoroughfare with considerable development potential for the chief towns along the route.

The Sustainable Sweden objective adopted by Parliament, with its emphasis on ecological sustainability, makes a scenario based on the *Sweden in 2021* Pathfinder scenario a natural choice in such a sparsely populated municipality as Storuman. There is plenty of evidence that in such areas small-scale projects are more worthwhile than conventional large-scale ones. the study is expected to generate new solutions when it comes to land use principles, service delivery etc.

The Full Speed Ahead and Pathfinder scenarios were analysed with reference to potentially relevant national environmental quality objectives. Several indicators were defined for selected national environmental objectives, i.e. *Clean Air, A Good Urban Environment, A Magnificant Mountain Landscape, A Non-Toxic Environment* and *Limited Influence on Climate Change*.

The work on the case study was many-faceted. Many conclusions can be drawn, and the municipality will benefit from these in future planning exercises.

8. The Board of Regional Planning and Urban Transportation – case study
Environmental objectives and indicators in strategic environmental assessment on the regional level

Stockholm county council is the authority responsible for regional planning in Stockholm County. Regional planning relates to the use of land and water areas that involve several municipalities and require joint measures. Regional planning also includes continuous review of regional interests in Stockholm county and supplying data for the municipalities' and government agencies' planning.

One of the county council's tasks, which is delegated to the Office of Regional Planning and Urban Transportation (RTK), is to prepare a regional plan. The regional plan sets out the basic criteria for the use of land and water areas and provides guidelines for the location of buildings and facilities.

Three types of strategic assessments, including environmental assessments

In preparing the new regional plan – Regional Plan 2000 – the RTK chose to integrate strategic assessments relating to environmental, social and economic factors. The strategic environmental assessment is thus only one of three assessment processes. Interaction between the three assessments is expected to generate appropriate planning, consultation and decision guidance data.

Together, the three types of assessments can supply data for assessments of the regional plan's potential contribution to achievement of the important objective of sustainable development. The environmental assessment will thus not be the only input for an assessment of sustainability, but it should throw light on key aspects of a sustainable living environment.

Environmental scope of regional planning	**Aspect/Strategic issue:** **Will the regional plan help...**
Global perspective	... to reduce the region's nutrient salt input into the Baltic Sea? ... to reduce the region's emissions of CO_2?
Management of the region's structures	... to preserve and develop the region's green belt system? ... to preserve and develop the cultural values of the urban landscape? ... to preserve the natural and cultural values of the archipelago? .. to prevent damage caused by the transport infrastructure?
Energy and materials efficiency	... to reduce the region's energy consumption and establish environmentally sound energy systems? ... to reduce transport volumes and improve transport efficiency in the region and in external relations?
Quality of life	... to achieve good public health standards and a safe living environment? ... to ensure a stimulating and attractive physical environment?

One important aim of the strategic environmental assessment is to facilitate assessments of whether various alternatives, measures and planning proposals contribute to meeting the targets of regional planning (including general national and regional environmental objectives). But it is also important to assess how relevant, important and applicable the regional and national objectives are to conditions in the greater Stockholm region, and to analyse and describe effects and consequences.

The work on the strategic environmental assessment commenced in 1997 and is expected to be completed by the end of 2001, when the regional plan is to be adopted. Planning consultations will begin in two months' time. The environmental assessment has thus come half way, which means that its function and results cannot yet be presented in full.

The planning process is very much a dynamic process, and both methods and perspectives have changed since the planning programme and the environmental assessment programme were adopted. During the planning consultations the status of the assessments will be evaluated and it will be decided whether it is necessary to make any changes in the organization of the planning and assessment process.

One priority in the continuing process is the co-ordination of and interface between the three strategic assessments of environmental, social and economic factors. Assessments of overall effects, including conflicting objectives and collaboration on objectives, are just as important as the sector-by-sector assessments.

Organization

The project leader of the environmental assessment is Kajsa Bernergård (who succeeded Berit Pettersson on April 1 1999). The assistant project leader is Tomas Andersson.

The steering committee for the regional plan is also the management group for the environmental assessment. In March 1998 a reference group was appointed to assist with the strategic environmental assessment of the regional plan. The group was originally intended as a working group, but it has gradually assumed the character of a reference group, and its status as a reference group was established in October 1999.

The reference group consists of municipal officers, officials from the county administrative board and a Stockholm county representative of the Swedish Society for Nature Conservation. The members of the reference group were chosen for their expertise in planning and the environment, in particular, the region's environmental problems. The members are therefore primarily experts and not representatives of their respective organizations.

Ebbe Adolfsson, Swedish Environmental Protection Agency, and Aili Käärik, National Board of Housing, Building and Planning (up to October 31 1999, when Claes-Göran Guinchard, National Board of Housing, Building and Planning, succeeded him) were co-opted into the group. They followed the work of the group for the SAMS project (starting in the spring of 1998).

Anders Hedlund, Tyréns Infrakonsult AB, has provided methodological support at the programme stage and supplied data for the environmental assessment programme. Pending the planning consultation, Anders Hedlund has worked on the environmental assessment of the two structural alternatives and supplied data for the presentation of

results in each consultation document – Regional Plan 2000 and Transport in Regional Plan 2000 – and is preparing the environmental assessment in a separate report.

Ulf Ranhagen and Sara Trobeck, SWECO/FFNS, planned and held three seminars on an environmental assessment of the regional plan.

Lessons

With the consultation of the plan due in about two months' time, it may be noted that it has proved difficult to implement the far-reaching integration that is necessary to achieve the high ambitions of the strategic environmental assessment programme [1]. It has become obvious that the various participants in the process have had different expectations as regards the scope, role and importance of the environmental assessments. In other words, the planning process has not been prepared for the consequences of the work on environmental assessments.

Lessons:

- One result of the work on the strategic assessments was that planning was organized on an incremental basis, with analyses and drafting of scenarios, alternative regional structures and planning proposals.

- The strategic assessment procedure has helped to highlight the sequence of operations in the planning process.

- The work on strategic assessments has led to better defined and earlier decisions on matters of principle and strategy (choices).

- Discussion of environmental aspects related to planning, conflicting objectives/collaboration, choices etc. was late in starting.

- There has been some uncertainty as to the function of the environmental assessment as an input in planning. It is not clear to what extent environmental concerns have been taken into account in the adoption of principles, alternatives and proposals.

- Owing to the tight time schedule, the planning process has offered little scope for quality assurance, communication and feedback from the results of the strategic assessments, in particular those relating to alternative regional structures.

[1] *The Strategic Environmental Assessment Programme in the Regional Plan*. Memorandum 16:1999. Office of Regional Planning and Urban Transportation (RTK). Stockholm county council 1999.

PROPOSAL:
Directive of the European Parliament and of the Council on the assessment of the effects of certain plans and programmes on the environment

DIRECTIVE 2000/ / OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of

on the assessment of the effects of certain plans and programmes on the environment

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 175(1) thereof,

Having regard to the proposal from the Commission [1],

Having regard to the Opinion of the Economic and Social Committee [2],

Having regard to the opinion of the Committee of the Regions [3],

Acting in accordance with the procedure laid down in Article 251 of the Treaty [4],

Whereas:

(1) Article 174 of the Treaty provides that Community policy on the environment is to contribute to, inter alia, the preservation, protection and improvement of the quality of the environment, the protection of human health and the prudent and rational utilisation of natural resources and that it is to be based on the precautionary principle. Article 6 of the Treaty provides that environmental protection requirements are to be integrated into the definition of Community policies and activities, in particular with a view to promoting sustainable development.

(2) The fifth Environment Action Programme: Towards sustainability – A European Community programme of policy and action in relation to the environment and sustainable development [5], supplemented by Decision No 2179/98/EC [6] on its review, affirms the importance of assessing the likely environmental effects of plans and programmes.

(3) Environmental assessment is an important tool for integrating environmental considerations into the preparation and adoption of certain plans and programmes which are likely to have significant effects on the environment in the Member States, because it ensures that such effects of implementing plans and programmes are taken into account during their preparation and before their adoption.

(4) The adoption of environmental assessment procedures at the planning and programming level should benefit undertakings by providing a more consistent framework in which to operate by the inclusion of the relevant environmental information into decision-making. The inclusion of a wider set of factors in decision-making should contribute to more sustainable and effective solutions.

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1 OJ C 129, 25.4.1997, p. 14 and OJ C 83, 25.3.1999, p. 13.

2 OJ C 287, 22.9.1997, p. 101.

3 OJ C 64, 27.2.1998, p. 63 and OJ C 374, 23.12.1999, p. 9.

4 Opinion of the European Parliament of 20 October 1998 (OJ C 341, 9.11.1998, p. 18), Council Common Position of (not yet published in the Official Journal) and Decision of the European Parliament of (not yet published in the Official Journal).

5 OJ C 138, 17. 5.1993, p. 5.

6 OJ L 275, 10.10.1998, p. 1.

(5) The different environmental assessment systems operating within Member States should contain a set of common procedural requirements necessary to contribute to a high level of protection of the environment.

(6) The systems operating within the Community for environmental assessment of plans and programmes should ensure that there are adequate transboundary consultations where the implementation of a plan or programme being prepared in one Member State is likely to have significant effects on the environment of another Member State.

(7) Action is therefore required at Community level to lay down a minimum environmental assessment framework, which would set out the broad principles of the environmental assessment system and leave the details to the Member States, having regard to the principle of subsidiarity. Action by the Community should not go beyond what is necessary to achieve the objectives set out in the Treaty.

(8) This Directive is of a procedural nature, and its requirements should either be integrated into existing procedures in Member States or incorporated in specifically established procedures. With a view to avoiding duplication of the assessment, Member States should take account, where appropriate, of the fact that assessments will be carried out at different levels of a hierarchy of plans and programmes.

(9) All plans and programmes which are prepared for a number of sectors and which set a framework for future development consent of projects listed in Annexes I and II to Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment [1], and all plans and programmes which have been determined to require assessment pursuant to Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild flora and fauna [2], are likely to have significant effects on the environment, and should as a rule be made subject to systematic environmental assessment. When they determine the use of small areas at local level or are minor modifications to the above plans or programmes, they should be assessed only where Member States determine that they are likely to have significant effects on the environment.

(10) Other plans and programmes which set the framework for future development consent of projects may not have significant effects on the environment in all cases and should be assessed only where Member States determine that they are likely to have such effects.

(11) When Member States make such determinations, they should take into account the relevant criteria set out in this Directive.

(12) Some plans or programmes are not subject to this Directive because of their particular characteristics.

(13) Where an assessment is required by this Directive, an environmental report should be prepared containing relevant information as set out in this Directive, identifying, describing and evaluating the likely significant environmental effects of implementing the plan or programme, and reasonable alternatives taking into account the objectives and the geographical scope of the plan or programme; Member States should communicate to the

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[1] OJ L 175, 5.7.1985, p. 40. Directive as amended by Directive 97/11/EC (OJ L 73, 14.3.1997, p. 5).

[2] OJ L 206, 22.7.1992, p. 7. Directive as last amended by Directive 97/62/EC (OJ L 305, 8.11.1997, p. 42).

Commission any measures they take concerning the quality of environmental reports.

(14) In order to contribute to more transparent decision-making and with the aim of ensuring that the information supplied for the assessment is comprehensive and reliable, it is necessary to provide that authorities with relevant environmental responsibilities and the public are to be consulted during the assessment of plans and programmes, and that appropriate time frames are set, allowing sufficient time for consultations, including the expression of opinion.

(15) Where the implementation of a plan or programme prepared in one Member State is likely to have a significant effect on the environment of other Member States, provision should be made for the Member States concerned to enter into consultations and for the relevant authorities and the public to be informed and enabled to express their opinion.

(16) The environmental report and the opinions expressed by the relevant authorities and the public, as well as the results of any transboundary consultation, should be taken into account during the preparation of the plan or programme and before its adoption or submission to the legislative procedure.

(17) Member States should ensure that, when a plan or programme is adopted, the relevant authorities and the public are informed and relevant information is made available to them.

(18) Where the obligation to carry out assessments of the effects on the environment arises simultaneously from this Directive and other Community legislation, such as Council Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds [1], Directive 92/43/EEC, [or Directive ../…../EC establishing a framework for Community action in the field of water policy [*]], in order to avoid duplication of the assessment, Member States may provide for coordinated or joint procedures fulfilling the requirements of the relevant Community legislation.

(19) A first report on the application and effectiveness of this Directive should be carried out by the Commission five years after its entry into force, and at seven-year intervals thereafter. With a view to further integrating environmental protection requirements, and taking into account the experience acquired, the first report should, if appropriate, be accompanied by proposals for amendment of this Directive, in particular as regards the possibility of extending its scope to other areas/sectors and other types of plans and programmes,

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[1] OJ L 103, 25.4.1979, p. 1. Directive as last amended by Directive 97/49/EC (OJ L 223, 13.8.1997, p. 9).

[*] to be inserted if that Directive is adopted before this one.

HAVE ADOPTED THIS DIRECTIVE:

Article 1

Objectives

The objective of this Directive is to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes with a view to promoting sustainable development, by ensuring that, in accordance with this Directive, an environmental assessment is carried out of certain plans and programmes which are likely to have significant effects on the environment.

Article 2

Definitions

For the purposes of this Directive:

(a) "plans and programmes" shall mean plans and programmes, as well as their modifications

- which are subject to preparation and/or adoption by an authority at national, regional or local level or which are prepared by an authority for adoption, through a legislative procedure by Parliament or Government, and
- which are required by legislative, regulatory or administrative provisions;

(b) "environmental assessment" shall mean the preparation of an environmental report, the carrying out of consultations, the taking into account of the environmental report and the results of the consultations in decision-making and the provision of information on the decision in accordance with Articles 4 to 9;

(c) "environmental report" shall mean the part of the plan or programme documentation containing the information required in Article 5 and Annex I;

(d) "the public" shall mean natural or legal persons, and their associations, organisations or groups.

Article 3

Scope

1. An environmental assessment, in accordance with Articles 4 to 9, shall be carried out for plans and programmes referred to in paragraphs 2 to 4 which are likely to have significant environmental effects.

2. Subject to paragraph 3, an environmental assessment shall be carried out for all plans and programmes,

   (a) which are prepared for agriculture, forestry, fisheries, energy, industry, transport, waste management, water management, telecommunications, tourism, town and country planning or land use and which set the framework for future development consent of projects listed in Annexes I and II to Directive 85/337/EEC, or

   (b) which, in view of the likely effect on sites, have been determined to require an assessment pursuant to Article 6 or 7 of Directive 92/43/EEC.

3. Plans and programmes referred to in paragraph 2 which determine the use of small areas at local level and minor modifications to plans and programmes referred to in paragraph 2 shall require

an environmental assessment only where the Member States determine that they are likely to have significant environmental effects.

4. Member States shall determine whether plans and programmes, other than those referred to in paragraph 2, which set the framework for future development consent of projects, are likely to have significant environmental effects.

5. Member States shall determine whether plans or programmes referred to in paragraphs 3 and 4 are likely to have significant environmental effects either through case-by-case examination or by specifying types of plans and programmes or by combining both approaches, and in all cases taking into account relevant criteria set out in Annex II.

6. In the case-by-case examination and in specifying types of plans and programmes in accordance with paragraph 5, the authorities referred to in Article 6(3) shall be consulted.

7. Member States shall ensure that their conclusions pursuant to paragraph 5 are made available to the public.

8. The following plans and programmes are not subject to this Directive:

   – plans and programmes the sole purpose of which is to serve national defence or civil emergency,

   – financial or budget plans and programmes,

   – plans and programmes falling under the 2000-2006 programming period under Council Regulation (EC) No 1260/99 of 21 June 1999 laying down general provisions on the Structural Funds [1] or under the 2000-2006 and 2000-2007 programming periods under Council Regulation (EC) No 1257/99 of 17 May 1999 on support for rural development from the European Agricultural Guidance and Guarantee Fund (EAGGF) and amending and repealing certain regulations [2].

Article 4

General obligations

1. The environmental assessment referred to in Article 3 shall be carried out during the preparation of a plan or programme and before its adoption or submission to the legislative procedure.

2. The requirements of this Directive shall either be integrated into existing procedures in Member States for the adoption of plans and programmes or incorporated in procedures established to comply with this Directive.

3. Where plans and programmes form part of a hierarchy, Member States shall, with a view to avoiding duplication of the assessment, take into account the fact that the assessment will be carried out, in accordance with this Directive, at different levels of the hierarchy.

Article 5

Environmental report

1. Where an environmental assessment is required under Article 3(1), an environmental report shall be prepared in which the likely significant effects on the environment of implementing the plan or programme, and reasonable alternatives taking into account the objectives and the geographical scope of the plan or programme, are identified, described and evaluated. The information to be given for this purpose is referred to in Annex I.

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[1] OJ L 161, 26.6.1999, p. 1.

[2] OJ L 160, 26.6.1999, p. 80.

2. The environmental report prepared pursuant to paragraph 1 shall include the information that may reasonably be required taking into account current knowledge and methods of assessment, the contents and level of detail in the plan or programme, its stage in the decision-making process and the extent to which certain matters are more appropriately assessed at different levels in that process in order to avoid duplication of the assessment.

3. Relevant information available on environmental effects of the plans and programmes and obtained at other levels of decision-making or through other Community legislation may be used for providing the information referred to in Annex I.

4. The authorities referred to in Article 6(3) shall be consulted when deciding on the scope and level of detail of the information which must be included in the environmental report.

Article 6

Consultations

1. The draft plan or programme and the environmental report prepared in accordance with Article 5 shall be made available to the authorities referred to in paragraph 3 of this Article and the public.

2. The authorities referred to in paragraph 3 and the public referred to in paragraph 4 shall be given an early and effective opportunity within appropriate time frames to express their opinion on the draft plan or programme and the accompanying environmental report before the adoption of the plan or programme or its submission to the legislative procedure.

3. Member States shall designate the authorities to be consulted which, by reason of their specific environmental responsibilities, are likely to be concerned by the environmental effects of implementing plans and programmes.

4. Member States shall identify the public for the purposes of paragraph 2, including relevant non-governmental organisations, such as those promoting environmental protection and other organisations concerned.

5. The detailed arrangements for the information and consultation of the authorities and the public shall be determined by the Member States.

Article 7

Transboundary consultations

1. Where a Member State considers that the implementation of a plan or programme being prepared in relation to its territory is likely to have significant effects on the environment in another Member State, or where a Member State likely to be significantly affected so requests, the Member State in whose territory the plan or programme is being prepared shall, before its adoption or submission to the legislative procedure, forward a copy of the draft plan or programme and the relevant environmental report to the other Member State.

2. Where a Member State is sent a copy of a draft plan or programme and an environmental report under paragraph 1, it shall indicate to the other Member State whether it wishes to enter into consultations before the adoption of the plan or programme or its submission to the legislative procedure and, if it so indicates, the Member States concerned shall enter into consultations concerning the likely transboundary environmental effects of implementing the plan or programme and the measures envisaged to reduce or eliminate such effects.

Where such consultations take place, the Member States concerned shall agree on detailed arrangements to ensure that the authorities referred to in Article 6(3) and the public referred to in Article 6(4) in the Member State likely to be significantly affected are informed and given an

opportunity to forward their opinion within a reasonable time-frame.

3. Where Member States are required under this Article to enter into consultations, they shall agree, at the beginning of such consultations, on a reasonable time-frame for the duration of the consultations.

Article 8

Decision making

The environmental report prepared pursuant to Article 5, the opinions expressed pursuant to Article 6 and the results of any transboundary consultations entered into pursuant to Article 7 shall be taken into account during the preparation of the plan or programme and before its adoption or submission to the legislative procedure.

Article 9

Information on the decision

1. Member States shall ensure that, when a plan or programme is adopted, the authorities referred to in Article 6(3), the public and any Member State consulted under Article 7 are informed and the following items are made available to those so informed:

   (a) the plan or programme as adopted, and

   (b) a statement summarising how environmental considerations have been integrated into the plan or programme and how the environmental report prepared pursuant to Article 5, the opinions expressed pursuant to Article 6 and the results of consultations entered into pursuant to Article 7 have been taken into account in accordance with Article 8 and the reasons for choosing the plan or programme as adopted, in the light of the other reasonable alternatives dealt with.

2. The detailed arrangements concerning the information referred to in paragraph 1 shall be determined by the Member States.

Article 10

Relationship with other Community legislation

1. An environmental assessment carried out under this Directive shall be without prejudice to any requirements under Directive 85/337/EEC and to any other Community law requirements.

2. For plans and programmes for which the obligation to carry out assessments of the effects on the environment arises simultaneously from this Directive and other Community legislation, Member States may provide for coordinated or joint procedures fulfilling the requirements of the relevant Community legislation in order inter alia to avoid duplication of assessment.

Article 11

Information, reporting and review

1. Member States and the Commission shall exchange information on the experience gained in applying this Directive.

2. Member States shall communicate to the Commission any measures they take concerning the quality of environmental reports.

3. Before [*] the Commission shall send a first report on the application and effectiveness of this Directive to the European Parliament and to the Council.

   With a view further to integrating environmental protection requirements, in accordance with Article 6 of the Treaty, and taking into account the experience acquired in the application of this Directive in the Member States, such a report will be accompanied by proposals for amendment of this Directive, if appropriate. In particular, the Commission will consider the possibility of extending the scope of this Directive to other areas/sectors and other types of plans and programmes.

   A new evaluation report shall follow at seven-year intervals.

4. The Commission shall report on the relationship between this Directive and Regulations (EC) No 1260/99 and No 1257/99 well ahead of the expiry of the programming periods provided for in those Regulations.

Article 12

Implementation of the Directive

1. Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive before [**]. They shall forthwith inform the Commission thereof.
2. When Member States adopt the measures, they shall contain a reference to this Directive or shall be accompanied by such reference on the occasion of their official publication. The methods of making such reference shall be laid down by Member States.
3. The obligation referred to in Article 4(1) shall apply only to the plans and programmes of which the first formal preparatory act is subsequent to the date referred to in paragraph 1.
4. Before [*], Member States shall communicate to the Commission, in addition to the measures referred to in paragraph 1, separate information on the types of plans and programmes which, in accordance with Article 3, would be subject to an environmental assessment pursuant to this Directive. The Commission shall make this information available to the Member States. The information will be updated on a regular basis.

Article 13

Entry into force

This Directive shall enter into force on the day of its publication in the Official Journal of the European Communities.

Article 14

Addressees

This Directive is addressed to the Member States.

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[*] Five years after the entry into force of this Directive.

[**] Three years after the entry into force of this Directive.

[*] Three years after the entry into force of this Directive.

Done at Brussels,

For the European Parliament
The President

For the Council
The President

ANNEX I

Information referred to in Article 5(1)

The information to be provided under Article 5(1), subject to Article 5(2) and (3), is the following:

(a) an outline of the contents, main objectives of the plan or programme and relationship with other relevant plans and programmes;

(b) the relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan or programme;

(c) the environmental characteristics of areas likely to be significantly affected;

(d) any existing environmental problems which are relevant to the plan or programme including, in particular, those relating to any areas of a particular environmental importance, such as areas designated pursuant to Directives 79/409/EEC and 92/43/EEC;

(e) the environmental protection objectives, established at international, Community or Member State level, which are relevant to the plan or programme and the way those objectives and any environmental considerations have been taken into account during its preparation;

(f) the likely significant effects * on the environment;

(g) the measures envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the environment of implementing the plan or programme;

(h) an outline of the reasons for selecting the alternatives dealt with, and a description of how the assessment was undertaken including any difficulties (such as technical deficiencies or lack of know-how) encountered in compiling the required information;

(i) a description of measures envisaged for monitoring the implementation of the plan or programme;

(j) a non-technical summary of the information provided under the above headings.

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* these effects should include secondary, cumulative, synergistic, short, medium and long-term permanent and temporary, positive and negative effects.

ANNEX II

Criteria for determining the likely significance of effects referred to in Article 3(5)

1. The characteristics of plans and programmes, having regard, in particular, to

– the degree to which the plan or programme sets a framework for projects and other activities, either with regard to the location, nature, size and operating conditions or by allocating resources;

– the degree to which the plan or programme influences other plans and programmes including those in a hierarchy;

– the relevance of the plan or programme for the integration of environmental considerations in particular with a view to promoting sustainable development;

– environmental problems relevant to the plan or programme;

– the relevance of the plan or programme for the implementation of Community legislation on the environment (e.g. plans and programmes linked to waste-management or water protection).

2. Characteristics of the effects and of the area likely to be affected, having regard, in particular, to

– the probability, duration, frequency and reversibility of the effects;

– the cumulative nature of the effects;

– the transboundary nature of the effects;

– the risks to human health or the environment (e.g. due to accidents);

– the magnitude and spatial extent of the effects (geographical area and size of the population likely to be affected);

– the value and vulnerability of the area likely to be affected due to:

  = special natural characteristics or cultural heritage;

  = exceeded environmental quality standards or limit values;

  = intensive land-use;

– the effects on areas or landscapes which have a recognised national, Community or international protection status.

The project *Community Planning with Environmental Objectives in Sweden* (‘the SAMS Project’) is managed by the National Board of Housing, Building and Planning and the Swedish Environmental Protection Agency in cooperation with several local and regional authorities. It is cofinanced by Life, the EU environmental fund, and the Swedish International Development Cooperation Agency (Sida). The purpose of the project is to develop methods for integrating environmental concerns into community planning, to identify ways of using spatial planning as an important instrument for achieving environmental objectives and to support the dialogue between the various disciplines involved in planning. Hopefully, the methods that are developed will provide useful tools for local and regional authority planning.