

## **Green structure planning. A Norwegian approach**

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### **Introduction**

Greenway planning has long traditions in Norway (Bruun 1991), and from the late 1980s we have developed the concept further into what we have mentioned as “green structure planning”. Green structure is defined as a multi-functional urban system, where “the green” in the city is attributed to different values and functions inspired by the landscape ecological thinking. Examples of important values and functions of the urban green structure could for example be: 1) Cityscape and aesthetic conditions, 2) Recreation, play and quality of life, 3) Nature and biodiversity, 3) Biological production related to forestry and agriculture, 4 ) Technical matters related to storm water management and local climate, 5) Soft transportation (biking, walking). Based on an overview of the development of the Norwegian concept, the main goal is to present a planning methodology for a multi-functional green structure, the so called “Green poster”, and some of the key lessons learned from experiences with this tool.

### **Background**

The green structure concept was introduced in Norway in the late 1980s within a research project called „Environmentally sound urban development” (Dyring 1987, Næss 1992). The main aim of the project was to get more knowledge of what was important to achieve more sustainable cities. A trend scenario was compared with a sustainable urban development scenario based on the Brundtland Commission's report (WCED 1987). The reason for the project was a concern over the consequences of extensive urban sprawl especially since the 1970s. In order to achieve sustainability goals, these studies revealed the necessity of compacting cities in Norway. This would help to stop the loss of agricultural or forested land outside the cities, and to reduce greenhouse gas emissions and private car transportation inside the urban area. Preserving the green structure was highlighted to counterbalance the compact city and to secure health and quality of life for residents.

The project influenced the overall planning policy (see for example White paper 31 from the Ministry of environment 1992 -93), and since the early 1990s the development of Norwegian cities has turned to a more compact direction. Green structure also became an issue of urban planning and a part of the compact city policy. A number of handbooks from the environmental authorities are available to guide planners and politicians. The last one was published by the Directorate for Nature Management seven years ago (DN 2003).

The green structure concept was in accordance with the Norwegian traditions influenced by Alhpand's and Haussmann's plans for Paris, Olmsted's park system and Howard's garden city ideas. The lesson learned from these examples was particularly the thinking about the urban green as a planned system and as a superior structure of a city equal to the transportation and building structure.

To achieve sustainability objectives, the multi-functional green structure was also quite early a part of the concept inspired by landscape ecological ideas. Urban green areas were ascribed values and functions for recreation, for the structuring / perceiving the cityscape, for biodiversity, to manage storm water and local climate, etc. Norwegian cities are mostly quite green and most of the greenery is on private land. Thus on the basis of a multi-functional approach, one can not only take into account publicly owned or accessible areas. Quite soon we therefore considered the ideas of greenways or park systems being too narrow. The difference between the green structure concept and the park systems approach is that while the park system primarily is associated with public areas, the green structure in principle is “everywhere“. Thus we wanted a more comprehensive concept including all kinds of greenery and vegetation-covered areas. This is generally accepted among other researchers in the European context today (Werquin et al 2005).

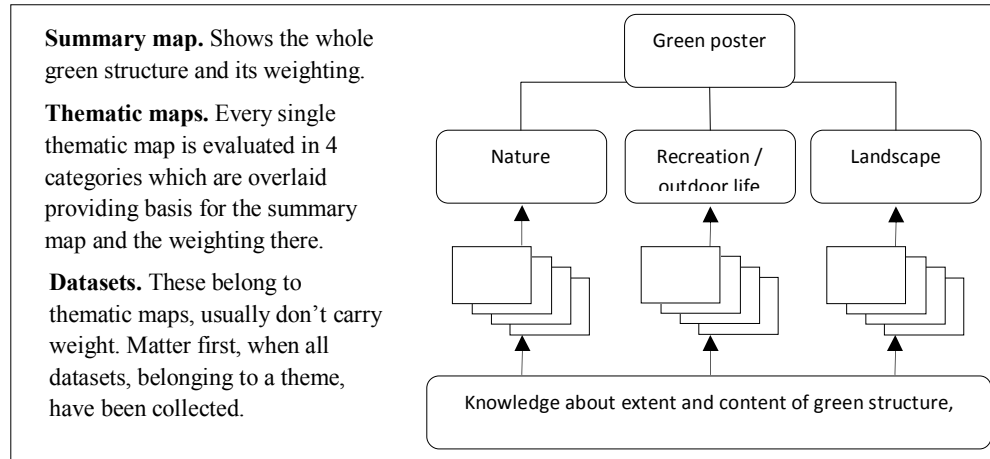
According to the official Norwegian definition, the green structure therefore can be seen as a ‘web’ consisting of large and small natural and vegetation covered areas of the city or the town, including the water systems. It may be more or less continuous and consists of many different land use types like: 1) the transition zone between town and countryside about 1-2 km into the large continuous areas around the cities, 2) large and small natural areas including beach areas, coastal areas, lakes, rivers and streams, 3) parks, institutional areas, cemeteries, other manmade green areas, 4) agricultural land / allotment gardens, 5) private gardens / commons in residential areas, 6) green residual areas / impediment etc. (DN 2003: 8).

## **Methods**

This article does not present one specific research project, but rather experiences from almost 20 years of development of planning tools to manage the urban green structure. In this respect, “The green poster” is the overall tool by which the article will focus on. It must be emphasized that what is presented not from the beginning has been a targeted testing process. Coincidence and new problems in the real world, have contributed to the development of the tools. As a first step, the ideas behind the “The green poster” and its structure will be revealed. In the discussion section, we will present and discuss important experience gained from some major phases of the development of the poster. Some of the lessons learned are summarized in unpublished reviews and used in the last handbook (DN 2003), while other experiences are brought to light through conversations with those who have been involved.

## The green poster

“The green poster” intends to be a „warning triangle“ for the urban green. The poster is not a politically adopted plan, but a way to make the values and functions of the green structure visible in a transparent way. Figure 1 presents the main structure of “The green poster” (DN 2003).



**Figure 1 The structure of The green poster (According to DN 2003:70)**

Until now Norwegian municipalities mainly have based their posters on three themes related to the blue-green structure; landscape values, recreational and outdoor values / functions, nature values / biological functions. So far, none of the municipalities have included themes related to for instance storm water and the hydrological systems or local climate and air pollution.

According to a landscape analysis perspective, “The green poster”, can be regarded as a “value analysis”. The main goal is to get an overview of values and functions of the urban green and blue in a comprehensive and easily understandable manner. Hopefully this will help awareness rising among all kinds of planners as well as among developers. Even the grassroots organizations and the general public can use the poster. Thus an important point is that “The green poster” must be logically built up and all valuations must be clearly explained and transparent. The theme maps and the poster itself are evaluated. Usually the municipalities divide the evaluation into four or five classes: 1) very high value, the area should not be developed, 2) high value, the area might be changed according to specific requirements, 3) areas of value, can be developed 4) areas outside the green structure 5) areas with potential for establishing nature, vegetation or water systems. In addition, the posters also give information on areas lacking outdoor space/ playgrounds that must be taken into consideration in further planning and development. Areas where there are major barriers for example caused by traffic or migratory routes for wildlife are also often shown in many posters.

To prepare the green poster, and the various theme maps, it is necessary to have basic knowledge about the blue-green structure in itself. See Figure 1. Traditional plant sociological approaches can be difficult to implement in cities. We therefore developed a method that we called the K-and N-series method. K stands for the cultivated man-made green elements, while the N stands for the original so-called natural vegetation. The method is based on identifying spatial distribution of the vegetation covered and blue areas regardless of property boundaries. This means that horizontal distributions as well as distribution of the vertical structure, the layers of the vegetation were mapped by using aerial photos with subsequent digitization.

According to our experience this kind of basic knowledge has appeared to be useful when it comes to planning for a multi-functional green structure. Figure 2 shows an example of a green poster prepared for Tønsberg municipality in the southern parts of Norway. This poster is made up of three theme maps; landscape values, natural values and recreational values.



Figure 2 “The green poster” of Tønsberg (details)

The green poster can be used in municipal planning and management of plans. It will also reveal which areas should receive special protection in the overall plans and thus form part of the public park-/greenway systems and support the park policy of the municipality. The poster can even be used to identify areas that can be developed taking special considerations, for example safeguarding storm water, special demands on typology of the buildings etc. Since “The green posters” today are GIS based, they can also be used as a part of an indicator system to evaluate how the structure and even each value and function changes over time (Thorén 2000). The poster is in other words, a planning tool to manage the blue and green systems in densification processes of the urban fabric.

## Discussion

### *Interdisciplinary organization and knowledge transfer*

To ensure a multifunctional and transparent approach “The green poster” has to involve several sectors and stakeholders in urban planning and development. Experiences from the Norwegian „Environmental friendly cities project (1993 –

2000) revealed that municipalities with good anchoring politically and with cross-sector working groups have been most successful. To make “The green poster” as useful as possible, the ownership of the content and the information is crucial. Compared with landscape analysis in general the process of developing “The green poster” should be seen as a project where the main purpose is to transfer and share knowledge. This is emphasized also by Oppermann and Harrison (2005: page 325). They argue that since “... a broader range of land use types is perceived to contribute to green structures today, new actors especially private and not governmental actors have entered the planning process.” Green structure planning based on the multi-functional approach involves, in other words, a new type of planning, because it goes straight through property boundaries as well as sectors. This means also that it is crucial to organize good arrangements for broad participation as a part of the process from the discussions of objectives, through discussions about the topics and even areas geographically that should be included.

Participation and interdisciplinarity can contribute to common ownership and a better flow of information, but it is also necessary to develop information to show how the posters can be used. The reason for this is the lack of knowledge about the importance of a multi-functional green structure among those who are involved in municipal planning and development. The posters must also be date-stamped while after a few years, the contents of the green structure might be changed, which also means that “The green poster” has to be changed. That is why it is important when starting the process of making a “Green poster” one also must decide on how and how often the content should be revised. This also has economic and practical implications for municipalities.

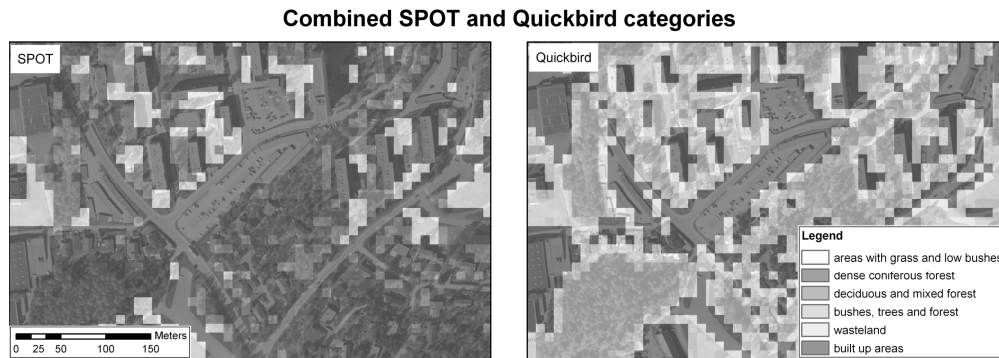
#### *GIS and consequences of today's green structure analysis*

The use of digital tools and GIS, have been central to the development of “The greenposter” and the thinking behind it. Finding solutions to the use of GIS was quite time consuming during the early years. The use of GIS was therefore devoted particular attention, and in the handbook about municipal green structure planning from 2003 (DN 2003) the theme is highlighted. In today's Norway, GIS is a natural part of everyday life of urban planners. We have good arrangements to obtain the local and national planning and environmental data through “Norway digital”. All data in this database has to be transformed into SOSI-standard, i.e. coordinated arrangement for geo-information based on international standards.

#### *Basic mapping of the urban green structure*

There were different opinions among the municipalities of environmental friendly cities project about the usefulness of the basic mapping of the green structure. They found it time consuming and unnecessary. They believed that orthophoto maps would be sufficient to identify the green structure itself. We had in other words failed to communicate the difference in how to use an unclassified aerial photo and a classified set of data. The manual mapping method, including manual digitizing was obviously time-consuming. It was therefore commenced a project to test whether

one could identify K-and N-series categories using satellite data and automatic classification (Fredriksen et al 1997). It turned out that the satellite data at that time were not detailed enough. A new project was therefore initiated in 2007 and it is still under work. Figure 3 presents categories identified in the new project.



**Figure 3. Example of green structure classification based on satellite data. Source Geodatasenteret AS Arendal**

Within the new project two types of satellite data are used, respectively SPOT data with 10 x 10 meter pixels and Quick Bird Data in which pixels are 0.6 x 0.6 meters. So far we have been able to identify different categories of green automatically, but we had to give up the K-and N-series approach in which the main emphasis was on the structure of vegetation. From the Spot data, we have identified two main groups of green areas, 1) unbuilt green areas and 2) built up areas with different percentages of green. The Quick Bird data provides detailed information on vegetation distribution which is especially important within the built up areas where the Spot data only reveals percentages of green. In this way, the two data sets complement each other. An important part of future work is to create examples of how the data can be used.

*Theme: Green structure and urban landscape*

This theme was only based on professional assessments without user interaction. The theme was difficult to handle for those who were involved even though they often were landscape architects. One lesson learnt is that one should distinguish clearly between professional and layman evaluations. For most people it is difficult to separate the experience from the action and the theme should be connected to recreation and use of green areas. People's own assessments must be in focus. This is also in line with the European Landscape Convention's definition of landscape: "*Landscape*" means an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors;.. "(Council of Europe 2000 Chapter 1. Article 1). The landscape and green structure theme from a professional point of view should rather concentrate on the spatial and structural significance of the urban green.

A criticism of the green structure thinking has also been that the concept can give an interpretation of "the green" to be separated from "the built", not an integrated part

of the urban fabric (Løvrie 2001). A Norwegian development of the landscape theme reveals that this does not need to be the fact. The municipality of Sarpsborg, southeast of Norway, has for example analyzed the morphology of “the green” and “the built” elements in the urban fabric in an integrated way. New urban categories encountered and have been useful when assessing further densification of the urban area from an aesthetical/spatial point of view. When testing the basic mapping of the urban green structure mentioned above, we want to proceed on this topic by connecting the morphological data with terrain data which hopefully will provide additional information.

*Theme: Green structure values/functions for recreation, play, physical activity etc*

One of the main challenges of the densification policy is how to manage green spaces for play, outdoor life and recreation. Despite increasing attention on the significance of green areas, the reduction of the supply is also accelerating. This leads to increased resistance to the densification policy, and also to local action groups like the “Network for protection of green lungs” in Oslo. (<http://www.gronnelunger.no/>). The reason is lack of public participation. This was also evident in “The environmental friendly cities” project. This project and even later experiences also reveal that the municipalities have insufficient knowledge about the regulatory status of the green areas. The detailed plans are old, and the important green areas for citizens today are in many cases legally bound for other purposes.

*Theme: Green structure and nature values/functions – biodiversity*

Lack of knowledge about nature and biodiversity in urban areas is one of the main problems associated with this theme. There is some monitoring of individual species and biotopes, and some few studies based on landscape ecological thinking and indicator species in Norway. In this field, however, there is a need of far more research.

*Valuation and weighting*

Valuation of the green areas and also weighting of the various themes are challenging, and was conducted differently in the five Environmental Friendly Cities. The most important however is that the valuation and weighting has to be clearly described, and thus transparent; making it possible to everyone to understand and to criticize. In recent years, some municipalities for example Sarpsborg, have left the poster idea and instead based their municipal plan on the theme maps. This might have simplified the process of weighting, but might also be a minus because one loses the overall overview of the green structure and hence the multifunctional green structure.

## **Conclusion**

The green structure concept has meant a lot to restore the significance of green areas in urban planning in Norway. From a multifunctional point of view the efforts of the municipalities have been concentrated around three themes; recreation,

cityscape/landscape and biodiversity (DN 2003), and „The green poster” has been proven to be a useful tool to many municipalities. In the future green structures will be even more needed in urban areas to adapt to climate change, to help people to be more physically active etc. City planners must therefore leave the one-sided idea that climate adaptation is all about high density as a tool to reduce CO2 emissions. Adaptation to climate change involves much more, including preserving/developing of the green structure. Not all green areas have equal importance and everything that is green cannot be taken care of, especially not in a Nordic context, where the cities are green. In other words, we must preserve and develop areas where the green values and functions have the greatest importance for the urban fabric as a whole. The green poster is a tool for this.

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