

# Spatial Planning with Respect to Aesthetics in Mind

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**Key words:** Spatial planning, landscape planning, visual resource, 3D-visualization, aesthetics, cultural heritage.

## ABSTRACT

The evolution of our understanding of landscape as a visual resource occurred in parallel with the changes of perception of spatial planning. Already in the 70s the visual landscape was an issue in spatial planning. This resulted from the Romantic period when the emotional close ties with one's home country were very important.

With the emerging discussion at the end of the 70s about ecology and ecological planning, more and more the components of natural science of ecological planning were discussed, at the expense of the visual landscape and aesthetics. With the improvement of the possibilities of the digital 3D representation of landscape it seems that landscape as visual resource became more important in the discussion. 3D visualisation will support the participation in the planning process and will become an important part of decision support systems in spatial planning. The use of virtual landscapes will help to study processes in the landscape such as fragmentation of landscape and/or urban sprawl.

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## 1. SPATIAL PLANNING AND THE LIVING SPACE OF HUMANS

When the Swiss Parliament discussed the Federal Law for the Protection of the Environment it became clear, that it wasn't the intention of the legislators to create a new Federal Law of Environment Protection (October 7, 1983), which encompasses all aspects of the natural environment. Instead they wanted to create a law that would integrate the existing laws concerning the natural environment such as the Federal Law of Nature Protection (July 1, 1966), the Federal Law for the Prevention of Water Pollution (January 24, 1991) and the Federal Law of Spatial Planning (June 24, 1979).

All the relevant laws have one thing in common, their subject is the living space of humans. This living space of humans can be defined by the functions living, work, education, supply and disposal, recreation as well as transportation and communication. The two most important laws regarding the living space of humans are the Federal Law of the Protection of the Environment and the Federal Law of Spatial Planning. They form the basis for the preservation, forming and development of the living space of humans.

The goal of spatial planning is to provide preconditions for the spatial allocation of the life functions of living, work, education, supply and disposal in order to maximise the well-being of the society. The backbone of the spatial division of the named life functions is an efficient traffic and communication system. The way in which life functions are allocated, and transportation and communication needs are met, has a significant impact on the natural environment including the visual landscape. In the last two decades we have become more aware that in order to allocate the different life functions we have to make use of the natural potential, in other words, of the ecological resources. They enable the efficient use of the living space. From an ecological point of view, the living space of humans can be characterised by its ecological potential (Haase 1978):

- biotic-yield potential
- biotic-regulation potential
- water-yield potential
- waste-disposal potential
- source-materials potential
- development potential
- etc.

The system of life functions reflects the socio-economic approach while the system of ecological potentials stresses the ecological approach. In Swiss law, the socio-economic approach is mostly covered by the Federal Law on Spatial Planning and the ecological approach by the Federal Law for the Protection of the Environment. Both laws deal with the living space of humans as a whole but their orientation and instruments are different. Therefore there exists a need to adapt spatial planning and environmental protection to each

other. To facilitate the link between spatial planning and environmental protection, planning concepts and methods are required which enable the determination and evaluation of the effects of a particular land use demand on natural resources, as well as any associated effects on other land use demands. The instrument assuring this linkage may be termed ecological planning. In addition to the concepts and methods described above, it also includes the concern for the future ecologically sound land use patterns. It accomplishes this by determining and evaluating the effects of land use demand on different ecological resources. (Baechtold et al., 1995)

## **2. THE PERCEPTION ON THE VISUAL LANDSCAPE DURING THE LAST DECADES**

The visual landscape was always more or less an issue in spatial planning. The changes on the visual landscape reflect spatial relevant processes. When the law on spatial planning was discussed in the parliament the main concern was to stop urban sprawl and to have a clear distinction between built-up area and non-built-up areas. At that time, many landscapes of national significance and outstanding scenery were in danger of being destroyed by over-development. In such cases the Federal Government has the possibility to pass an emergency resolution (March 17, 1972) to protect the landscapes. Consequently, a substantial number of landscapes were protected because of their aesthetic quality. I believe that the motivation for protecting these landscapes was not so much the visual quality of the landscape itself but the preservation of the recreational potential and the protecting of the cultural heritage.

It was the same reason when three Non-Governmental Organisations started to take an Inventory of Landscapes of national significance. In more cases the quality of the visual landscape was the main reason why a landscape was placed on the inventory. This inventory eventually became the national inventory of landscapes of national significance and acquired legal importance.

These examples reveal a general awareness of the importance of the visual landscape. At that time, the awareness resulted mainly from the Romantic Period (Age of the Romanticism). The emotional close ties with one's home country were very important. This is reflected in the name of the law. The Federal Law on Nature Protection was originally called the Federal Law on Nature Conservancy and Home Country Protection. Although if nobody was talking about ecological planning at that time, this kind of treating important visual aspects of the country side can be addressed as reactive, as well as partly strategic ecological planning.

The visual landscape was a component of spatial planning but visualisation techniques were very rarely used. Techniques were restricted to physical models and hand drawn perspectives. Later, photography, photomontage, and photogrammetric 3D terrain models also became available; but these techniques were rarely used.

With the emerging discussion at the end of the 70s about ecology and ecological planning, more and more the components of natural science of ecological planning were discussed, at the expense of the visual landscape and aesthetics. The result is that for many years in Switzerland and the rest of Europe, the visual landscape and aesthetics were neglected. (Nohl,

1993) This contrasts with the US where landscape aesthetics and the management of the visual resource have been a widely acknowledged topic in research and practice. (e.g. BLM, 1980; Elsner and Smardon, 1979; USDA Forest Service, 1974)

The ability to visualise the landscape changed about twenty years ago, when GIS became an efficient digital tool to be used in the planning process. More and more, digital representations took over the place of analogue representations such as hard-drawn perspectives, photomontage and physical models.

Although digital representations started do take the place of analogue representations, two-dimensional, often rather abstract representations, are still predominantly used today. Efficient digital tools for realistic representations of the three-dimensional landscape have only recently been developed and interactive digital 3D-visualizations have become more common, leading to virtual reality.

Although there is no single definition for the term virtual reality, common to all is the notion of exploring a space using computer technology and stereographic viewing devices supporting spatial vision. (e.g. Berndt et al., 1998) A virtual landscape can be defined as a real imagined space with a certain dimension, which can be seen from any viewpoint using stereographic devices. (see also Schmitt, 1993)

### **3. EXAMPLES OF THE DEVELOPMENT ON VISUAL REPRESENTATION IN THE PLANNING PROCESS**

In the following I will give a few examples on visualisation of landscapes in the planning process. The first example demonstrates that already before the 70s and before environmental protection and ecological planning were well established, the visual landscape was an issue.

Due to the system of direct democracy in Switzerland and the decentralised organisation of spatial planning, building permits are in most cases granted by the local municipality. Once a request for a building permit is submitted, neighbours and others with legitimate interests are given time during which they can object to the construction of the building. In general, lay people have difficulties reading 2-dimensional plans and visualising the impact of a 3-dimensional building on the landscape. Therefore, the client for whom the house will be built is required to put up poles at each corner of the house to be built, which indicates the height of the house and the slope of the roof. In this manner the future house will be visualised and people can gain a better understanding of its visual impact on the landscape. The main goal of this kind of visualisation is to support the informed participation of people in the planning process.

In the early 1980s it was quite an experiment to create a 3D-model from the available cartographical maps. Two examples from our case study "Bündner Rheinvalley" illustrate this. The one example shows the 3D-representation of the project area. The model was then used to analyse the slopes in order to identify risks from natural hazards for the population in the valley. It also formed the basis for a visual representation of the pollution in the Bündner Rheinvalley. (see Fig. 1)

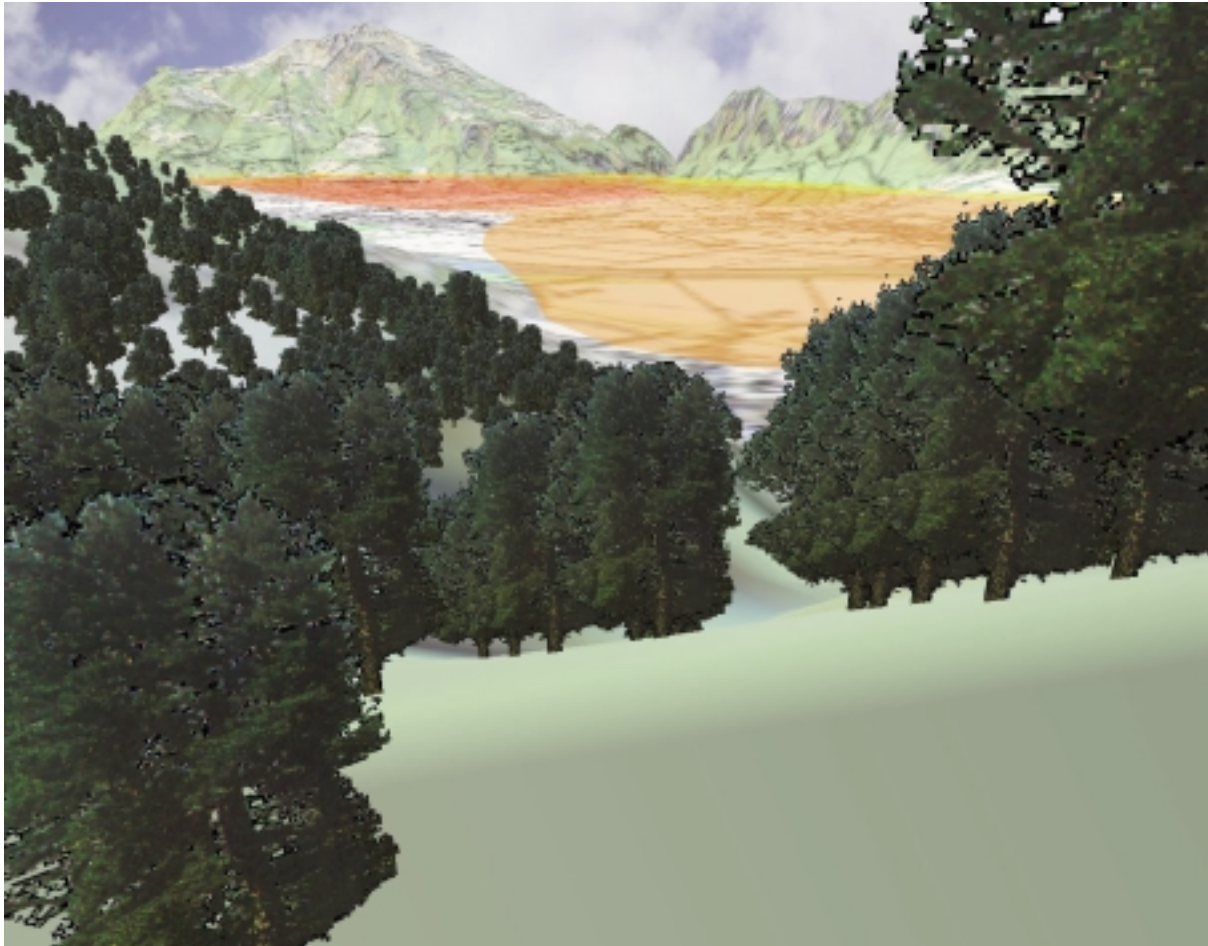


Figure 1. Visual representation of the pollution in the Bündner Rheinvalley.

The following examples represent the developments of 3D digital representations of landscape in recent years and are all results from research projects at the Division of Landscape and Environmental Planning at the ORL-Institute:

- a) Environmental Impact Assessment for the extension of a hydroelectric power plant. (see Hehl Lange & Lange 1993, Lange 1994a)

Eckart Lange, my former PhD student and Sigrid Hehl-Lange, one of my PhD students worked on this project. The capacity of an existing hydroelectric power plant in South-East Switzerland in the Canton of Grisons at the Bernina-Pass (2307 m above sea level) was to be expanded. According to the proposal of the power company the existing two dams which are about 10m in height were to be replaced by dams of about 35 to 40m in height. (see Fig. 2) A project of this kind and of these dimensions is subject to an environmental impact assessment. (EIA) The objective of the EIA is to find out whether the proposal meets the criteria expressed in the various environmental protection laws. The two most important aspects of the EIA for the proposal were issues of environmental protection, i.e., the protection of rare plant species and the quality of the visual landscape. (Lange, 1994a) The importance of the latter can be explained by the significant role of tourism for the local

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economy. The key problem influencing the assessment of the visual quality of the landscape at the Bernina-Pass was the visual impact of the dams.

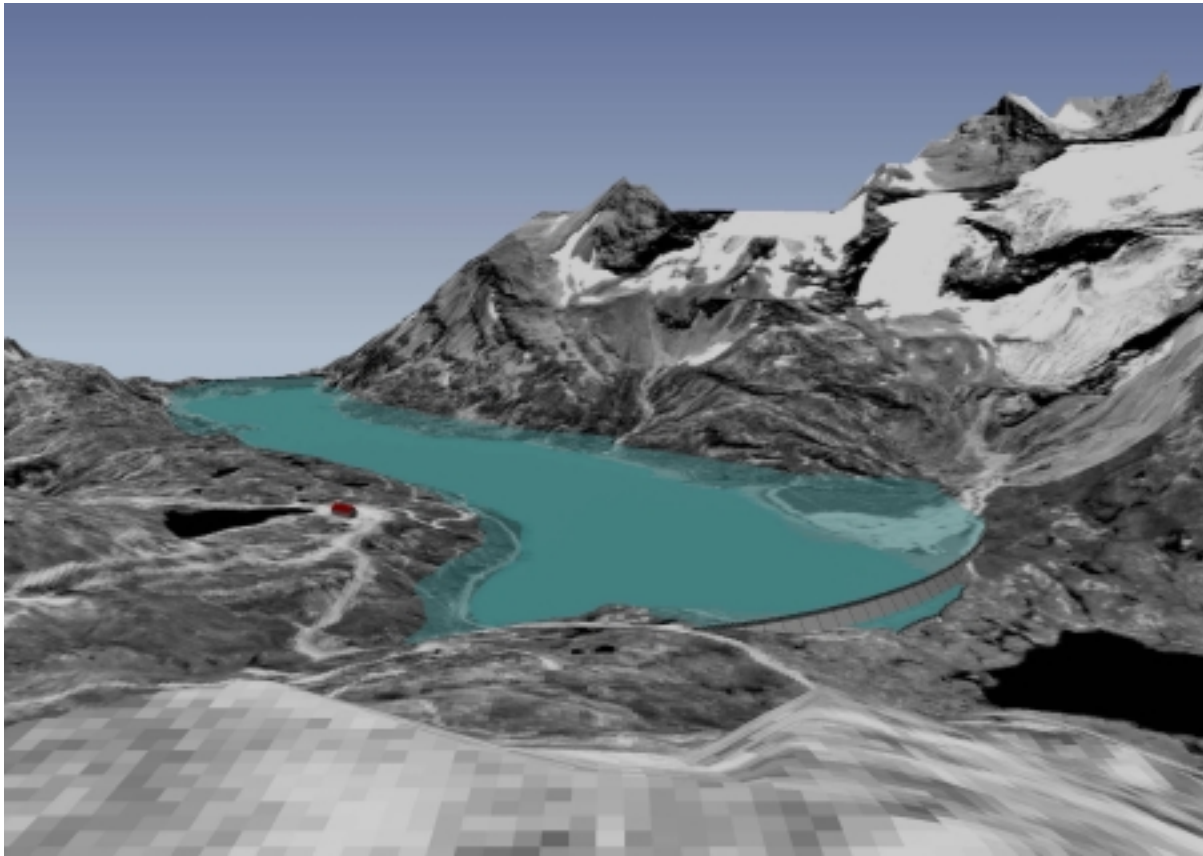
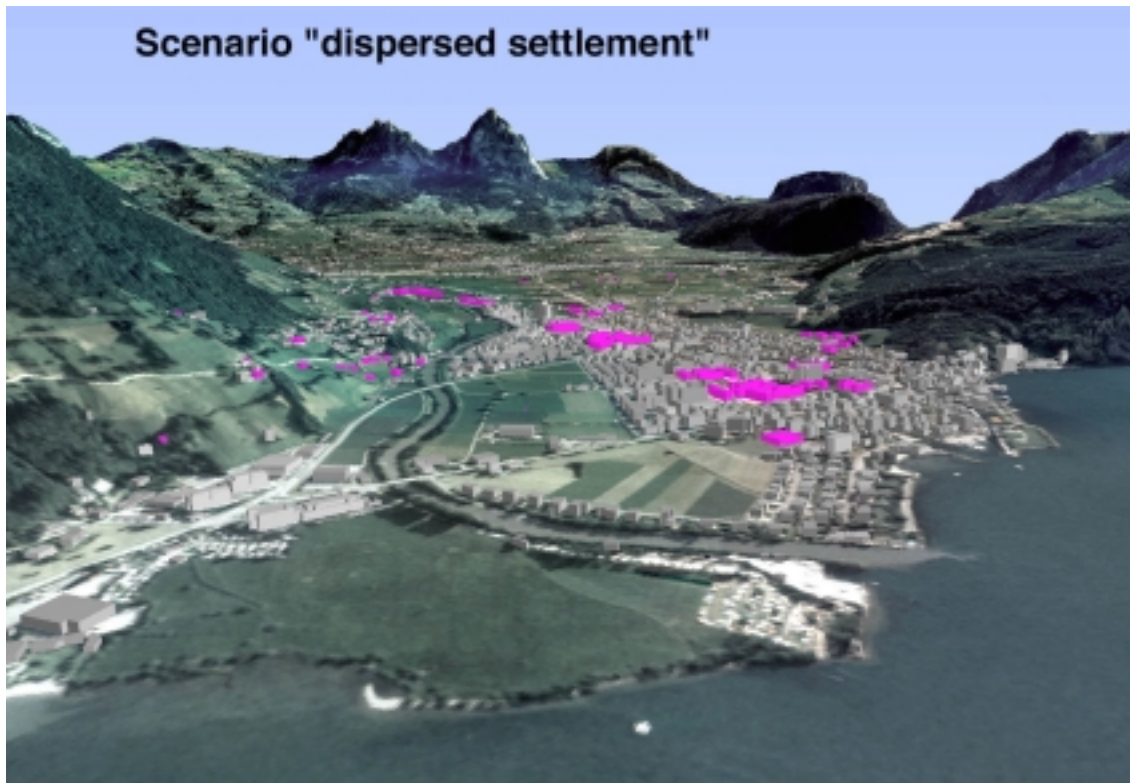


Figure 2: EIA Brusio, existing situation and proposal for Lago Bianco at the Bernina Pass (Hehl-Lange & Lange 1993)

On order to visualise and evaluate the proposal, traditional drawings, physical models of the vicinity of the dams, and digital photomontages were made. Large colored signs were set up on site to mark the new level of the lake. The traditional techniques only allowed the team to visualise small sections or certain views of the landscape. A physical model of the whole landscape with enough detail would have been too bulky. Therefore, a virtual landscape model was made which included the whole surrounding landscape. In this case the advantage was that the project of the extended hydro electric power plant was located above the tree line and only rocks, snow and meadows were to be represented. The same terrain data which was used for the virtual landscape model was utilised to carry out a visibility analysis of the dams (in before and after conditions), which assisted in quantifying the visual impact. Although the 3D real time visualisation was comparatively simple, it was still technically difficult. Going beyond a purely visually descriptive approach, the visualisations were used as an aid for the 'experts' to evaluate the visual impact of the proposal as well as important information for the general public. Both proponents as well as opponents valued the representation through the virtual landscape very highly, as the project was shown in detail as well as in the landscape setting.

b) Development scenarios for the town of Brunnen at Lake Lucerne. (see Lange 1999)  
Brunnen is located just opposite the historic Rütli-Meadow, the founding place of Switzerland in the year 1291. At the turn of the century, Brunnen was a very prestigious resort town with a status similar to that of St. Moritz, Grindenwald or Davos. Among the visitors were Queen Victoria of England, King Alfons XII of Spain and Queen Wilhelmine of the Netherlands.

Unfortunately, the reason of the town's popularity led to the decline of tourism in later years: the location at a major transit route connecting Central and Southern Europe. With the increase in traffic, traffic-related infrastructure, and buildings the quality of the landscape has deteriorated dramatically especially within the last 40 years. The proposed Alptransit high-speed railway may also impact the valley. It has not been determined yet whether the Alptransit will cut across the valley bottom or be built underground. The change in the situation today compared with the situation in 1958 in terms of man-made versus natural structures in the landscape is dramatic. In approximately 40 years, 40% of the fruit trees were cut, whereas the number of buildings doubled. (see Lange 1994) It is unknown as yet whether the future landscape change will be as dramatic as that of the past. Ineichen (1993) assumes that within 50 years the valley bottom will be built up completely, unless development shows down. In order to visualise possible changes, three scenarios were developed by E. Lange. They are termed 'zoning', 'dispersed settlement', and 'concentration'. In the 'zoning' scenario, new development complies with the legally binding zoning regulations. In many cases in Switzerland, the potential land designated in the zoning plan to be developed, goes far beyond the demand in the near future. This resulted from the desire in the past for each community to have as much buildable land as possible, in order to encourage further development. Consequently, this might result in a non-desirable development pattern, even when all new buildings comply with the zoning plan. In the 'dispersed settlement' scenario (see Fig. 3), new development complies with the zoning regulations. In addition, it is also possible to have further development in the agricultural zone. In February 1999, the Swiss Citizens voted on this option and accepted it. The idea is to give farmers the opportunity to start or expand small businesses other than farming to provide for a secure family income. Depending on the detailed legal regulations, which are still to be elaborated, this option could weaken the fundamental ideas of spatial planning in Switzerland e.g., the clear separation of built and open land. In the 'concentration' scenario (see Fig. 4) reduced zoning is assumed. Buildable land is concentrated and furthermore is allowed to have a higher intensity in the central locations. This scenario reflects the general principle of spatial planning: limitation of settlement growth.



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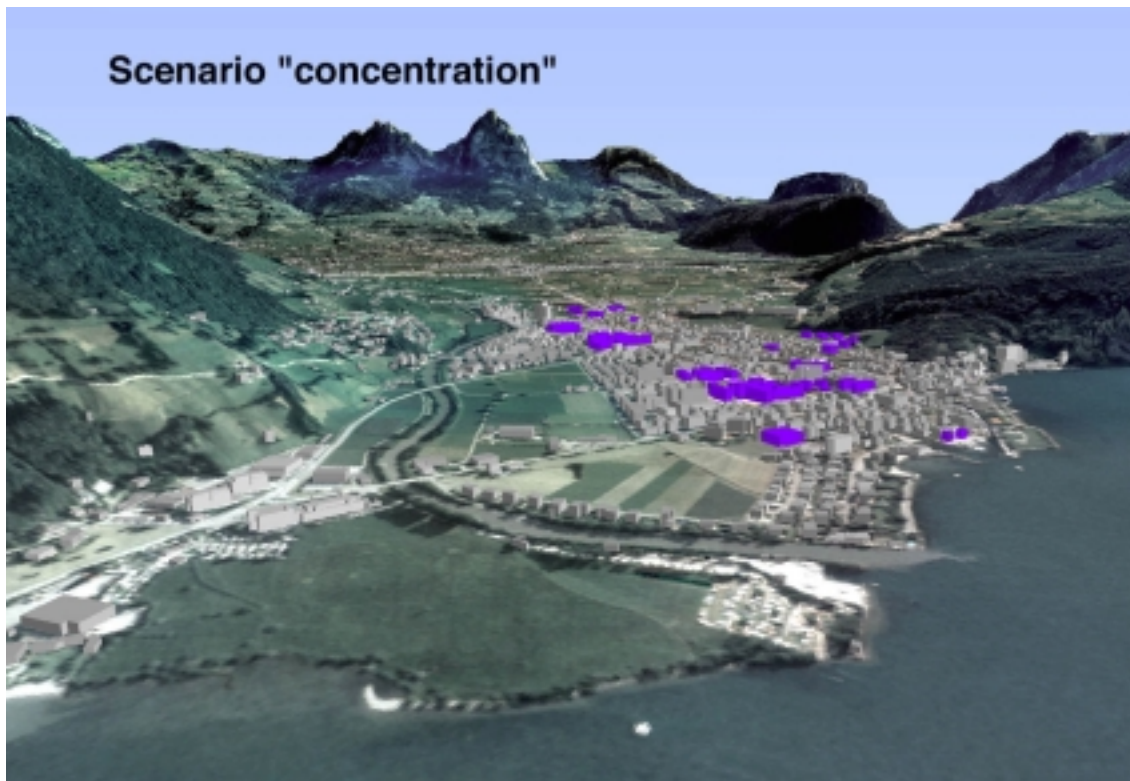


Figure 4: Scenario concentration (Lange 1999)



c) Functions and effects of Landscape elements on the habitat-use of Greater Mouse Eared Bat. (Hehl-Lange 1998)

The Greater Mouse Eared Bat orients its flight path along structures. Thus, protecting just the site of the nursery colony is not sufficient. (fig. 5) If biotopes, either for foraging or for connection, would be destroyed or isolated, it could have an enormous negative impact on these animals. In terms of strategic ecological planning, the GIS-model used is a flexible instrument for incorporating the effects of possible future land-use changes. It allows the modelling of the effects of biotope fragmentation as well as modelling the positive influence of a structural habitat network.

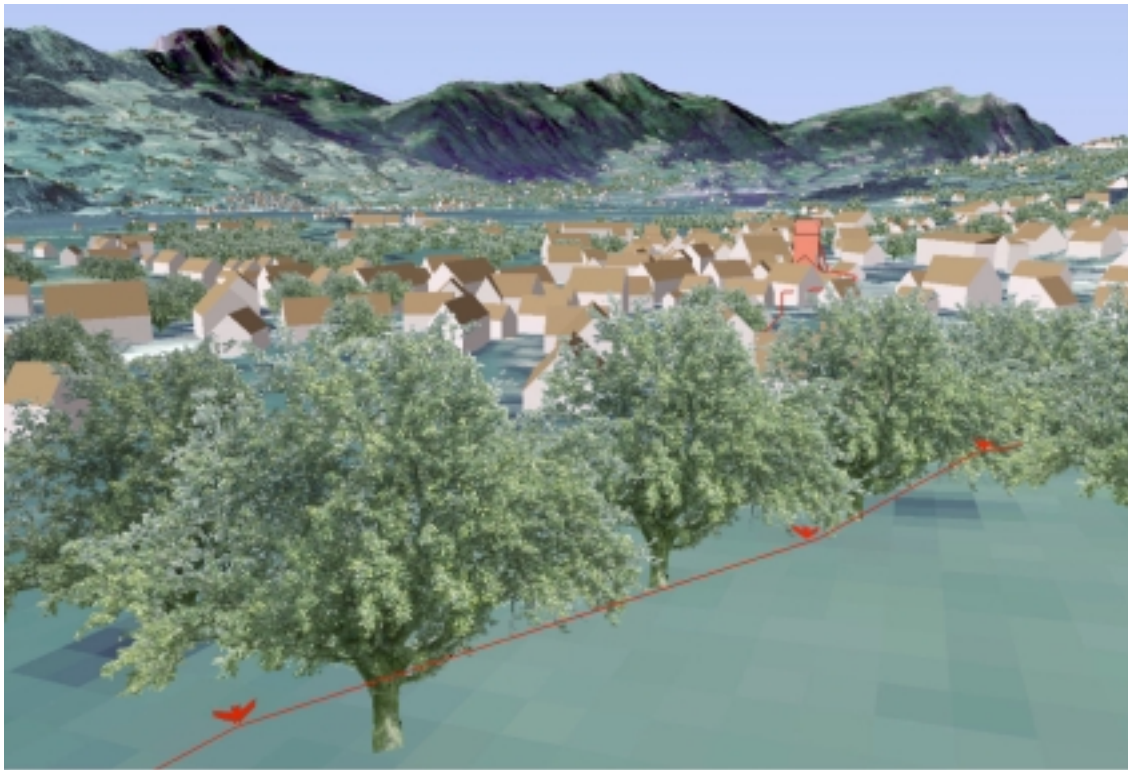


Figure 5: Flight path of the Greater Mouse-Eared Bat following structural landscape elements (Hehl-Lange 1998)

#### 4. FINAL REMARKS

The examples presented here allow the conclusion that at least in recent years, the development of digital tools supported the importance of visual landscape for spatial planning. Nevertheless, the visual approach is still rather not often well used in the planning process in Switzerland and in Europe, although aesthetics that were influenced by the Romantic period were the driving force for nature protection from the beginning.

Five theses may be formulated for the future of spatial planning and ecological planning:

1. On the technical side there is still a wide open field of development opportunities. The future of spatial planning will be deeply influenced by these developments. The main problem will be for professional planners to keep pace with technical developments.
2. Since a bottom up planning process and public participation have become important, 3D visualizations of the living space of humans become indispensable for the informed dialogue between professionals and citizens. The real world is three-dimensional. Its representation in two-dimensional plans demands a level of abstraction that is difficult to interpret correctly for non-professionals.
3. Decision support systems are being more frequently applied in spatial planning. Virtual landscapes have a great potential for being used for the assessment of the visual impact on the visual landscape of alternative actions relevant to space. Virtual landscapes will become an important part of decision support systems in spatial planning.
4. Virtual landscape may be used in the future as experimental laboratories in order to analyze and to study the different processes in the landscape.
5. At sometime in the future spatial planning will be completely done in a three-dimensional environment directly with the computer. A completely new area in planning will be initialized. This development is already evident in architecture.

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