Interactive Landscape Planning – Results of a pilot study in Koenigslutter am Elm, Germany

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1 ABSTRACT

In the Lower Saxony town of Königslutter am Elm, Germany an online landscape planning support system has been implemented in the context of the Development and Implementation Project (E+E Vorhaben) "Interactive Landscape Plan" (*interaktiver Landschaftsplan*) www.koenigslutter.de/landschaftsplan.htm, which was sponsored by the German Ministry for Nature Protection (BFN) and the State of Lower Saxony. From April 2002 until Jan. 2005, an interdisciplinary team from the University of Hanover developed an internet platform in conjunction with the preparation and implementation of the landscape plan. The implementation of the internet platform, which explored new approaches to information, communication and participation in communal landscape planning, is the focus of the following article. The objectives, prerequisites, components, benefits and limitations of this online landscape planning support system are discussed. Of particular interest is the role of landscape visualization in the planning process and communication with citizens.

The online landscape planning system aims to improve the quality and acceptance of the landscape planning proposals by improving citizen participation and understanding. To this goal, the research project attempted to identify the appropriate form of integration of the new media with the existing planning process. The internet platform that has been developed and tested in Königslutter is comprised of open-source components that can be implemented individually, depending on the needs and resources of the community. In this paper the results of the project will be described with an emphasis on two areas of research: the use of media in the participation and visualisation.

2 PURPOSE

Citizen participation in the decision making process about environmental issues is a goal of the Agenda 21 and the Aarhus Convention as well as a political objective that must also be addressed in landscape planning. The potential of the new media to support this goal in landscape planning and to improve citizen understanding and acceptance of environemtal measures was examined in the implementation and development project (E+E-Vorhaben) "Interactive Landscape Plan Koenigslutter"[19] (http://www.koenigslutter.de/landschaftsplan.de). From April 2002 until Jan. 2005 an interdisciplinary team at the University of Hanover composed of landscape planners, computer programmers and social scientists accompanyed the preparation of a landscape plan in Königslutter am Elm, which was carried out by the city of Koenigslutter and an independent planning office.[20] The team was responsible for the conception and implementation of the internet plattform as well as the execution of citzen participation events in Koenigslutter. In additon, the accompanying evaluation research carried out by the Institute for Open Space Development and Planning Sociology assessed the development of the internet plattform and supplied feedback throughout the project.

2.1 Objectives

The objectives of the research project were to develop an online landscape planning system, composed of individual components or tools, which assists citizens, politicians and public authorities to understand, actively participate and exercise their influence in the landscape planning issues. It was also the goal of the online landscape planning system to compliment existing planning participation methods by:

making communication more efficient and flexible,

reducing the need for personal communication,

offering access to additional participation opportunities independent of time and place and

improving the understanding of planning issues through visualization.

Finally the research project attempted to identify the appropriate forms of integration with the existing planning process.
In addition to financal benefits and incentives the city of Königslutter had a variety of objectives and reasons for taking part in the research project. With the use of new media in the implementation of the landscape plan, the city aimed/hoped to:

reach a wider range of citizens, including young peole,

make political and administrative decisions more transparent,

motivate citizens to take part in the planning process,

improving acceptance of nature and landscape related planning measures and

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promote citizen identification with the town and improve its image.

The interactive landscape plan addresses a wide range of users, from the citizen of Koenigslutter with little planning knowlege to the experienced landscape planner. Especially important user groups such as:

farmers, who as important land users are crutial for the implemation of planning measures,

citzen groups who are effected by planning decisions as well as

nature protection organizations, young people and city authorities.

An additional research challenge was to develop an online solution which would meet the needs of the diverse user group and their varied information and participation demands.

2.2 The initial situation for the landscape plan and the E+E-project in Koenigslutter am Elm

Koenigslutter am Elm is a rural, agricultural community in the southeast corner of Lower Saxony, Germany with approx. 17,800 citizens and 17 incorporated town districts. The scenic landscape of hills, forest and river meadows provides important recreational opportunities for local residents and tourists. However, large parts of the community are used for intensive farming due to very fertile loess soil which, in turn, has lead to the loss of structural elements, e.g. hedgerows, in the landscape over the last 100 years (entera 2004).

In recent years, the politicians and city administrators of Koenigslutter have encouraged a service-oriented city administration and strived for better communication with local citizens, e.g. new internet site, more office hours. This open attitude and apparent interest in citizen participation made the city of Koenigslutter a good partner for the research project. However, in the rural community the high-capacity, broad-band internet connection was not yet available. This technical difficulty remained a hinderance to the online-participation throughout the project.

In Lower Saxony, the landscape plan is intended to be an expert assessment of the landscape and nature solely from an environmental perspective. The results and recommendations of the plan are then considered in the community's land use plan and other sector planning, which means public influence in this configuration is somewhat restricted. However the city of Koenigslutter tried to overcome this problem by allowing for more public involvement within the landscape planning process and promoting additional discussion of implementation strategies of landscape plan proposals with citizens and interest groups within a subsequent action plan.

In addition, the state of Lower Saxony offers relatively few subsidies and agri-environment measures and programmes focused on environmental protection, compared to other states in Germany (SRU 2002: 93f.) As a result, the implementation of landscape planning proposals is not financially attractive for the farmers and therefore their willingness to embrace the environmental measures is generally limited.

2.3 Structuring of the participation process

In the Interactive Landscape Plan, citizen participation activities were incorporated throughout the phases of the landscape planning process and reflected the discussion and participation needs which were recognized during the landscape plan. However, four major "participation projects" which focused on specific local environmental issues, formed the core of participation events during the case study.
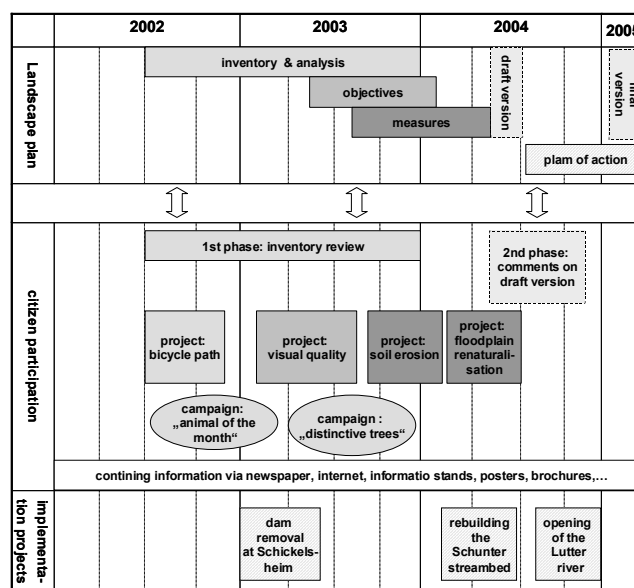

Fig. 1: Structuring of the participation process in Koenigslutter in phases and projects

Participation phases (general issues of the plan): Throughout the planning process the various public authorities (e.g. city administration, nature protection agency on the county level) were

encouraged to participate and the citizens could inform themselves about the progress of the landscape plan using the internet platform. Initially a broad public participation approach was taken in the inventory phase. Citizens were encouraged to review the inventory and analyis and to make comments and corrections online. To promote contributions to the inventory and to draw on the knowlegde of "local experts", two different campaigns were carried out, in which citizens were asked to report sightings of various animal species in Koenigslutter on a monthly basis and to send in photos of distinctive trees. In the end phase of the landscape plan, citizens could discuss the completed draft of the landscape plan (design phase). A detailed version and an abridged version of the plan were available on the internet. Using the participation modules citizens could draw and comment on the maps and draft text.

Participation projects (site and topic specific): The participation projects provided the opportunity to discuss topics that were relevant to both the planners and the public, such as a bicycle path concept, visual quality issues, soil erosion and the renaturalisation of a local floodplain. The projects, which involved a series of events, included town meetings, excursions, seminars and working groups and involved various user groups in different town districts. Visualisation techniques were tested in the context of these events to examine their effectiveness in public participation (see chapter 4.2).

3   THE LANDSCAPE PLANNING SUPPORT SYSTEM

The interactive landscape plan has been developed as a modular system, comprised of a "tool box" of open source components which can be implemented by the community as required (fig. 2). The system provides the user with a variety of functions that are essential for effective online support of citizen based planning (Couclelis, 2004). After the completion of the project the individual tools are available as open source applications and can be used for landscape planning or related planning forms when appropriate.
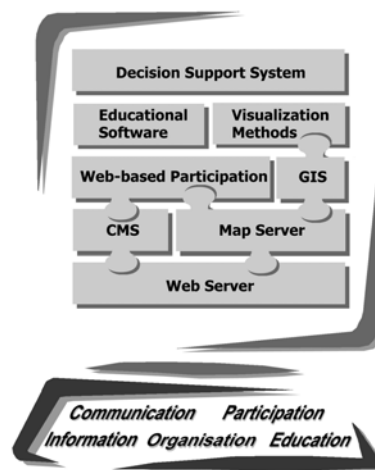

Fig. 2: Components of the Interactive Landscape Plan

3.1   Functions, components and media used

Providing citizens with **information**[21] is still the primary function of the internet platform. Background information about the landscape plan, its methods and planning procedures, the project framework, meeting announcements (launched via a calendar) and minutes, updates on the progress of the landscape plan form the core of information. In Königslutter the complete text and maps of the draft landscape plan in an interactive, a comprehensive version of the draft plan as well as an abridged version prepared for the general public which is structured by chapters of the plan or by city districts, aerial photos and panorama photos help visualize the information online. Detailed information about the topics to be discussed in upcoming town meetings was posted in the internet to help the citizens prepare for the discussions. Beyond simple information retrieval, users can subscribe to an electronic newsletter which delivers information about the most recent planning developments.

The **geographic information system (GIS)** is a core information component of the internet platform for which a digital landscape plan[22] is a prerequisite. The geo-referenced landscape planning data is visualized in the internet as interactive maps with query functions through the use of a **map server**. (In order to promote open source product development, the UMN map server was chosen.) The interactive maps were developed for users with little GIS and computer experience. Therefore, an intuitive and simple interface design, without English computer jargon, was considered essential. Users can interactively view the landscape plan, pan and zoom, and specify the map content, displaying different layers with dynamically generated legends. The ease of using the interactive

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[21] defined in this context as one-way-flow of information items from the central "player" e.g. the planner towards the recipients e.g. the public
22 The landscape plan was prepared by entera and the city of Koenigslutter am Elm with ArcGIS 8.1 from ESRI.

maps, fast loading time, naturally increases with improved hardware and faster internet connections. In rural areas, such as Königslutter, where DSL is not always available, users can view the interactive maps but they must still contend with slower performance.

The **educational** potential of the internet for independent learning and the transfer of knowledge can be used to promote a broader understanding of landscape planning issues. Interactive multimedia learning modules provide an excellent means for presenting landscape and nature protection information in a playful and entertaining manner. The Interactive Landscape Plan offers several modules designed for different age groups, which not only inform about Königslutter but also explain ecological topics such as the hedge rows habitats.

Beyond accessing information, citizens must be able to **participate** in the process and **communicate** their ideas and needs. The internet platform in Königslutter offers citizens email contact to the project team, a discussion forum as well as comment forms for the interactive maps and a map annotation module (see map-based participation module). Discussion forums offer citizen groups, such as farmers, the opportunity to network and discuss controversial issues, regardless of time or place. Different visualisation techniques like panorama photos and interactive simulations of planning proposals supported discussions both online and within town meetings along with traditional metaplan-techniques and printed maps. The challenge is to integrate the participation possibilities over the internet and the visualisation techniques with the traditional "live" planning process. For example, effective online discussion groups, which offer the opportunity to follow up on issues raised in community meetings, must appear promptly in the internet and require sufficient publicity. Planning, coordination and flexibility is essential for the effective integration of such "live" and "online" discussions.

The interactive maps are not only an information tool, but also assist communication between users and promote quick and easy feedback using comment forms. In addition, the map server supports a **map-based participation module** that allows citizens to annotate the maps with text and graphics using a Java applet. These comments are then submitted directly to the City Authority for Environment in Königslutter and posted on the map server. The "place based" comments are published, either anonymously or with the author's name, in a layer of the interactive maps. The city can then evaluate the comments, respond directly to the citizen via email and, when necessary, make the appropriate amendments to the GIS data. The map-based participation module improves access to the plan information, promotes transparency of opinions and ensures that the comments are accurately geo-referenced (Hachmann, 2003).

A content management system developed within the project helps the administrators to **organize** and update the complex and constantly changing internet platform without the need of extensive computer programming knowledge. The use of editors for different purposes like text editing and picture upload makes for a corporate layout of the platform (Friese et al. 2003). The system also manages user, group and access rights which is the basis for the map-based participation module.

As part of the concept of integrated use of new and traditional media, the city of Koenigslutter supported all activities with extensive media and personal information including press releases, printed newsletter and sometimes direct information of relevant partners on the local scale. Fig. XYZ summarizes all media used within the project and Fig. 123 illustrates how the two groups of media were be used in combination within one participation project in Königslutter.
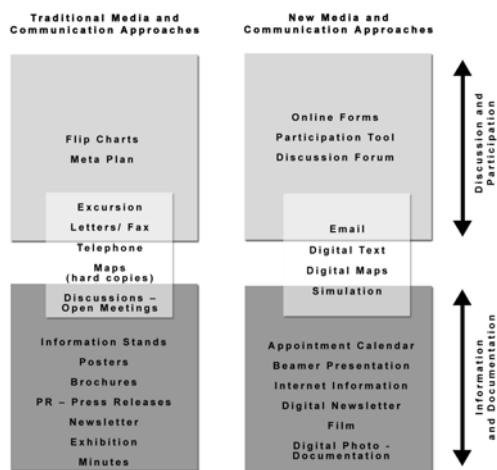

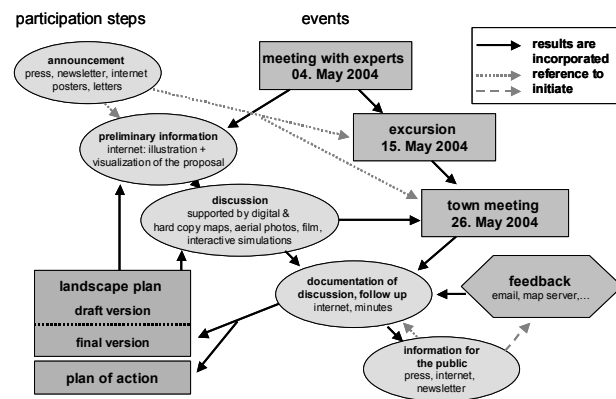Fig. 3: Kind of media used in the interactive landscape plan

Fig. 4: Combined use of new and traditional media in the course of a participation project

3.2 Results: Analysis of citizen participation

The evaluation of citizen participation in the interactive landscape plan –both online and traditional participation – considered all kinds of comments and communication related to the landscape plan: letters and emails, telephone conversations, minutes from meetings and discussions related to the participation phases and projects, annotations on printed maps, and comments over the participation modules, the online discussion forum and online forms. Each remark or mark on a map was counted as a comment, which means a letter or email can contain several comments. (The results presented in this paper are still of a preliminary nature.)

Feedback preferences with new media

Initially the city officials feared that the new and more impersonal means of communication would cause a flood of comments as well as produce non-issue-related or even offending comments. Neither of these has been the case in Koenigslutter. With an entire number of approx. 860 comments, participation turned out to be manageable. (Only comments (511) originating from the participation phases are considered in the following analysis.) Despite the development and promotion of new media within the project, by far the most comments arrived by traditional means, i.e. marks and written comments on the printed maps, contributions to discussions in town meetings, letter or fax. In the inventory phase, the new media was used primarily for making site-related comments by responding with the form linked to the map server. (At that time, the participation modules were not yet available.) In the design phase, email was the preferred type of new media, often along with an attached text document. Some citizens used the discussion forum to comment on the participation projects and to make general comments about the use of the internet platform, but it was not used for commenting on the draft of the landscape plan itself.
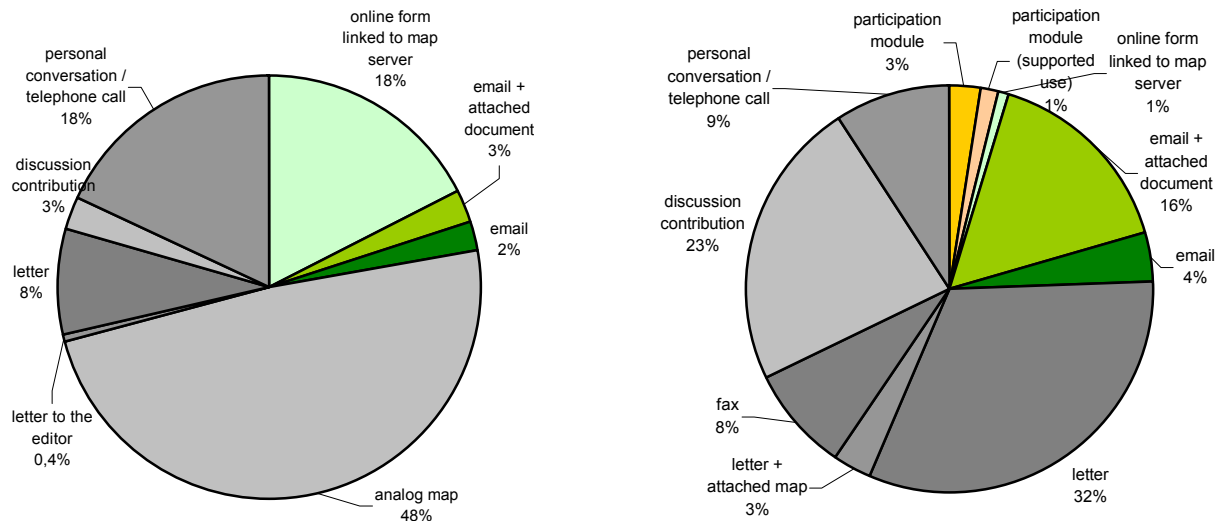

Fig. 5: Comments and feedback within the two participation phases (left: inventory phase, spring/summer 2003, right: design phase, summer/fall 2004), sorted after media usage

Correlation between content of feedback and choice of media

All submissions and feedback from users were classified according to the nature of the comment and the precision with which they could be processed. The responses fell into three main categories: either they focused on a specific area of the map or portion of the text; they pertained to the proposed planning measures or they were a general statement about the landscape plan as a whole. As an example, the following comments were classified in those categories:

Area- or text-related comments:

correction to the biotope inventory relating to specific land parcels, mainly from grassland to fallow land

negative comments about specific proposed protected areas

opposition to specific measures proposed for habitat corridors because of anticipated conflicts with agricultural land use

measure-related:

statement about the feasibility of low-intensity agricultural land use

refusal of proposed focus area for programmes for natural field borders because farmers were not informed in advance,

general statement:

rejection of the landscape plan in general because disadvantages and a loss in farmers income were anticipated

Generally, comments that were submitted with the help of new media were the most precise, and were predominantly related to specific areas or text passages and – in case of the participation modules – even geo-referenced and automatically saved in a database that can be queried by the planners and city administrators. Additionally, online-forms, such as the report forms used in the "animal of the month" campaigns, produce more complete and exact information. Both aspects improved the quality and efficiency of the planning process. Letters, faxes and discussions, on the other hand, tended to be of a more general or thematic nature and less specific.

The reasons for the relatively small amount of comments received over the participation modules are not completely clear. To some extent users reported problems with the use of the modules, finding it somewhat complicated to use or not having the nessecary plug-ins installed. However much of site-related feedback was received as comments on printed maps. Therefore, it can be assumed that there exists potential for increased online use of object based feedback and participation modules.

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175

The analysis of the data shows that most of feedback from the citizens consisted of general, comprehensive statements about the landscape plan or addressed a measure in general. Neither of which were related to a specific portion of the map or text. The participation modules, as they are developed today, are not geared towards people who are used to composing their comments in letters, in which general comments about a range of issues are discussed. User also stated that they perceive writing a letter as an official and reliable way of communicating their opinions and comments to the recipient. The new techniques still have to prove their reliability.

Categorizing the comments into "precision classes" does not say anything about the quality of their content. It can be said about all three types of comments that they are helpful in development of the landscape plan and that the participation modules – as a conclusion – provide an additional means for participation and help process site- or text-related comments. However, they cannot replace the other means of communication. Further development of these software tools should address the user wishes to comment on broader issues using different types of comment interfaces.

3.3   Implications for the planning process

Public participation, as it was implemented in Koenigslutter, has several implications for the planning process:

> The frequent meetings and discussions forced planners to prepare and present intermediate results more often than usual in the planning process. The use of GIS require the planners to formulate site-specific proposals with unavoidable accuracy. It is therefore more difficult in the conceptual phase of the planning to convey the tentative character of "planning in progress" to the citizens.
>
> Citizens comments during the inventory phase were not integrated directly into the database, but first checked in the field by the planner. This helped the planners to identify and correct discrepencies in the biotope inventory that were caused by misinterpretations of the aerial photos. Participation in this phase can, on the one hand, truly improve the quality of the data but, on the other hand, it also means additional work for the planner. Furthermore, the planner needed to respond to all the public submissions, explaining whether and how the comments would be integrated into the plan. Thus, additional feedback loops and more time are necessary in the inventory phase and participation processes of the planning process, which requires additional resources. The fast communication via internet raises the expectations of citizens that database changes should occur immediately. In many cases this is not possible, but it still requires a confirmation and response to the citzen comments, thus creating an additional task in the process.

However, the online participation in Koenigslutter did help to make improve the effectiveness of the plan preparation. In the initial phase, the biotope inventory was based primarily on the aerial photo interpretation of the site, with minimal field work, due to financial restrictions. Through the comments from the citizens in the inventory phase, field work could be concentrated on critical issues and sites. Thus, using participation efficiently can also save money.

> It was found in Koenigslutter that the citizens preferred to discuss specific, concrete planning measures which they could imagine rather than abstract planning objectives. Therefore planning content that would normally be developed later in the planning process, during the measure development phase, was presented during the participation projects – which in Koenigslutter already started while the phase of analysis was still going on. This meant planners had to develop specific planning proposals while the analysis phase was still in progress. To avoid such complication in the planning process, participation projects should be carried out later in the planning process in order to benefit from concepts and data already prepared and available.

3.4   Participation in a sector plan: How does that fit together?

From the start, participants need to understand how much influence they have on the planning decisions and how their comments will be incorporated into the landscape plan, otherwise their enthusiasm can turn into frustration. In other words, the opportunities but also the limits of participation must be made clear, which is, admittedly, a difficult und time consuming task. The fact that the landscape plan in Lower Saxony is an independent assessment based solely on an environmental perspective, means that it also does not consider the feasibility of implementation. This presents considerable limitations for influence on the plan by the public and other agencies. In the inventory phase, however, broad participation can offer the planner valuable information and local knowledge, to improve the data and to clarify important issues. The development of a comprehensive concept of objectives for nature protection and development though requires the professional knowledge and experience which a planners can provide and offers little possibility for public involvement. In situations where a choice between alternatives of comparable environmental value must be made, there is then an oportunity for public participation. Also the comprehensive concept of planning measures is not intended for immediate implementation, but rather shoulc be considered as a source of proposals for possible future development. Therefore, it is not opportune to completely rule out the proposed measures, which meet with momentary negative reactions of local interest groups, as was sometimes the case with farmers in Koenigslutter.

The experience in Koenigslutter makes it clear that a plan of action (Handlungskonzept), which stems from landscape plan, is an important instrument for incorporating the suggestions developed in the participation phases. The plan of action helps to structure the

results of all the discussions, opinions, concerns and hints for possible cooperation in the implementation of measures as well as to support political decisions about the timeframe and content of the implementation of the landscape plan. Currently the plan of action for Koenigslutter is being prepared including a number of additional town meetings with the public. It is recommended that the action shall be reviewed as a political programme by the city council.

4   VISUALISATION

The goal of the visualization in landscape planning is to help citizens understand the spatial and temporal processes in the landscape, to comprehend the planning proposals as well as to promote communication. Visualization was used in Königslutter to assist the participants to understand and to evaluate planning proposals in order to become an active participant in the planning decisions. In the research project the following questions were addressed:

What role does the visualization play in the communication with citizens?

Which visualization methods are suitable for the planning process and for which tasks?

What advantages and disadvantages do the different visualization methods demonstrate in a planning situation?

Which organisational and content difficulties arise when visualization is used in the planning process?

4.1   Visualisations methods employed in the project

A wide range of visualization techniques were tested during the planning process in Königslutter in order to determine which characteristics of the visualization are important for citizens in different planning phases. The Visualization techniques employed ranged from low end, non-geo-referenced methods of landscape visualization such as digital photomontage, panorama photos to high end real-time virtual reality software such as Lenné3D system. and offered a variety of interactive options and levels detail of realistic representation.

In each of the planning phases a variety of techniques were employed. In the inventory and analysis phase of the landscape plan **2D maps aerial photographs** and **panorama photos** were used to visualize the existing conditions in the study area. In the development of planning goals and measures, planning proposals were simulated with **photomontage, sketches** and **3D-landscape models**, which were generated from the GIS data. Renderings of the 3D landscape model produced with **Visual Nature Studio (VNS)** illustrated the visual effects of planning proposals with before and after versions, which could be clicked on or off. A **virtual 3D model** (**VRML)** exported from the VNS project with Scene Express (add-on from 3D Nature) offered citizens the opportunity to explore the spatial effects of the proposed measures interactively in internet. Finally the system **Lenné3D** was used to visualize planning proposals in the context of nature protection scenario development. Lenné3D, which is being developed and tested by ZALF[23], offers a real time exploration of a 3D model from eye-level in conjunction with a site overview with **3D Maps (LandExplorer).**

Also developed during the project was a tool to convert the still images, produced by the various visualization techniques, into interactive images, in which the individual planning measures could be turned "on or off". (see Fig. ABC) With a image processing software, the individual measures are divided into different layers. The tool produces an interactive HTML version of the image.
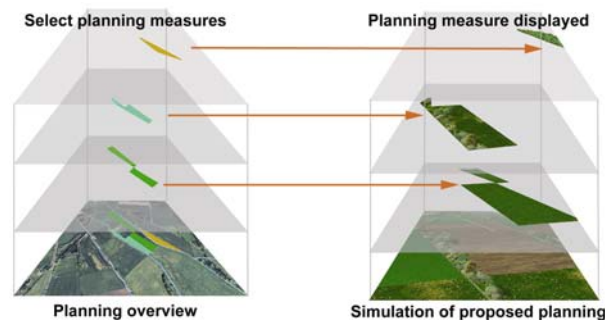

Fig. 6: Structure of interactive still images

4.2   Visualization in the Participation projects

In the first citizen participation project, citizens discussed the possibilities to improve the landscape visual quality in their community. The kick-off event for the discussion was a bicycle tour through the various landscape areas of the community and a citizen evaluation of the landscape quality. Afterwards, a virtual bicycle tour with panorama photos and opinion questionnaire in the discussion forum was accessible on the internet site. During a community meeting citizens discussed the visual effects of a proposal for new hedgerows in the landscape with the help of an interactive photomontage, in which the various hedges could be shown or hidden(turned on or off). Citizens also simulated their own vision of the landscape in a hands-on workshop using photomontage techniques.

In a second series of citizen participation sessions, primarily farmers but also other interested citizens, discussed scenarios which addressed soil erosion using simulations created by four different visualization methods: sketches, photomontage, Visual Nature Studio, and Lenne 3D. All four visualization types were used in the discussion and the citizens' reactions were observed. The participants were divided into four groups, each with a moderator and an observer. The groups rotated around four stations where

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[23] Zentrum für Agrarlandschafts- und Landnutzungsforschung e. V., Münchenberg

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177

simulations, created with different visualizations techniques, were presented and available for use in the discussion. At each station, the planning measures proposed in the scenarios were discussed using the available visualization. A technician operated the visualization, while citizens discussed the planning measures for twenty minutes at each station. Afterwards the participants expressed their opinions about the techniques.

A further citizen participation project addressed a concept for the renaturalization of a stream floodplain. A film, which is also available in internet, explained stream renaturalisation and showed the opinions of various interest groups was shown in the meeting. An interactive simulation, which was produced with VNS, gave an overview of the planning measures and was linked to before and after eye-level views of the planning. A simulation of the planning area in 15 years was prepared with Scene Express and presented as a virtual reality model using VRML

4.3 Participant reaction to the visualization

User reactions to the visualizations used in the town meetings were gather with questionnaires, interviews, in experimental situations as well as by participatory observations. (Oppermann & Tiedtke 2004) The visualization was tested in the context of three thematic participation projects which addressed the issues of visual quality assessment, soil conservation and river renaturalization. Interactive maps were available in the internet which documented and demonstrated the current information available from the landscape plan.

Citizens want interactivity

The citizens welcomed the visualization and used it actively in the discussions to locate their comments or to illustrate or emphasise their ideas. The citizens felt that the visualization helped them to understand the "where" and "how" of the proposed planning measures. Especially the before and after simulation of individual measures, which could be turned on and off, was frequently employed by citizens in the discussions. The comparison of planning alternatives and conditions provided an important method for helping citizens understand and make decisions about the effects of the proposed measure and constitutes a minimum requirement for content interactivity of visualization systems. In addition the citizens used the visualization actively in the discussion in order to explain their ideas, instructing the technician to pan to the areas in question or wanting "to go there". The possibility to view different perspectives of the landscape was important in the communication with citizens.

2D supports orientation

The experience showed that the 2D maps and aerial photos were an important orientation tool for the citizens and they provided a good means for documenting the comments provided by citizens. Some citizens had difficulty to orient themselves in the 3D visualizations. On one had, citizens wanted to observe the planning from different perspectives. On the other hand, many citizens found the changing position, which the interactive navigation offers, difficult to follow and, thus, the orientation was more difficult. The experience indicates that 2D visualization can not be replaced by 3D and that the spatial orientation was best achieved through a combination of the two.

Realistic but not too photo realistic

The citizens in Königslutter desired a photo realistic representation of the planning measures. However, it was observed in the meetings that citizens were quick to point out the weaknesses of the simulation, e.g. standardized hedgerows, seasonal discrepancies in the flowering plants with the photo realistic visualisations, such as photomontage, VNS and Lenné3D, which promote a high expectation of correctness. in some cases this distracted from the discussion or led to mistrust in the validity of the visualization. Never the less, when asked, they found the less photo realistic visualizations in Scene Express and VNS sufficiently realistic to understand and assess the proposed planning measures. The objective of the visualization and the quality of the available data are decisive in determining how detailed the visualization should or can be. The challenge for the visualization remains to find a level of detail which was sufficient to illustrate the planning, but which also suggests the proposal or tentative character of the planning.

Live vs. online

All of the visualization methods could be presented in the town meetings as well as in the internet, with the exception of Lenné3D, whose real time presentation is not accessible in the inernet. A third of the participants in the meetings who were asked, voiced the intent to view the visualized results of the meeting in the internet. However, far fewer had viewed the information on the internet site prior to the town meeting. The visualization sparked interest in the plan. The visualization in the internet provides the participants with the opportunity to review the planning proposals without interruptions and in their own time. The internet presentation must also take into consideration the possible technical limitations experienced by the users, i.e. slow internet connection, outdated hard or software, availability of plug-ins, and offer visualizations in a variety of resolutions.

Participants wish for more

Most of the participants were excited by the visualizations but disappointed that the technology did not support the possibility to immediately visualize their suggestions or planning ideas. The interactive presentation of new content in the visualization remains a task for future software development. Citizens also request the 4D visualization of the landscape, in order to see the development and growth of the planning proposals over time. This too remains an important task for future development.

5 CONCLUSIONS

With the implementation of the Aarhus convention, citizen participation in the planning process is no longer a luxury but a requirement. Online participation is one possible approach to address these new challenges. The experience from the Interactive Landscape Plan in Koenigslutter shows that the new media provides useful new channels of information and communication with citizens during the landscape planning process. The new media, however, can not replace traditional participation methods and

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should be considered a supplement to traditional media. An intelligent mix of media which include internet, press articles, and personal interaction gives the most benefit to participation and the planning process.

Open source programs make solutions for online planning available at low cost for communities with limited resources. In the context of the Interactive Landscape Plan, open source applications were developed which can be used in other online landscape planning support systems. The flexible "tool box" of applications which were implemented in Koenigslutter includes: CMS, map server, participation modules, a soil conservation decision support tool, interactive still images and educational programs. The modular concept of the "tool box" allows communities to implement the components which suit their needs.

The experience in the Interactive Landscape Plan showed that digital feedback in the planning process has advantages for the planner. Comments can be processed much more efficiently and the information they contain is generally more precise and complete. The possibility to process spatially referenced comments, which the participation module offers, is seen as a promising opportunity to satisfy the growing demand for citizen participation not only in landscape planning, but also in related planning sectors. Although the absolute number of people who took part in online participation in Koenigslutter was not as high as initially expected, it was a good response relative to the number of citizens who normally attend community meetings in Koenigslutter. Moreover, the online participation improved the amount and quality of information available to the citizens who took part in the planning process over the internet. Ultimately, it is the quality and not the quantity of participation that is decisive in the landscape planning process

The promise of participation raises expectations among citizens about their potential to influence the planning. At least in lower Saxony, the opportunity and extent to which citizens can influence the landscape plan is limited. In Koenigslutter, these limitations were overcome through the development of a plan of action (*Handlungskonzept*) for the implementation of the findings of the landscape plan, which supports the political decision process. From the start, it is important that the framework, in which citizen participation can influence the planning, is made clear from the beginning, otherwise enthusiasm can turn into frustration.

Visualization in the planning process in Königslutter was welcomed by citizens, who actively used the visualizations in discussions to locate and illustrate their comments. Traditional 2D visualization techniques such as maps and aerial photos should not be discarded in favour of new interactive and 3D techniques. Instead, a combination of the different visualization techniques best helps citizens to understand and evaluate the simulated planning proposals. The choice of visualization techniques used to present and illustrate landscape planning issues depends greatly on the planning phase and the planning task at hand. Furthermore, the effective use of visualization techniques is a challenge for the moderator of a meeting, who must be familiar with both the content and use of the visualization. Ultimately, the effectively integration of visualization into the planning and participation process requires good project and time management with all parties involved.

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179