GEOVISUALISATION METHODS FOR PARTICIPATORY SPATIAL PLANNING

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Abstract: Use of geovisualisation methods in the process of public participation in the spatial planning has been presented basing on the experience gained at the realisation of an international project named Participatory Spatial Planning in Europe. The methods have been adjusted to two forms of participatory spatial planning, i.e. realized during public meetings and accomplished via Internet means. Applied methods comprised of 3D virtual visualisation, interactive choropleth and diagram mapping, methods used in map server technology as well as animations. The case study located at the Vistula River Valley addressed a part of the Warsaw Metropolitan Area Plan. Three scenarios of the plan have been developed and serve as a basis to the alternative plan solutions presented by geovisualisation tools.

Participatory spatial planning becomes one of the common practice in the democratic societies. That comparatively new praxis requires modern means of its implementing. The traditional ways in social communication are replaced by the Information and Communication Technologies (ICT) tools. One of the most powerful means for delivering spatial information is a geovisualisation oriented to the various groups of recipients.

In the framework of the international project named Participatory Spatial Planning in Europe a number of geovisualisation techniques are tested during the ongoing planning process in several regions of Europe. The project is part-financed by the INTERREG IIIC Programme of the European Commission and by participating institutions of Belgium, the Netherlands, Poland, Portugal and Spain. The main objective of the project is to share knowledge on the use of innovative methods (mainly geovisualisation ones) in improving the interaction between the public and local government. Within the project a number of case studies have been initiated in order to implement the methods in line with the public consultations in diverse social, cultural and environmental context.

The participatory spatial planning is based on the involvement of citizens, societies, NGOs and private parties on majority of the stages of the planning process. In traditional planning the citizens are not involved in the stage of constructing the plan – they can only give comments on a ready concept plan. So in the participatory arrangement the participants, who are involved, have more influence to the final shape of the plan. All partners have opportunity to learn a lot about the landscape, its components and relations as well as about particular stakeholders’ requirements and arguments. According to (Kingston 1998) public participation (PP) can have form of the ladder (the first, less mature ladder has been proposed by (Arnstein 1969) subdivided to low and high level of participation, namely:

- low level participation
  - public right to know
  - informing the public
  - public right to object
- high level participation
  - PP in defining interests, actors and determining agenda
  - PP in assessing consequences and recommending solutions
  - PP in final decision

Another approach to the public participation issues has been defined by the International Association for Public Participation in form of a public participation spectrum. It distinguishes five levels of public participation, i.e. informing, consulting, involving, collaborating and empowering. They are described in three aspects showing goals of public participation, promise given to public and examples of techniques to consider. The Figure 1 below present it in order of increasing level of public impact.
INCREASING LEVEL OF PUBLIC IMPACT

<table>
<thead>
<tr>
<th>Public Participation Goal</th>
<th>INFORM</th>
<th>CONSULT</th>
<th>INVOLVE</th>
<th>COLLABORATE</th>
<th>EMPOWER</th>
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<td>To provide the public with balanced and objective information to assist them in understanding the problem, alternatives, opportunities and/or solutions</td>
<td>To obtain public feedback on analysis, alternatives and/or decisions</td>
<td>To work directly with the public throughout the process to ensure that public concerns and aspirations are consistently understood and considered</td>
<td>To partner with the public in each aspect of the decision including the development of the alternatives and the identification of the preferred solution</td>
<td>To place final decision-making in the hands of the public</td>
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Promise to the Public

We will keep you informed
We will keep you informed, listen to and acknowledge concerns and aspirations, and provide feedback on how public input influenced the decision
We will work with you to ensure that your concerns and aspirations are directly reflected in the alternatives development and provide feedback on how public input influenced the decision
We will look to you for direct advice and innovation in formulating solutions and incorporate your advice and recommendations into the decisions to the maximum extent possible
We will implement what you decide

Example Techniques to Consider

- Fact sheets
- Web sites
- Open houses
- Public comment
- Focus groups
- Surveys
- Public meetings
- Workshops
- Deliberate polling
- Citizen advisory committees
- Consensus-building
- Participatory decision-making
- Public comment
- Focus groups
- Surveys
- Public meetings

Figure 1: The Public Participation Spectrum (from International Association for Public Participation webpage)

The geovisualisation methods and tools should be adjusted to each of the above forms of public participation in the planning process. Taking into account a way of involvement in the planning process (passive role of public and increasingly active one) and a mode of communication/interaction, the methods can be subdivided on two main categories, i.e. supporting public discussion and supporting individual assessment of the plan.

The particular forms of geovisualisation were selected for distinct groups of users and to portray the landscape and its alternative states in different conditions. The number of available geovisualisation software solutions have been tested and analysed. The main requirements for using them in the process of the participatory planning have been defined and final selection have been performed in two categories: solutions for public discussions and for internet consultations.

Among three means of modern communication, i.e. the desktop (supported by projector), personal digital assistant and large screen, the first one solution has been selected. The second one is not yet sufficiently popular, so their use in the participatory planning seems to be premature. The last one used to be quite expensive and requires special premises, so it is also not practical for single events.

The major tool for 3D visualisation in public discussions is Virtual LandScape software of YDreams (Figure 2). It integrates different geographical datasets and multimedia data with real time 3D visualisation. The software allows users to zoom into detailed geo-referenced data and to move freely in space, changing navigation speed and interacting with a variety of objects.
The index map tracks in real time the route followed by users in the virtual environment, up to the current position. The system also includes orientation tools, controls for navigating multiple information layers, as well as pre-defined paths and viewpoints, allowing users to move directly to specific points of interest.

The Internet consultation requires different tool – simpler in using and less dependent of the large datasets. Available Map Server scripts are incorporated in the dedicated software developed in Java environment. The final solution will enable users-stakeholders to portray the area of interest with selection of data layers. The scenario-based versions of the image of possible future landscape changes will be also available to the user in order to enable examination of the options to choose. User will also have additional tool to express his comments and to show his preferences. Recording of his comments both in textual and drawing form will be gathered during consultation period and analysed in order to distinguish the most popular and requested options. Some form of voting system performed by means of Internet will be also available.

An approach presented by Jankowski (1998) has been adopted in the process of the Internet application development. The approach assumes running a sever application available to the Internet certified users and enabling several functions, namely: security of the process, communication with users, data management, exploration, evaluation, voting and delivery of voting results. The Figure 3 shows the Spatial Understanding and Decision Support System based on that approach.

The implementation of the selected methodology has been performed in the framework of five case studies of the Participatory Spatial Planning in Europe project. One of them is prepared for the middle valley of the Vistula River close to Warsaw agglomeration. The ongoing process of elaboration of the Warsaw Metropolitan Area Plan has been
supported by the case study introducing modern geovisualisation methods to the stage of public consultations. The case study extent refers to the part of the plan area where a semi natural landscape still exists and some protected areas have been established. On the other hand there is an extensive agriculture activity and a number of conflict spots can be identified.

The existing spatial data of the case study region has been gathered, harmonised and processed in order to prepare of the 3D virtual models of the case area and other relevant geo-referenced databases. The 3D visualisation has been based on the satellite images and air photos of the region combined with DEM data. Location of some hot spots have been also introduced to the Virtual Landscape viewer. Additionally land use and vegetation layers as well as several layers of the Warsaw Metropolitan Area Plan have been integrated within one software environment.

Figure 4 Satellite oblique 3D image of the case study area

Another set of information comprised of the statistical data, sampling data and reference layers. They were prepared for geovisualisation applications (both for public discussion and for Internet consultations) of the tabular data, performed by more traditional choropleth and diagram maps.

One of the important issue for presenting the information for discussion with all stakeholders in the region is developing possible scenarios of the future arrangement of the space. Three scenarios related to the nature protection have been defined on the basis of several discussions with authors of the Warsaw Metropolitan Area Plan. The first one is oriented to the river regulation and industry development; the second represented an opposite solution to first one; and the third one is focus on the reforestation. Each of the scenarios has been subdivided to the options related to the specific areas (regions) and split on the stages. For each variant a set of derived layers integrated with the 3D images have been generated. The time sections showing the gradual changes were put together in order to develop the animation presentations, available both for public discussions and Internet applications.

The main partners taking part in the process of participatory spatial planning are subdivided onto following parties: planners, regional and local authorities, local communities and non-governmental organisations. The discussion on the scenarios will take place during special meetings with all partners. The first series of meetings will involve planners, regional authorities and experts. The main subject of discussion will cover the first version of the Warsaw Metropolitan Area Plan and possible alterations. Every solution will be visualised in form of 3D virtual reality presentations and a set of thematic maps. The conclusions of these meetings will be used for elaboration of improved versions of scenarios.

The second group of meetings will be addressed also to other stakeholders like local government representatives, non-governmental organisations and citizens. The structured presentation of the proposed scenarios will be followed by the voting procedure which will give planners information on the most wanted solutions.

3D virtual visualisations will be used during both kind of meetings. The Virtual Landscape software gives an opportunity to navigate across the landscape and to switch on the required data layers. Its functionality helps understanding the relations between spatial objects and phenomena. The second method of geovisualisation used during these meetings will be based on the interactive choropleth and diagram mapping. Another visualisation module will be based on the map server technology and will enable browsing collected data and introducing comments in form of "post-it" labels and additional objects placement. The last group of the methods will be based on animations showing changes simulated on the basis of proposed scenarios.

The Internet applications will be prepared using last three groups of methods. The 3D virtual visualisations are too heavy for that kind of media like Internet. Users will have possibility to see 3D models of the landscape but without
navigation functionality (some small areas demos with navigation capabilities will be provided for downloading). After assessing particular scenarios, Internet users will have opportunity to vote and to send additional comments. All these votes and comments will be thoroughly analysed by planners and then published together with the final form of the plan.

The described procedures of public participation in the spatial planning creates an opportunity to proliferate knowledge on the geovisualisation methods in the society. The case study introduced the methods themselves to the public but also brought spatial information closer to the citizens. The presence of the geovisualisation in the participatory planning procedures creates basis for spatial thinking during the individual decision making. Generating alternate future states of the neighbourhood influences imagination and deepens understanding of the processes going in the space.

References


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Born in 1951. He graduated as a master of geography at the Warsaw University in 1973. He received PhD degree at the Institute of Geodesy and Cartography in 1980. His research carrier started at the Institute of Geodesy and Cartography and was continued at the Geodetic and Cartographic Data Processing Centre where he was a research worker and later scientific director. In 1988 he came back to the Institute of Geodesy and Cartography, where he established Spatial Information Systems Department and served as its head till 1997. In 1991 he was nominated as a director of the UNEP/GRID-Warsaw Centre – an unit specialised in environmental information and operating within the UN system as a collaborating centre. In the period 1982 – 1994 he was also lecturer of the computer assisted cartography at the Warsaw Technical University, Faculty of Geodesy and Cartography. Since 1993 he is lecturer of GIS at the Warsaw University, Faculty of Environmental Protection.

His main fields of professional interest comprise of geographic information systems, digital cartography, cartographic visualisation, land use / land cover inventory and mapping and environmental information systems. In period 1992 – 2004 he was a member of the National Committee for Global Change. Since 1992 he is a member of National Committee for Man and Biosphere Programme. He is member of the Cartographic Section of the Polish Geographic Society (vice chairman 1990 – 1999). Since 1989 he is a vice president of the Polish Association for Spatial Information.
