Geographic Information Systems on the Internet: Sustainable Solution for the Information Society

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1   INTRODUCTION

The world is changing rapidly under the growing influence of information and communication technologies (ICT) and globalization, which are reciprocally strengthening factors. This process of transforming our industrial society into an informational society has the potential of dematerialization – substitute information and knowledge for material products to some extent, as well as progressive globalization of the economy that has thus far boosted goods production, freight volume and passenger transport. The information society also means the acceleration of innovational processes, and thus an ever faster devaluation of those already existing by new, whether hardware or software, technical products or human skills and knowledge (Hilty, Ruddy 2005). The relationship between the information society and sustainable development are of great concern when we consider the future of our planet (Välimäki, 2002).

The last decade has seen exponential growth, in the use of the Internet for the delivery of a whole new set of services across the globe, coupled with a growing reliance on new ICT to support the functions and delivery of municipal services for urban planning and management. Geographic Information Systems (GIS) have advanced into an increasingly important information tool, especially on-line Public Participatory Geographic Information Systems (PPGIS), with the aim to enlarge the level of citizen's involvement and participation in decision-making processes. This paper will investigate the potential of GIS on the Internet to support public participation in sustainable management of the urban regions in Germany, with the crucial question: Is GIS, on the Internet, a sustainable solution for the information society?

2   GIS ON THE INTERNET

A Geographic Information System (GIS) is an organized collection of computer hardware, software, geographical data, and personnel designed to efficiently capture, store, update, manipulate, analyze, and display many forms of geographically referenced information (ESRI, 1995). The GIS has been used for solving a wide range of planning problems. The GIS, on the Internet, can allow many more people to have access to GIS functionality and to enhance community participation in planning. The GIS used to support public participation is often referred to as Public Participation GIS (PPGIS) (Steinmann, Blaschke, Krek, 2004). "Public Participation GIS" (PPGIS) is a closed set of methods and technologies intended for public participation, presentation of various forms, and combinations of spatial information depending on aspects selected for problem perception (Krygier, 1997). Thanks to the GIS on the Internet, which is becoming a powerful communicational tool between different interest groups, it is possible to involve the public in the planning process from its very beginning. So-called on-line PPGIS are being used to facilitate the delivery of spatial information to participants and allow them to return their information for inclusion in the database (Craig et al, 2002).

The use of GIS on the Internet (PPGIS on the WEB) should be to:

- enhance the participation of the public and their presence. Kingston (2001) presents that the use of PPGIS on the WEB enhances the public opinion and helps to reflect their real agenda.

- enhance the public reliability, objectivity and confidence on the data in the planning process. Also, PPGIS on the WEB, should enable on-line relative data, quick up-dating, and easy accessibility from everywhere.

- empower the public participation process, by incresing the number of participants, and by deepening the involment of the public in the planning process.

Keyem (2000) summarizes the topology of differences between GIS applications and PPGIS applications:

- Focus – in GIS it is technology; in PPGIS it is the people and technology

- Goal – in GIS it is to facilitate official policy-making; in PPGIS it is to empower communities

- Organizational structure – in GIS it is rigid, hierarchical and bureaucratic; in PPGIS it is flexible and open

- Details – in GIS they are specified by technologists and GIS experts; in PPGIS they are specified by users, focus groups

- Applications – in GIS they are led by independent specialists; in PPGIS they are specific, project-level activities

- Approach – in GIS it is top-down; in PPGIS it is bottom up

a.   Interactivity of PPGIS applications

By definition, interactivity is an overused term that basically means that the client or user is engaged to interact with the content or information. In the framework of a PPGIS application, interactivity refers to the user's interaction with the application using computer. Steinmann, Blaschke, Krek (2004) distinguish four stages of interactivity PPGIS applications:

- Information delivery – the stage where participation exists in an entirely passive mode and can be described as "the public right-to-know". On this stage, the delivery of on-line services to the user is in a one-way direction and has some sort of informative status for the users. The users can extract geographic information by using the PPGIS application and the data stored in the database.

- On-line discussion – the stage where the participation has a higher degree of interactivity which is achieved through the two-way exchange of information and participant's suggestions and comments. This stage includes the on-line discussion among participants, planning offices and planning authorities. The possibilities of drawing changes on the map are not included in this stage.

- Map-based discussion – the stage with PPGIS applications which provide the user with possibility of communication on the basis of an on-line map. The participants can (geo)graphically express suggestions for changes or can make comments on specific objects in the selected map. A PPGIS application and its specific tools enable the participants to send their personal map version together with annotations or additional material to the planning authorities. Participants send their suggestions to the people responsible for collecting this material, but they are not actively involved in the decision/making process through iterative processes or feedback-loops.

- Involvement in decision-making – during this stage, participants can actively contribute to the decision–making process and participate in the final planning processes and consequently in the decision making. The main difference to the previous stage, is the binding character of the citizen's decision.

b. GIS functionalities included in PPGIS applications

There are different GIS functionalities included in PPGIS applications which range from basic operations to more complex operations, such as 3D visualization or statistic calculation. Some GIS operations also allow for "personalized views" of data sets and enable the user to access information on specific topics. The standard GIS functionalities are usually needed for PPGIS applications:

- Topological overlay – GIS is traditionally organized in different layers and then they can be combined in a customized map. Topological overlay is an analysis for determining the spatial coincidence of geographic features presented in layers, which are integrated in a GIS.

- Informational retrieval – In a GIS, graphical data is related to the attribute data describing their characteristics. Attribute data can be a number describing the features of the object or a qualitative description of the object. The user can, with the simple mouse, click on a spatial element and retrieve attribute data about the selected object.

- Query – When performing a query, it implies that the user can retrieve the data according to the related terms, phrases or features chosen.

- Data selection tools – These functions enable the user to select spatial objects on the specified thematic data layer. They are usually used if the participant submits a comment related to the object or a question about the characteristics of the selected object.

- Zoom and Pan – GIS zooming bottoms usually show zoom in with an (a+) or zoom out (a-) symbol. The usage of these tools enables the users to change their view and the level of detail by clicking on a location or by dragging a box to define a particular extend. The pan functionality enables the user to move the map on the screen into the position they like, focusing on the part of the map that is of interest to them.

- Distance measure – This function enables the user, for e.g., to measure the distance between two locations or the total distance of the route, with multiple stops. The calculation is performed in the background and the result of the measurement is displayed on the map or underneath.

3   THE INFORMATION SOCIETY

The Internet knows no national borders. German cooperation with partners in Europe and the rest of the world is an essential part of the Federal Government's Internet strategy. Germany supports the implementation of the EU's eEuropa 2005 Action Plan for the creation of a European Information Society, as well as i2010, known as "European Information Society 2010".

c. Improving Public Participation

E-government and the provision of better services for public participation in Europe was one of the responses to the Lisbon Strategy. The eEurope 2005 Action Plan was launched at the Sevilla European Council in June 2002 and signed by the Council of Ministers in the eEuropa Resolution of January 2003. The aim of the eEurope iniative was to use the power of ICT in order that it may provide a favourable environment for private investment, job creation, productivity and growth, while modernizing public services and giving all citizens the opportunity to participate in the Global Information Society. On June 1, 2005, the European Commission announced, i2010 – also known as "European Information Society 2010"- with the aim to promote growth and jobs in the European Information Society and media industries. The new five-year strategy, which is meant to succeed the previous eEurope 2005 initiative, provides a comprehensive framework for the development of the digital economy. In this respect, EU policy instruments such as regulatory initiatives, research, and partnerships will play a key role in the implementation of the new strategy. Among other things, the Commission will, in particular, promote high-speed, secure, broadband networks to support the delivery of rich and diverse digital content in Europe.

According to the European Commission, the i2010 initiative will contribute to the implementation of three policy priorities:

- **Create an open and competitive single market for the information society and media services within the EU**. To this end, the Commission will propose the following initiatives: an efficient spectrum management policy in Europe (2005); a modernization of the rules on audiovisual media services (end 2005); an updating of the regulatory framework for electronic communications (2006); a strategy for a secure information society (2006); and a comprehensive approach for effective and interoperable digital rights management (2006/2007).

- **Increase EU investment in research on information and communication technologies (ICT) by 80%**. Europe currently lags behind in ICT research, investing only EUR 80 per head as compared to EUR 350 in Japan and EUR 400 in the US. Among other initiatives, i2010 will promote trans-European demonstrator projects to test out promising research results, and take measures to better integrate small and medium-sized enterprises in EU research projects.

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- **Promote an inclusive European information society**. The Commission will propose an **Action Plan on e-Government for citizen-centered services (2006)**; three "quality of life" ICT flagship initiatives in the areas of aging, intelligent vehicles, and multilingual digital libraries (2007); and a number of actions to overcome the geographic and social digital divide, culminating in a European Initiative on e-Inclusion (2008).

Concerning e-government, the European Commission's i2010 Communication notes that making public services "better, more accessible and more cost-effective" is a "key challenge". In spite of considerable advances achieved in the roll-out of electronic public services, the Communication stresses that "much remains to be done to demonstrate economic impact and social acceptance" of e-government. In addition, there is still a need to develop "common interfaces, portability of identity from one system to another and authentication systems", the Communication says, as well as for "new practices, new skills and different rules" (European Commission, 2005).

4   THE CASE STUDY: THE PROJECT OF THE CITY OF BERLIN

Senate Department of Urban Development in Berlin developed online PPGIS applications for urban management. Public participation on all levels on the planning process is possible and available on the Internet, not only on the information level, but also on the active concrete participation level. The preparatory use plan (Flächennutzungsplan) and the legally binding land use plan (Bebauungsplan) are present on the Internet with the help of GIS and giving an opportunity for active public participation. The objective of the project is to promote the sustainable urban management.

d.   PPGIS on the Internet (Bebauungsplan I-216 Postblock)

The system of the project Bebauungsplan I-216 Postblock was built on a website with spatial data (digital map data) and the GIS web system on the Internet. The site enables the public to participate in the process, anywhere and anytime. It enables viewing extensive amounts of GIS-based data from surveys, as well as, statistical analysis on the internet. The site contains presentation of various subjects related to the legally binding land use plan, and the public is able to respond and comment to the planning team. The site is http://www.stadtentwicklung.berlin.de/planen/b-planverfahren/de/oeffauslegung/i-216/index.shtml , Figure 1 presents the print screen of the PPGIS on the Internet.
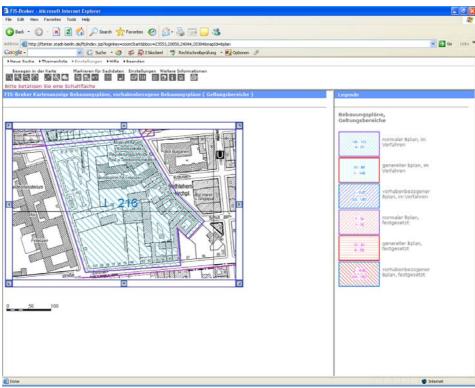

Figure1: PPGIS on tne Internet „Bebauungsplan I-216 Postblock"

The PPGIS application for the project "Bebauungsplan I-216 Postblock" in respect to different forms of on-line participation and on the degree of interactivity, can be defined as 'on-line discussion.' The participant has a high degree of interactivity which is achieved through the two-way exchange of information and participant's suggestions and comments. The on-line discussion among participants, planning offices, and planning authorities is included. Besides the standard GIS functionalities like- topological overlay, informational retrieval, query, data selection, zoom and pan- PPGIS's project "Bebauungsplan I-216 Postblock" gives an opportunity to have direct contact with the planning office via e-mail or phone.

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5   CONCLUSION

The GIS on the Internet in Germany is technically mature and widely used at all levels of administration and planning for urban management. The German Information Society has developed impressively in the last few years. The project of the Senate Department of Urban Development in Berlin is one example of how the GIS on the Internet is a sustainable solution for the information society with the characteristics of on-line discussion to improve government decision-making and to increase efficiency, and also the role of citizens in decision-making.

6   REFERENCES

BANGER, Samir: Integrating GIS with web for public participation , on line available at:
> http://www.gisdevelopment.net/technology/gis/techgi0058pf.htm

CRAIG,William; HARRIS,Trevor; WEINER Daniel (2002): **Community Participation and Geographic Information Systems,** Taylor & Francis
> Group

European Commission unveils new Information Society strategy, on line available at:
> http://europa.eu.int/idabc/en/document/4340/330

GUDES, Ori; STERN, Eliahu; SVORAY, Tal: Geographical Information Systems on the Web for Public Participation in Planning, on line available
> at:
> www.hig.se/geoinformatics/proceedings/files/p459.pdf

HILTY Lorenz; RUDDY Thomas: Towards a Sustainable Information Society, on line available at:
> http://www.empa.ch/plugin/template/empa/*/32695/---/l=2

Information Society Germany 2006 (pdf), on line available at:
> http://www.kompetenznetze.de/Redaktion/Zentralredaktion/Literatur/medien/en/info__information__society-2006,property=pdf.pdf

KINGSTON, Richard (2005): Urban Regeneration in the Intelligent City, on line available at:
> www.ppgis.man.ac.uk/papers/ kingston_paper_CUPUM_2005.pdf

Senatsverwaltung für Stadtentwicklung, on line available at:
> http://www.stadtentwicklung.berlin.de/

STEINMANN, Renate; BLASCHKE, Thomas; KREK, Alenka (2004): Can Online Map-Based Applications
> Improve Citizen Participation?, on line available at:
> www.iapad.org/publications/ppgis/092804_bozen_last.pdf

STEINMANN, Renate; KREK, Alenka: Stärken und Schwächen von Public Participatory GIS (2005),
> on line available at:
> http://mmp-tk1.kosnet.com/corp/archiv/papers/2005/CORP2005_KREK_STEINMANN.pdf

VĂLIMĂKI, Jari (2002): The Information Society and the Use of Sustainable Development Indicators, on line available at:
> www.internetix.fi/futuralehti/2002_2/02_2_kansi.pdf

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