Possibilities of Web-based softGIS Method in Revealing Residents Evaluation Knowledge of the Living Environment

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Abstract

Development of more interactive and innovative methods is needed in the framework of collaborative planning and decision making so that urban planning as a process could operate more online and target two-way communication. This is not an easy goal to achieve, because there are still many weaknesses in planning process that need to be studied. One notably weakness is the use of the residents knowledge of their living environment and the integration of it to planning process. New localised data that the residents could produce by evaluating their living physical environment is needed concerning the quality of an environment as perceived by residents. This kind of knowledge is difficult to find out, collect, interpret and share. Through Information and Communication Technology (ICT) and Geographical Information System (GIS) new possibilities emerge to develop methods, which help to gather this kind of database, to utilize it and analyze. The evaluation knowledge can form a special database of geographical information (GI). A web-based GIS method called softGIS is an example of a tool for residents to produce and evaluate the perceived quality factors of the environment. This method enlarges our view of the Public Participation Geographic Information system (PPGIS) and specially Web-based PPGIS, which challenges the traditional top-down practices towards more bottom-up thinking. The paper studies softGIS method in the framework of PPGIS and considers the nature of the evaluation knowledge produced by residents and the possibilities to analyze it and utilize in planning practises.

Introduction

Planning as a whole is going towards more participatory direction. To develop it further we need new methods to lighten it up for both planners and residents. At the moment, for example in Finland, the planning process is quite heavy and laborious for both the planner and for the resident. Basically because planners have to arrange a lot of meetings, which are usually held in the evening and this makes it harder to join after workday. This kind of system serves more those residents who are familiar with the system and do not hesitate to express their opinion. There are a lot of residents who can not be reached in current planning process. Planning as a whole should be developed to more collaborative and interactive direction, so that the residents could give information about their living environments generally without commitment to a particular planning process. Planners could use this kind of

evaluation knowledge of the environment produced by residents when they need it and at the different levels of spatial planning and decision making.

The evaluation knowledge produced by residents gives us the information about the quality of their living environment. The nature of this knowledge is perceived and individual. The quality of the living environment can be approached from two directions. Another one is based on the perceived knowledge, and the other one is more objective, based on the institutional and official measures. There have been various studies about the quality of life regards to the quality of an environment as perceived by its inhabitants, both in Finland (Nevalainen et al., 1990; Kyttä et al. 2000) and abroad (Bonnes & Bonaiuto, 1995; Skjaeveland & Gärling, 1997). These studies are carried out under various headings: residents ' satisfaction, place attachment and preferences. Common to all these studies is the lack of attaching the perceived quality factors to physical environment by residents.

Information and Communication Technology (ICT) has made it possible to study differently social aspects. By combining ICTs with the Geographical Information System (GIS) it is possible to produce more innovative and interactive methods to study the experienced quality factors of the environment, but also to search relevant methods to combine this kind of information to planning processes. With the help of Public Participation Geographic Information system (PPGIS) based on the Internet we can combine these three aspects, ICT, GIS, and people fundamentally.

This article is organized into four parts. In the first part we go theoretically through the nature of the perceived quality factors. In section two we tell more about public participation GIS. In section three we present the Web-based query method called softGIS, which is developed to collect locally the perceived quality factors of the residents, attached to their living environment. With this case study, which was carried out in Järvenpää in Finland we clarify the softGIS-method. After that we introduce the respondents and in the results part we look more closely the nature of the information that is possible to achieve with softGIS and what kind of possibilities it offers in the framework of participatory spatial planning and decision making process.

The Quality of living environment and the perceived quality factors

Quality of living environment

Quality of living environment has been applied to a vast number of fields for example urban and regional planning, health promotion, disability, social indicators research, economics, and mental health research. Central to this developing interest in quality of life is research concerning the relationship between people and their everyday life environment (Garb et al., 2004). Still, there is not developed a generally accepted model or measures of quality of life. As Mitchel (2001) concluded: "there is no agreement yet on quality of life, in terminology or in construction of methods or the criteria that comprise quality of life". In general there is, however, a need for integrated concepts of the quality of life and ways to measure it. Such a multidisciplinary conceptual framework of physical, social and other aspects of the everyday life would make possible more theory based choice of indicators, and would enable better assessment of the implications of spatial and planning processes, urban policies, etc. (Garb et al., 2004).

The concept of quality of life is a container concept that integrates many different dimensions, of which economic, social/cultural and physical aspects are in the core. Geographical studies of the socio-spatial variations about the quality of life at different geographic scales, ranging from global to local have resulted in valuable insights into differential incidence of deprivation and other characteristics of the population within cities and metropolitan areas. Parallel to the attempts to use official characteristics for the analysis of quality of life, so called experiential based indicators have gained large attention. Experiential or perceived quality of life is referred to as individually perceived well-being, livability, health, etc. Its precise meaning depend on the place, time and purpose of the assessment (Pacione, 2003).

The perceived quality factors

Studies about the quality of an everyday living environment as perceived by its inhabitants have produced a considerable number of criteria, which help to determine either the perceived environmental quality, or the general criteria for a human friendly environment (Kyttä, 2003).

Existing studies on perceived environmental quality share an essential flaw: in the research carried out in this field, the perceptions have not been attached to physical environments. Resent studies can not be seen as examples of transactional human environment studies, which emphasize the mutual activity in the interaction between people and their environments (Altman & Rogoff, 1987). In transactional research the person-environment relationship is seen as a dynamic, interactive system, the components of which should not be taken out of context. This transactional approach stresses the active role of both parties in this interactive relationship. People are seen as active agents and are perceptive in their environments: they can influence their environments and change them. Also the environment plays an active role with regards to human beings on all different levels. The material, social and cultural environments all influence people by providing prerequisites for certain functions or by facilitating social encounters in the environment. In this system neither of the components, environment or humankind, hold a deterministic role, but rather a probabilistic one (Kyttä, 2003).

The study of the quality of living environments in close connection with the physical environment requires concepts that do not create dualism between man and his environment. The notion of affordances that is used in ecological perceptual psychology is a worthy candidate for such a concept. The term 'affordances' has traditionally referred to the perceived opportunities and restrictions concerning a person's actions in a given environment (Gibson, 1979). Objects and other things are not perceived as such, but rather as functionally meaningful units, which make the perception of functional meaning primary. This concept can be expanded to include also the emotional, social and socio-cultural opportunities and restrictions that an environment offers (Kyttä, 2003).

We don't know enough about the '*quality factors*' of the inhabitants, what they are and how reachable they are. Urban environment can be seen as a functional system, consisting of a multitude of individual '*quality networks*,' where each inhabitant can create her/his own quality network according to her/his preferences, abilities,

personal projects, mobility possibilities, and restrictions. The quality network of the perceived environment is defined by the actualization of affordances on one hand (perception, utilization or shaping) and by the availability of affordances on the other (Kyttä, 2004a). These two dimensions determine the so called individual eco-social niche in which a person lives (Kyttä, 2004b).

To collect this kind of knowledge we need special methods, which offer the residents the possibility to evaluate their everyday living environment. In addition to collect systematically the evaluation knowledge of the environment there is a need to consider the possibilities to link it more closely to planning practises and decision making.

Participation and Geographic Information System (GIS)

Evaluation and Public Participation

In democratic societies there is a general belief that individuals have the right to be informed and consulted (Sewell and Coppock, 1977). This right is a very simple one but in the field of planning it seems to be hard to implement. Consultation, communication and participation have been keywords in planning for over 40 years and still the current level of public participation in the planning process is a cause of concern (Hudson-smith, 2002?). Hall (1995) has made a question against planning process: "How can the planning process truly aim to improve the quality of life for the whole of society if society is only given a limited say in the process? ".

Quite often it seems to be also difficult to inspire people to participate and those who participate actively are those who participate anyway. Usually people are participating when they are concerned about a specific project (not in my backyard) (Roche, 2003) but generally speaking it is difficult to get people to participate. One view is that we need more innovative and interactive methods so that people could find the proper one for themselves. For example, common practice in traditional methods of public participation involves the public, or at least those with a particular interest, in attending planning meetings. These inequalities of access, both to information and the meetings themselves, severely limit the level of empowerment gained through participation in planning meetings (Carver, 2001).

Arnstein (1969) developed public participation ladder to describe the transfer of political power from traditional power-holders having power over citizens, and to citizens having the power to achieve their own requirements. In this ladder on the base there is no possibility to participate and higher rungs represent increased levels of participation as well as greater public empowerment in the decision making process. There are several researchers who have adapted this theory to their own consideration and also in the field of PPGIS there are several researchers who have made their own ladder to match better the needs in the digital era.

In participation it is important that the residents get information, get involved in planning process or decision making but there should also be a systematic way to gather information that the residents produce from their everyday living environment. This kind of data that the residents produce by evaluating their environment should form crucial part of participation. In addition to that there is a need to collect this kind of information continuously.

The nature of planning and development can be seen as a spiral (as in Figure 1.) (Horelli, 2000; 2001). In this model, planning is seen as a process linked to economical, organizational, cultural, social, and environmental context. In this process we can separate following phases, which are closely linked to each other: initiation, planning and design, implementation, evaluation and research, and maintenance. Phases do not follow one another in tight order and there are several phases that could operate simultaneously. Important in this model is the temporal dimension, which emphasizes the importance to see planning and developments as a continuous process.

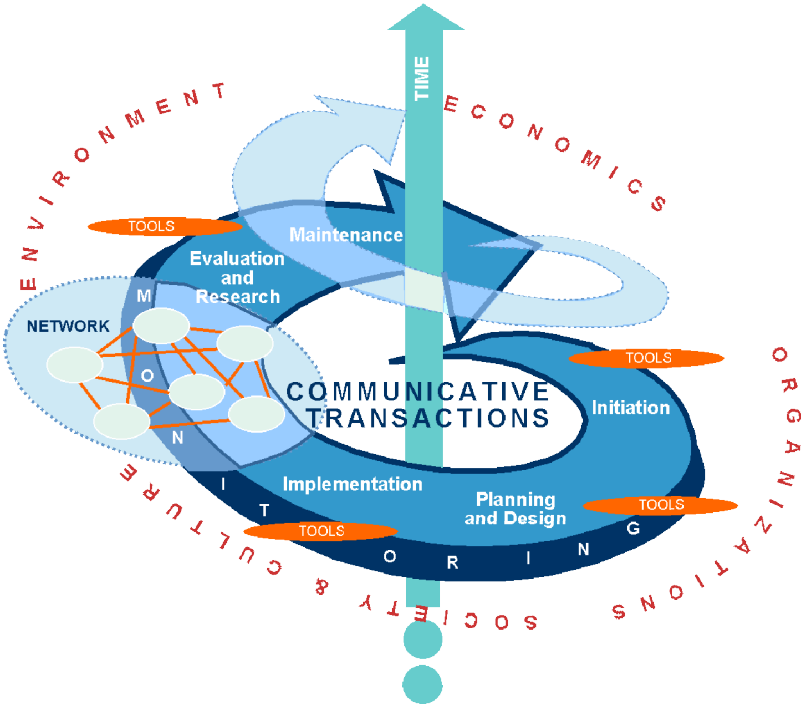

Figure 1. Spiral of planning and development (Horelli, 2000; 2001)

Public Participation Geographic Information System (PPGIS)

During the past decade also community groups and non-governmental organizations have started to take advantage of Geographic Information System (GIS) in addition to the authorities. On their agenda is an attempt to enlarge the access to geographic information and the need to develop participatory approaches through GIS-based spatial analysis and visualizations (Ghose and Elwood, 2003). In these research and development projects GIS is increasingly used as a platform that connects different actors in community participation process. Planning professionals, decision makers, researchers, and citizen are increasingly interested in how GIS can be part of community participation in the context of neighborhood revitalization, urban planning and decision making (Weiner et al., 2001).

Definition of Public Participation Geographic Information System (PPGIS) is not clearly defined and there is a lot of different terms used that link together participation and GIS, for example PGIS, PPGIS, CIGIS, PGIST or BUGIS[1] (Schlossberg and Shuford, 2005; Nyerges, 2005; Tulloch 2003). PPGIS has a rich and diverse conceptual history based on several intellectual traditions including political economy and critical theory, participatory planning and community development, democracy and social justice, anthropology and ethnography, political ecology, and philosophies of science. PPGIS is a kind of broad umbrella with multiple meanings and a global reach (Weiner et al. 2001). At the moment there are a wide range of practical examples of PPGIS in function but the theory behind these has not reached the same level. To develop PPGIS further there is a need to clarify the theoretical background, and systematically evaluate existing projects and applications (Laituri, 2003).

As Talen (2000) argues GIS can also be used in a bottom-up way, which lets residents characterize their local environment. With this BUGIS-method residents can construct their cognitive maps and represent their everyday living environment. This kind of focus group –based method is one noteworthy effort to break down the conventional use of GIS as a tool of objective science. It is also possible to see the ‘hard’ and ‘soft’ uses of GIS as complementary ways to utilize the many possibilities that GIS offers.

BUGIS-method can reach only very limited number of inhabitants and it does not fully use the possibilities of information technology. Internet-based GIS-applications offer excellent possibilities to increase the access to the GIS-data, reach large number of inhabitants with minimum costs and develop user-friendly interfaces that can be easily updated frequently (Kraak et al., 2001). Internet is seen as an interesting way to present and spread spatial data and allow inhabitants express their views in a relatively anonymous way (Carver, 2001). Due to this Web-based mapping systems can play a significant role in future PPGIS projects (Weiner et al., 2001).

We can not develop an effective participatory decision support solution by putting GIS on the Internet alone, mainly because it is a complex system and the data difficult to interpret. Intelligent interfaces to specific problem areas are perhaps needed to allow effective interaction between individuals and the computer (Carver, 2001). One ongoing example is research activity called the Participatory GIS for Transportation (PGIST) where the principal research question is: What Internet platform designs and capabilities, particularly including GIS technology, can improve public participation in analytic-deliberative transportation decision making within large groups? (Nyerges, 2005) It is obvious that most of the current PPGIS projects do not utilize GIS functionality for advanced spatial analysis. In Web-based PPGIS applications the use of multimedia capabilities form the core of the application with the GIS providing the digital maps (Weiner et al., 2001).

Currently, the contents of Web-based PPGIS in practice are still quite one-sided and it functions only in one-way direction. Line of action and the implementation of PPGIS are built mainly to support top-down thinking and the interaction, if there is some, is mainly verbal. Although with the help of PPGIS there is a possibility to

[1] Participatory GIS for Transportation (PGIST), Participatory GIS (PGIS), Community Integrated GIS (CIGIS), Bottom-Up GIS (BUGIS)

change the alternative view of GIS as a top-down, rationalist, and technical tool towards a more user friendly collection of techniques that are sensitive to the everyday knowledge of the residents. There is a danger that otherwise GIS is going to rely only on "fact" – based planning of the rational tradition (Talen, 2000). It is not clear how web-based PPGIS should be built to face the needs and offer information for both sides: residents and planners / experts. Fact is that local people know their local area better than anyone else and with the help of different tools we can help the resident to evaluate and produce detailed insights into local phenomena that are not normally available via ordinary GI databases.

The more citizens are involved in the construction process of GI (e.g. useful for a specific decision-making problem regarding planning), the more they can participate in the decision making (Roche, 2003). The community itself needs to be regarded as a form of database, unconventional in the IT sense, but more understandable from a social science perspective.

From this point of view there is a need to strengthen the possibilities for residents and other users to affect to planning processes by developing innovative and interactive methods in the framework of Web-based PPGIS. One way to approach this is to see first of all planning as a continuous process which should be developed towards more open and online direction. Evaluation knowledge of the living environment attached to places gives to researchers the needed information and by analyzing this knowledge it serves also planners and other experts in the field. This GI which is produced by the PPGIS method can be seen as a special database or a container where the perceived information of the living environment can be stored.

Method softGIS

SoftGIS' preliminary version was developed in a project that is financed in the Environmental Cluster Research Programme carried out by Finland's Ministry of the Environment. "The effiency of the integration of community structures and the environmental quality – Policies, indicators, and people's daily rutines". This project is a joint endeavour between the Centre for Urban and Regional Studies and the Finnish Centre of Environment.

The objective was to create a so called 'soft-GIS' method that could ultimately become a special layer of the geographic information system by producing perceived GI database of the living environment by residents. The softGIS method was designed to be easy to use and suitable for all age groups from school children to the elderly. It has a tube-structure and it proceeds step by step, which means that each visitor of the page follows the same route through the application if they fill the whole web questionnaire (see Table 1). Special attention was paid to the quality of the maps used in the application. Aerial photos in scale 1:4000 were used and the orientation was aided by highlighting roads and landmarks (as in Figure 2). Due to the technical restrictions, only spot like information was possible to mark on the map, not routes or areas. Later we will try to overcome this restriction.

The technical development of the JavaScript/HTML-based application is realized by a group of media technology students in the Espoo-Vantaa Institute of Technology[2]. The English version of the application is available in www.softgis.fi.

Table 1. The structure of the softGIS application.

1. Introduction	General information about the study
2. Background information	Age, Gender, Family type, Number of Children, Occupation, District, Housing type, House type, Size of the dwelling, Number of rooms, Time of dwelling, Childhood environment, Situation of filling the questionnaire
3. Identification	(Voluntary) Alias, Password
4. Quality factors	• general introduction • name 3 positive quality factors • name 3 negative quality factors
4. Introduction to the 'map tool'	• mark the location of home • mark the location of work/study place

5. Positive and negative quality factors revisited	In this phase the application 'remembers' the already written quality factors
	• actualization, importance and control of the quality factor
	• the location of the quality factor
	• for each location a mini questionnaire appears:
	  • place/ route/ area?
	  • description of the setting
	  • activities
	  • actualization
	  • importance
	  • how often visit
	  • the means of travel
	  • time spent on travelling
	  • obstacles of access

6. The questions concerning the community	The pulling, pushing and binding factors
7. The location of basic services	• mark the location of daycare and schools (only asked if children in

[2] Project leader: Jarno Pitkänen

	the family) • mark the location of the daily grocery store
8. The perceived well-being	GHQ-12 (General Health Questionnaire)
9. The ending	• lottery • free word

The first version of the softGIS method was used in the city of Järvenpää, in Finland, between 10/2004-12/2004. The questionnaire was available in the front page of the homepages of the city of Järvenpää. The web survey was advertised in two local newspapers and in local libraries.

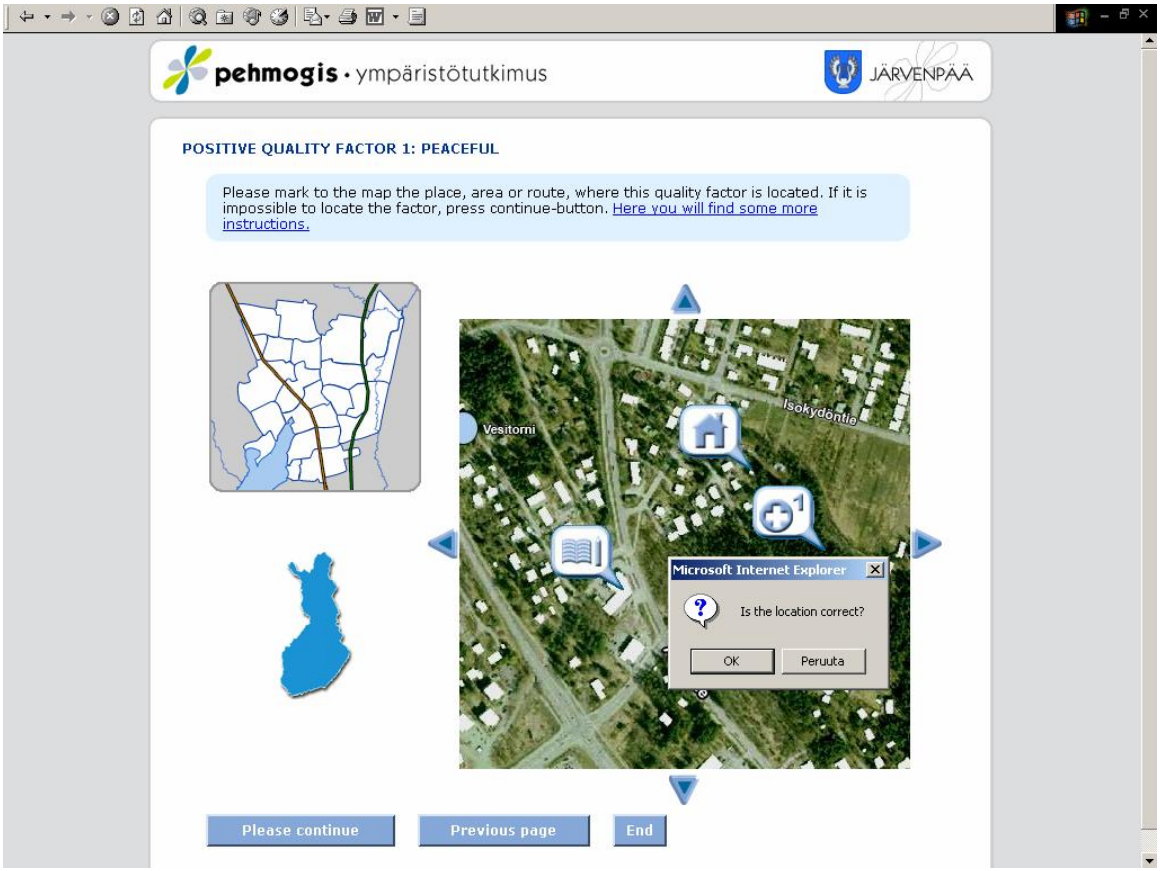

Figure 2. The softGIS application.

Respondents

During the *three* months 427 inhabitants filled the internet questionnaire. The age of the respondents varied between 13 and 73 years. The sample was dominated by young adults (25 – 29 years) and middle age persons between 40 – 45 years (as in Figure 3). Most of the respondents (64 %) were women and the majority (56 %) had children. Most of the subjects, 70 %, lived in an owned apartment or house, most often in single family house (32 %) or in detached house (32 %). Clerical employees and experts were the dominant socioeconomic group of the respondents (43 %).

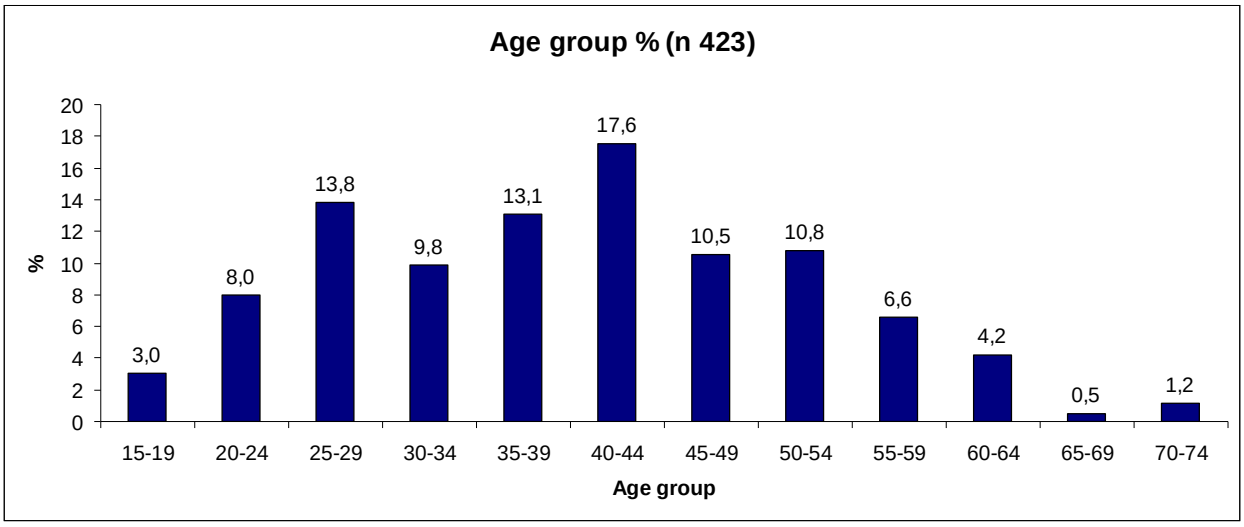

Figure 3. The age groups of the respondents.

The majority of subjects filled the web questionnaire at home (47 %). 34 % were at work, 4 % in public places and 6 % in other situations. When the respondents were able to send comments to the researchers at the end of the application, the majority of the comments were positive feedback about the research and the application (28 %).

> "It´s really good that this kind of questionnaires exist. The influence of living environment to the quality of life must be essential. Thank you! "

20 % of the comments were general observations concerning the city of Järvenpää. 24 % reported technical problems using the application. The complaints concerned most often about the use of the map tool, which was found to be difficult to use or the map hard to orientate. Another type of negative comments (10 %) was the criticism towards the use of QHG-scale at the end of the questionnaire. Many subjects were suspicious about the data security concerning this part of the application or wondered how these questions related to the themes of the rest of the

questionnaire. For this reason, information concerning data security was added in the application already during the data collection.

> "I am suspicious of the data security. Where is the data saved? Are they saved in the original form or as coded? Who has a right to look at the data after the study is done? "
> "The map tool was somewhat hard to understand. I wanted to mark whole areas instead of individual places. Open questions, or questions concerning districts could work better. "

About 40 % of the respondents did not fill the whole web survey. During the first four phases of the application we lost a steady number of respondents. Those who did reach the 5. phase did fulfil the task (as in Figure 4.)

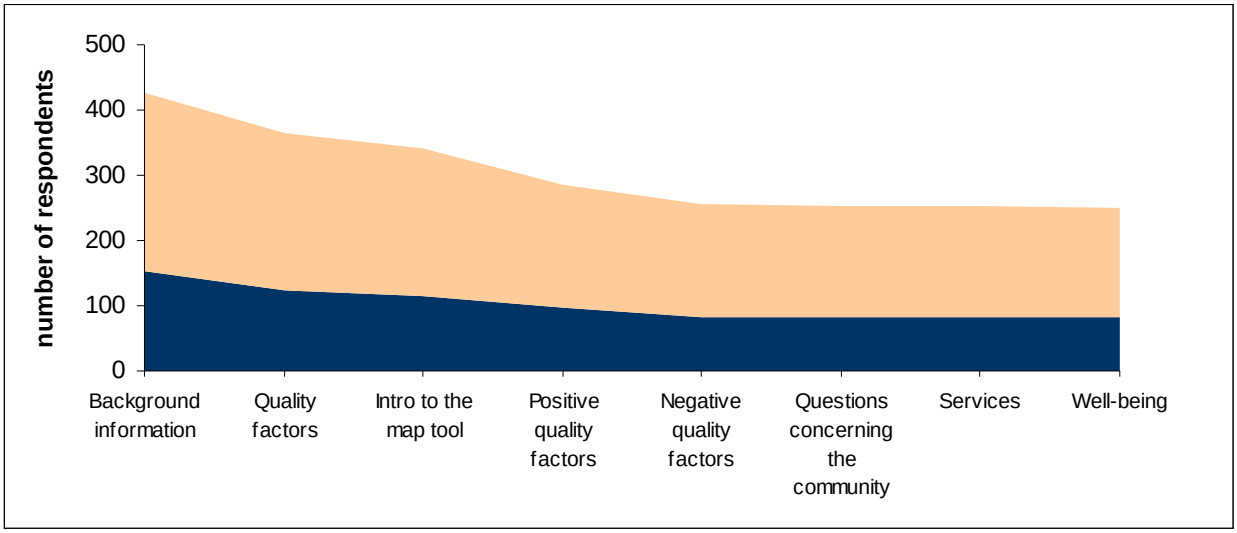

Figure 4. The number of respondents according to the progress of the application.

Though we had doubts that we could not achieve enough people from different age groups or with different incomes we were surprised of the variety of the respondents. Our doubt based to the fact that our survey was open only for three months and it was advertised only namely.

Results

In results part we are going through issues concerning the nature of the information of the perceived quality factors of the living environment. We are not going through the actual results of the quality factors though we are presenting more the nature of the information that we are able to produce with this kind of method. In addition to the possibilities that we have to analyze this kind of data we try to open up our experiences of the softGIS method. To develop softGIS further we detail more closely the possibilities that softGIS offers in the field of PPGIS and how it can be utilized in the field of planning and design practices.

With current web-based softGIS method we have the possibility to study more closely the perceived quality factors of the environment as evaluated by the residents. With help of this method we are able to produce a special GI database, which provides us essential individual knowledge of the living environment. This addition to the formal geographical information of environment opens a new way to analyze and visualize the perceived quality factors of the living environment attached to places.

Data of the perceived quality factors of the residents is quite special to analyze and to visualize because of the nature of the data. At general level following visualization can be used mainly as a private exploratory method at the initial stages of data investigation. But when we mean to present it to a wider audience and communicate more about the results we need to analyze it forward as well as visualize it in more advanced ways.

In Figure 5. is presented the georeferenced data of the residents positive and negative quality factors produced by softGIS method. The picture on the left side presents the positive quality factors and on the right side are the negative ones. The database is constructed by point data of the quality factors as well as mapped information about the homes, grocery stores, workplaces, daycare, and schools. This general visualization of the data provides possibilities to analyze how the quality factors are distributed and particular quality factors for example peacefulness are located. From this basic visualization we can already see how the negative quality factors are more clustered than the positive ones, which spread more to the region of the City of Järvenpää as a whole.

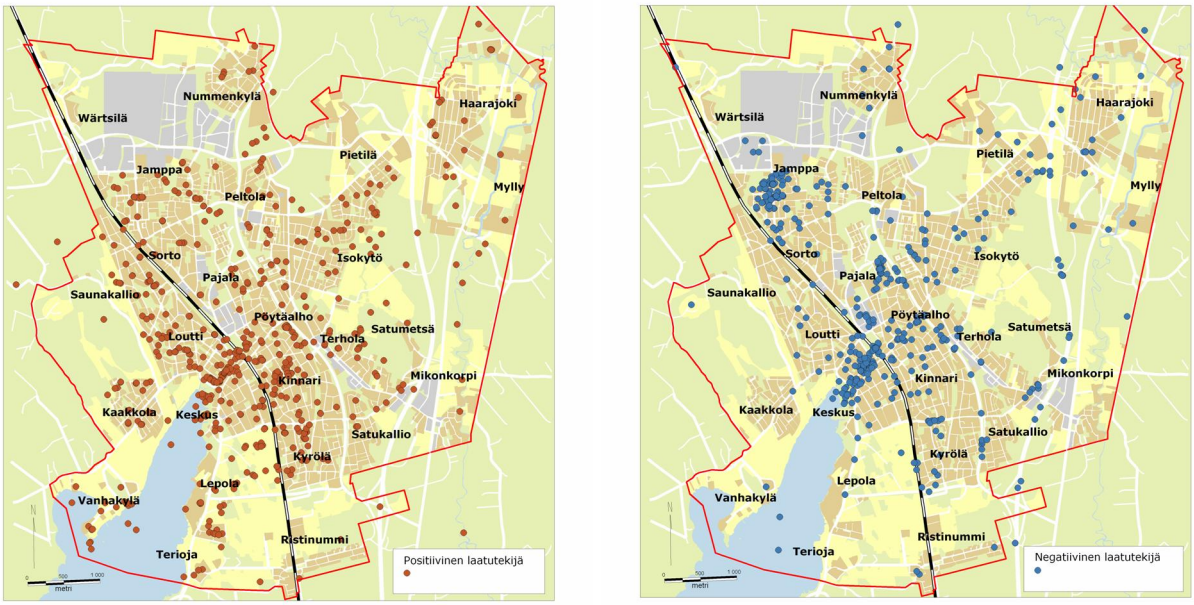

Figure 5. The nature of the georeferenced data of the positive and the negative quality factors produced by the respondents

To investigate the links between georeferenced data and background data with the traditional statistical analyzing techniques we have created special variables with MapInfo-techniques, which we have then analysed further in SPSS-program. One basic variable is the distance between the quality factors and respondents homes. With this factor we can study more closely the accessibility of the quality factors. Other variables delineate specifically the physical density around each respondents home. With the density we have measured the neighborhood density as well as the individual density of the respondents. The density measures used are houses per hectare, population per hectare, floor square metre per hectare and the green space per hectare. To count this kind of individual density of the respondents we have used the basic GIS techniques which make it possible to create a buffer individually around each respondents home (as in Figure 6.).

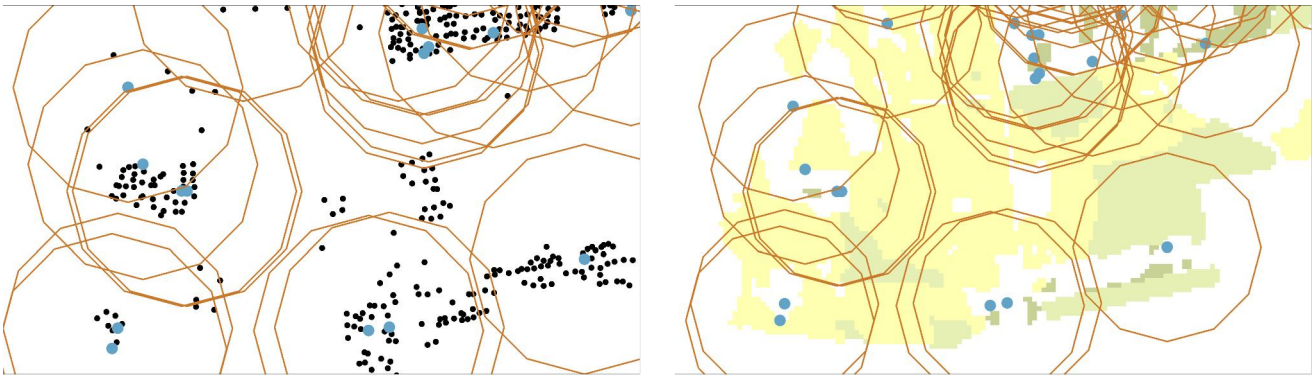

Figure 6. Visualization of the buffering techniques

The graphical representation of point data can be used to present information about other data dimensions by plotting them as symbols that may vary in size, shape colors, hue or saturation. If the data are multidimensional, this technique can not only improve the clarity of the graphical display but also portray information about the data in ways that may induce viewers to discover patterns of trends. This kind of thematic map provides a way to visualize the data, but because of the large number of data points (quality factors) it is difficult to identify a coherent pattern (visualizing spatial structure in urban data). Because of this it is useful to treat discrete objects as continuous, which allows transformation of point data to continuous surface. There are several methods to do this for sampled data. We have used a spatial interpolator and from these the inverse-distance weighting. With this we can spread the data out from each point over the surrounding area (Lloyd et al., XXXX). This is reasonable because we have asked in the questionnaire the nature of the data. From point, line or polygon the respondents choose mainly the polygon. Altogether there were 1141 localized quality factors from which it was characterized as point 34 %, polygon (area) 70 % and line 15 %. It is quite natural that for example when mapping safety of the neighborhood you mean an area and not only one specific point. Due to this it is useful to treat the point data when visualizing it as a continuous surface.

In Figure 7. is presented one thematic map based on the interpolation technique. In this map we have presented the relation between the negative and positive quality factors based on respondents home. The map tells us the spatial variety of the

residential areas based on the realization of the quality factors of each respondent. Red colour marks those areas where the quality factors are more often realized.

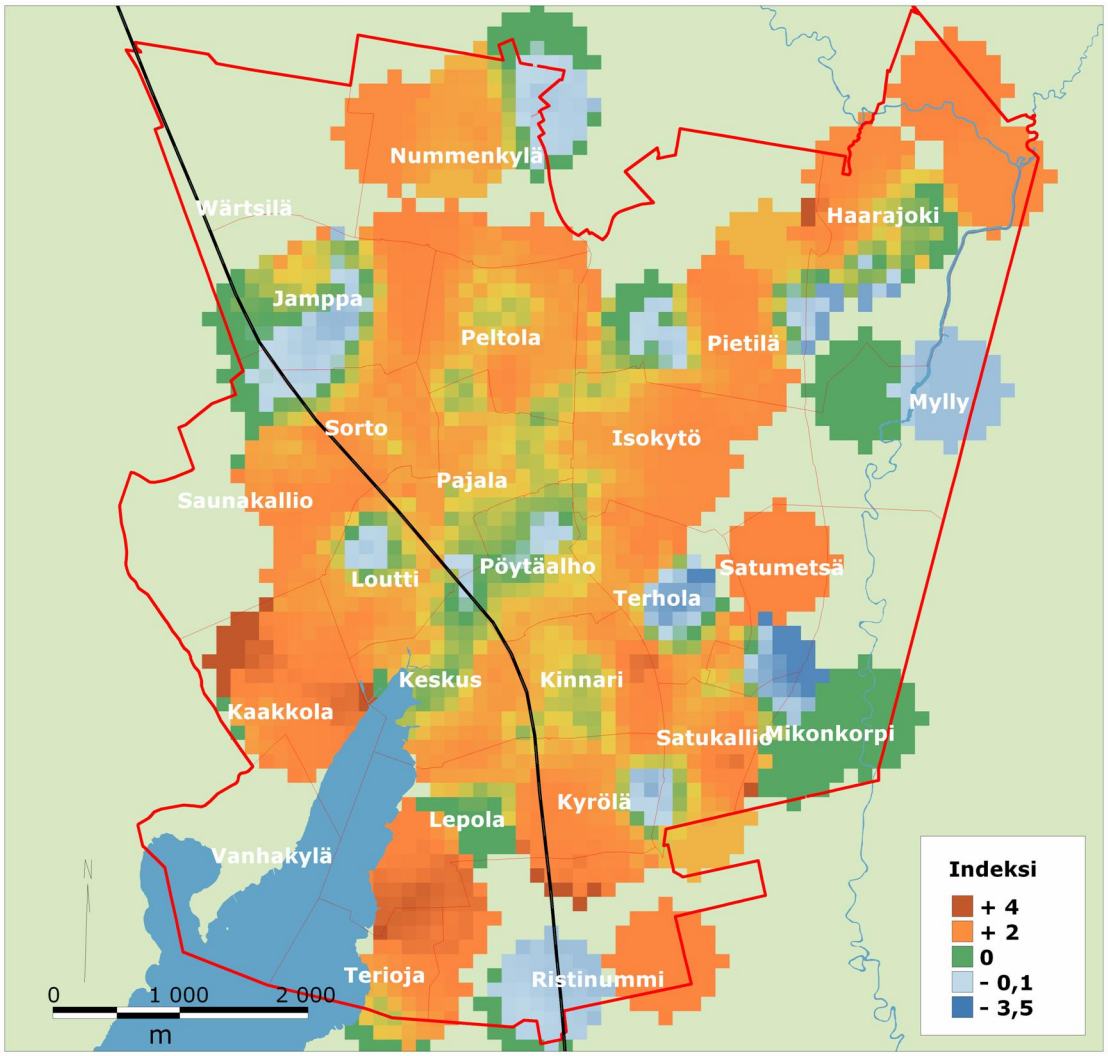

Figure 7. Realization of the respondents quality factors

By combining statistical analysis and the geographical information analysis we are able to do a wide range of different kinds of analysis, which were not possible without another. We have noticed that there is a great need to develop further the analyzing techniques. In the future there is also a need to develop analyzing techniques that could operate on-line in the Internet.

What could the softGIS offer to planning practices

With the web-based softGIS method we are able to gather evaluation knowledge of residents perceived positive and negative quality factors of the living environment. Due to the operations in the Internet we are able with the help of geographical information techniques gather simultaneously georeferenced information. This method is developed in the first place to serve research about the perceived quality factors of the residents as attached to physical place. This method could form a crucial part of planning practices, but first we need to study the nature of the information collected and the functionality and the practicality of the method. This study is first broader research which focuses concretely on the located quality factors of the residents. In the future there is a possibility to use these research results in planning practices. But there is still a lot to do on the research field as well. For example there is a need to look more closely the temporal aspects of the perceived quality. This could lead us to understand more closely how changes in the urban structure are related to the perceived quality of the living environment.

As in Figure 8. we have visualized the current situation from both experts and residents point of view in the field of PPGIS. We have tried to clarify more closely what sofGIS method could offer to current PPGIS discussion. At the planners side the contribution of the PPGIS is based on the formal GI data (so called hard data). The focus has been mainly in development of access to the formal data so that the residents could receive information easier. In addition to that there are examples where interaction is realized mainly verbally. Development of this kind of systems is quite easy to planners because they are already familiar with the system and information. They have the GIS-packages and the know-how to deal with it. The practices that have been developed in the field of web-based PPGIS are few and those remind mainly the available GIS packages. The only difference is that these function in Internet. From residents point of view these systems offer a possibility to get used to different kind of GI data and in some versions there are also a possibility to make some basic queries and use the chat for interaction. As mentioned earlier there is a need to evaluate the present projects to develop the theoretical backgrounds of PPGIS further.

From the residents point of view the situation is quite different because they are depending mainly on the available systems. Though there are some 'grassroot' organizations, which have developed advanced systems in the field of PPGIS for example to support decision making. Still there are not practices that focus on collecting the perceived data from the residents. In Figure 1 we have visualized the situation from the resident's point of view. There is a need to utilize more the information that residents have from their living environment. This perceived data is very unique and for that reason difficult to gather systematically. By building the bridges between these to sides we hope to develop a system that brings the two sides together and utilizes more so called soft and hard data. Now we have some experience of the localized 'soft' data and we can see ourselves as hanging on the bridge but we need to develop our method further to more sophisticated direction.

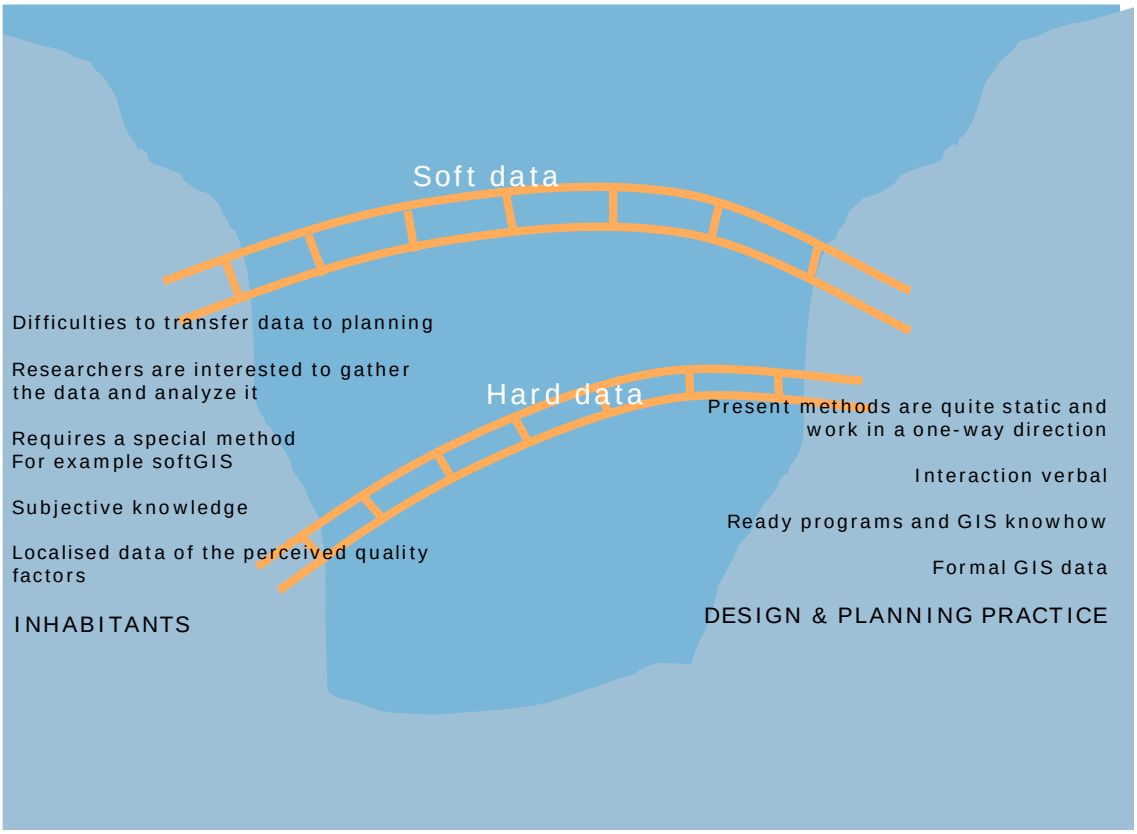

Figure 8. The current systems in the field of PPGIS in the Web-environment

Discussion

Many kind of web-based methods for the participation in urban planning and for the evaluation of existing environments already are developed that interest researchers and practitioners around the world. Still, few applications with true two-way interaction have been realised. In our on-going multidisciplinary research project OPUS – Urban planning and everyday life: a learning process, we will develop the softGIS method further as well as other types of web-based tools for participatory planning.

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References

Altman, I. & Rogoff, B. (1987) World views in psychology: trait, transactional, organismic and transactional perspectives. In Stokols, D. & Altman, I. (ed.): *Handbook of environmental psychology*. Vol 1. New York: Wiley.

Arnstein, S.R. (1969) A ladder of citizen participation. *American Institute of Planners Journal,* 35, 216-224.

Bonnes, M. & Bonaiuto, M. (1995) Expert and Layperson Evaluation of Urban Environmental Quality: The 'Natural' versus the 'Built' Environment. In Guerriei, Y. Alexander, N. Chase, J. & O'Brien, M. (ed.) *Values and the Environenment*. A Social Science Perspective. Chichester: John Wiley & Sons.

Carver, Steve (2001). *Participation and Geographical Information: a position paper Position paper for the ESF-NSF Workshop on Access to Geographic Information and Participatory Approaches Using Geographic Information*,
Spoleto, Italy, 6-8 December 2001.
1.9.2005 <http://www.geog.leeds.ac.uk/papers/01-3/01-3.pdf>

Garb, Yaakov, Irene Van Kamp, Marianne Kuijpers, Martin Ouředníček, Luděk Sýkora (2004). *SELMA Spatial Deconcentration of Economic Land Use and Quality of Life in European Metropolitan areas*. WP2 – Quality of Life Indicators report (D02) - TD.03.04.21-23.11.00.

Ghose, Rina and Sarah Elwood (2003). Public participation GIS and Local Political Context: Propositions and Research Directions. *URISA Journal*. Vol. 15, APA II.

Gibson, J. J. (1979) *The Ecological Approach to Visual Perception*. Houghton Mifflin, London.

Hall, P. (1998) *Cities of Tomorrow*. Blackwell Publishers.

Horelli, L. (2000) *Ympäristön tutkimuksen ja vuorovaikutteisen suunnittelun metodologiasta*.
15.1.2006 <www.hut.fi/Yksikot/YTK/koulutus/metodikortti/Metodit.html>

Horelli, L. (2001) A Methodology for participatory planning. In R.Bechtel & A.Churchman (Eds.) *A Handbook of Environmental Psychology*. New York: John Wiley.

Hudson-Smith, Andrew. *Digitally Distributed Urban Environments: The Prospects for Online Planning*. A thesis submitted for the degree of Doctor of philosophy. Bartlett School of Architecture and Planning, London.
1.9.2005 <http://www.casa.ucl.ac.uk/andy/thesis.pdf>

Kraak, Menno-Jan and Allan Brown (2001). *Web Cartography*. Developments and prospects.

Kyttä, M. (2003) *Children in outdoor contexts*. Affordances and independent mobility in the assessment of environmental child friendliness. Teknillinen korkeakoulu. Yhdyskuntasuunnittelun tutkimus- ja koulutuskeskus. Julkaisu A 28.

Kyttä, M. Lainevuo, A. & Päivänen, J. (2000) *Turvallisen matkan päässä kaupungista*. Lahden seudun pientaloalueet suunnitelmissa ja asuinpaikkoina. Yhdyskuntasuunnittelun tutkimus- ja koulutuskeskuksen julkaisuja B 79. Espoo: Otamedia.

Kyttä, M. (2004a) The Extent of Children ś Independent Mobility and the Number of Actualized Affordances as Criteria of a Child-Friendly Environment. *Journal of Environmental Psychology*, 24/2, pp. 179-198.

Kyttä, M. (2004b) *Ihmisystävällinen elinympäristö*. Tutkimustietoa ja käytännön ideoita rakennetun ympäristön suunnittelua varten. YTK & YIT. Helsinki: Rakennuspaino Oy.

Laituri, Melinda (2003) The Issue of Access: An Assessment Guide for Evaluating Public Participation Geographic Information Science Case Studies. *Urisa Journal*. Vol. 15, APA II.

Lloyd, D., Haklay M., Thurstain-Goodwin M. and Tobon C. (2003) Visualising spatial structure in urban data. In Longley, Paul A., Batty, Michael (editors.). *Advanced Spatial Analysis.* The CASA book of GIS. ESRI Press 2003. Redlands,

Mitchell, G. (2000) Indicators as tools to guide progress on the sustainable development pathway in Lawrence, R.J. (Ed.) Sustaining Human Settlement A challenge from the new Millennium. *Urban International Press*. pp 55-104

Nevalainen, R. Staffans, A. & Vuorela, P. (1990*) Asumisen laadun arviointi ja tutkiminen*. Kokoava tutkimus asumisen laatuun vaikuttavista tekijöistä. Yhdyskuntasuunnittelun täydennyskoulutuskeskus. Julkaisu B 60. Espoo: TKK Offset.

Nyerges, Timothy (2005). Scaling-Up as a Grand Challenge for Public Participation GIS. *Directions Magazine*.
15.1.2006 <http://www.directionsmag.com/article.php?article_id=1965>

Pacione, M. (2003) Urban Environmental quality and human wellbeing - a social geographical perspective. *Landscape and Urban Planning 65*, pp. 19-30.

Roche, Stephen (2003). Geographic information and public Participation: Research proposal from French Perspective. *Urisa Journal*. Vol. 15, APA II.

Schlossberg and Shuford. Delineating "Public" and "Participation" in PPGIS. *URISA Journal. Volume 16*, Number 2. 2005

Sewell, W. R. and Coppock, J. T. (1977). A Perspective on Public Participation in Planning. In W. R. Sewell and J. T. Coppock (eds.). *Public Participation in Planning.* London: John Wiley and Sons.

Skjaeveland, O. & Gärling, T. (1997) Effects of Interactional Space on Neighbouring. *Journal of Environmental Psychology*, 17, pp. 181 - 198.

Talen Emily (2000). Bottom-Up Gis. A New Tool for Individual and Group Expression in Participatory planning. *APA Journal,* Vol. 66, No.3.

Tulloch L. David and Shapiro Tamara (2003). The Intersection of Data Access And Public Participation: Impacting GIS Users 'Success?. *URISA Journal*, Vol. 15, APA II.

Weiner, Daniel, Trevor M. Harris and William J. Craig (2001). *Community Participation and Geographic Information Systems.* Paper presented at the "ESF-NSF Workshop on Access to Geographic Information and Participatory Approaches Using GI ". Spoleto, 2001