The Use of Web-based SoftGIS Method in the Urban Planning Practices

Maarit Kahila & Marketta Kyttä
Helsinki University of Technology, Department of Architecture
PO. Box 1300, 02015 TKK Finland
maarit.kahila@tkk.fi
http://opus.tkk.fi

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 open up and target real two-way communication. Localised 'soft' data that the residents could produce by evaluating their living environment is needed concerning the quality of an environment as perceived by inhabitants. 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 useful methods. New technology helps to gather a database of 'soft' data. The 'soft' data can eventually form a special database of geographical information (GI). Essential is to bring this so called 'soft' data besides 'hard' formal data. A web-based GIS method called softGIS is an example of tools 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 especially web-based PPGIS, which challenges the traditional top-down practices towards more bottom-up thinking. This paper introduces prototype of softGIS method which was tested in City of Järvenpää in Finland. In this paper we analyze softGIS method, study the nature of the 'soft' knowledge produced and the possibilities to develop this method in the future.

Introduction

In Finland new participation methods has been carried out due to our new Land Use- and Building Act. In practise these methods are still inadequate (Staffans, 2004; Bäcklund et al., 2002). Currently there is an ongoing discussion in Finland and abroad about the ways to utilize geographical information systems to improve inhabitant's possibilities to participate (Weiner et al., 2002). SoftGIS methods should be considered as supportive tools and possibilities to enlarge resent package of participation methods (see also Kyttä & Kaaja, 2001).

SoftGIS offers a fresh way to study resident's quality factors and would be impossible to make without Internet. Our aim was also to connect the research of the quality factors to some current topic in the field of urban planning. To this we choose the discussion around urban infill problem. These research results are going to be presented in IAPS International conference 2006 (International Association for People-Environment Studies) with paper: Urban Infill and the perceived quality of the living environment. In this paper we are focusing to the softGIS method

and actual research results are presented only lightly. Our aim is to go through following questions:

§ What kind of new participation methods collaborative planning requires?
§ What could be the role of 'soft' data alongside with the 'hard' geographical information?
§ What kind of information softGIS method discloses?
§ How softGIS should be developed in the future?

Demand for new participation methods

In the field of urban planning participation means collaboration and interaction between different actors. In this paper we study how collaboration between residents and officials could be improved. As Horelli (2001) argues collaborative planning could at its best produce contextually, that kind of physical environment, which matches to the needs of individual, group, community and society.

In Finland collaboration and participation are seen all the time more and more important in the field of urban planning. New Land Use and Building Act aims to improve resident's possibility to be part of urban planning practices (Maankäyttö- ja rakennuslaki, 1999). In addition to open planning process up the aim has been to move decision making and taking closer to the residents. Essential target is to integrate opinions of different users more closely to planning practices (Häkli, 2002). As Staffans (2004) points out current planning process does not connect the official data with the local data that the residents can produce of their living environment. So called 'hard' and 'soft' do not confront each other and remain separately.

Is not an easy task to get residents to participate. Busy residents are difficult to activate and usually only the most active residents participate. Thread in immediate surroundings can activate people. This so called NIMBY phenomenon (not in my backyard) activates people (Niemenmaa, 2002; Rinkinen, 2004). Current participation methods influence to resident's enthusiasm to participate. Experiences prove for example that residents react more to mailed questionnaires than come actually to official meetings. Participating residents are usually courageous, open minded and quick at repartee. Impressiveness to planning demands also familiarity with the subject, know how and perseverance (Staffans, 2004). Due to this development of different methods which are easy to use and offer protection of anonymity are needed. In this case Internet-based methods offer respectable option.

The planning process is seen quite heavy and laborious for both the planners and the residents. Planners need to arrange a lot of meetings, which are usually held in the evening and the effort, are always the same if there are one or more participants. Planners should see new Internet-based methods relieving. These help to transfer data more quickly and make communication easier.

There are several studies to improve collaborative planning and research. Methods developed can be divided into traditional research methods and techniques that support collaborative planning,

but usually there are parts from both (Horelli, 2001). As participation tools, could be seen all those techniques that improve participants individual and communal communication and collaboration. SoftGIS is also a good example of a method that produces relevant research data and on the other hand improves collaborative planning by producing 'soft' data to the formal planning practices. In the future the role of Internet and GIS should be taken seriously when developing new participation methods.

Inhabitants producing 'soft' geographical information

Geographical Information Systems (GIS) help to collect, handle, store and visualize spatial data. These systems help to build digital maps and to analyze spatial data. Especially geographical information systems are seen useful to use when the aim is to analyse and visualise 'hard' statistical or register-based data (Kraak et al., 2001). The utilization of geographic information systems as a part of collaborative planning and decision making is growing all the time.

Many local government agencies have a long history of using GISs and spatial information in their urban planning tasks and some have also been relatively supportive to facilitate citizen access to spatial data and GIS. During the past decade also community groups and non-governmental organizations have started to take advantage of GIS in addition to the authorities (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 neighbourhood revitalization, urban planning and decision making (Weiner et al., 2001).

The use of GIS for public participation and collaboration in geography-related planning projects has result a lot of different terms and definitions. At the moment there is a wide range of practical examples, which connect at some level participation and GIS, but still the theory behind these is lacking. This is mainly because of the research field has been mainly application driven (Balram, 2006). Focal terms used are PGIS (participation GIS), PPGIS (public participation GIS) and CGIS (collaborative GIS). But in addition to these for example CIGIS (community integrated GIS), BUGIS (bottom up GIS) and PGIST (participatory GIS for transportation) are used (Schlossberg and Shuford, 2005; Nyerges, 2005; Tulloch, 2003).

More recently, use of GISs has spread to the Web. These internet based applications have the great advantage of being available for citizens like any other pages in the Web. These help to familiarize people with geographical information, reach larger group of people with low costs, and develop more user-friendly platforms. By operating in Internet updating and maintenance comes easier. Internet is also seen an interesting way to introduce and spread information quite anonymously (Carver, 2001). Due to these advantages Web-based methods in public participation and collaboration GIS projects is going to grow (Weiner et al., 2001).

In addition to the variety of the different terms used, current applications target also contextually to different matters. Generally resent applications do still support distribution of formal knowledge to citizens (top down thinking). There is a lot of discussion of the possibilities to use GIS more in a

bottom up meaning by letting the residents actually disclose experienced based 'soft' data of their living environment (Kyttä & Kahila, 2006; Rantanen, 2006; Talen, 2000). There are some methods which support this thinking (see Talen, 2000; Berglund & Nordin, 2005). But still these are hard to implement and do not utilize possibilities that ICT offers.

There are several Internet-based applications which aim to support collaborative planning but only few are concentrated to collect 'soft' data that the residents can produce from their living environment. In Finland some early stage methods were planning game for children[1] and application to study school surroundings and art[2]. One important example for softGIS was Minun Maunulani –map application which let the residents in one neighbourhood to comment their living environment[3]. Same kind application was launched also in Turku[4] to support cooperation between residents and city authorities. Abroad in England in Virtual Slaithwaite –project the residents in the Village of Slaithwait have a possibility to comment their living environment and the planning[5].

In these above mentioned applications collected 'soft' data is studied only lightly. By this we mean that this experienced based 'soft' data is not connected with register based geographical information thoroughly. In the case of Järvenpää our main aim was to study systematically how the data produced with softGIS is possible to connect with the formal data and what kind of results can we achieve with this. On the other hand our aim was to study, how this 'soft' data matches besides formal data.

Case Järvenpää

In Järvenpää in Finland a special Web based softGIS method was carried out to collect locally the perceived quality factors of the residents attached to their living environment (see picture 1) (www.softgis.fi). In our ongoing multidisciplinary research project OPUS – Urban planning and everyday life: a learning process (http://opus.tkk.fi/index_eng.htm), we will develop these softGIS method further as well as other types of web-based tools to study the 'soft' data produced by residents. Our aim is to study what this kind of knowledge could offer to planning practices and decision making and how this method supports participatory planning. In autumn 2006 new softGIS-method will be opened in three new communes in Finland. In addition to that we develop in Turku a special softGIS-method to study the quality factors of children and youths. With these methods the aim is to study carefully the 'soft' knowledge that the residents can produce from their living environment. At the same time in the OPUS-project also a Development Forum of the Espoon keskus (http://oppivakaupunki.evtek.fi/opus) will be developed. In this Development Forum one kind of softGIS-method will also be introduced.

---

[1] http://www.kaupunginosat.net/seikkailu/
[2] www.taideareena.fi
[3] http://www.kaupunginosat.net/maunula/kartta/
[4] http://map3.centroid.fi/avointurku/
[5] http://www.geog.leeds.ac.uk/papers/99-8/
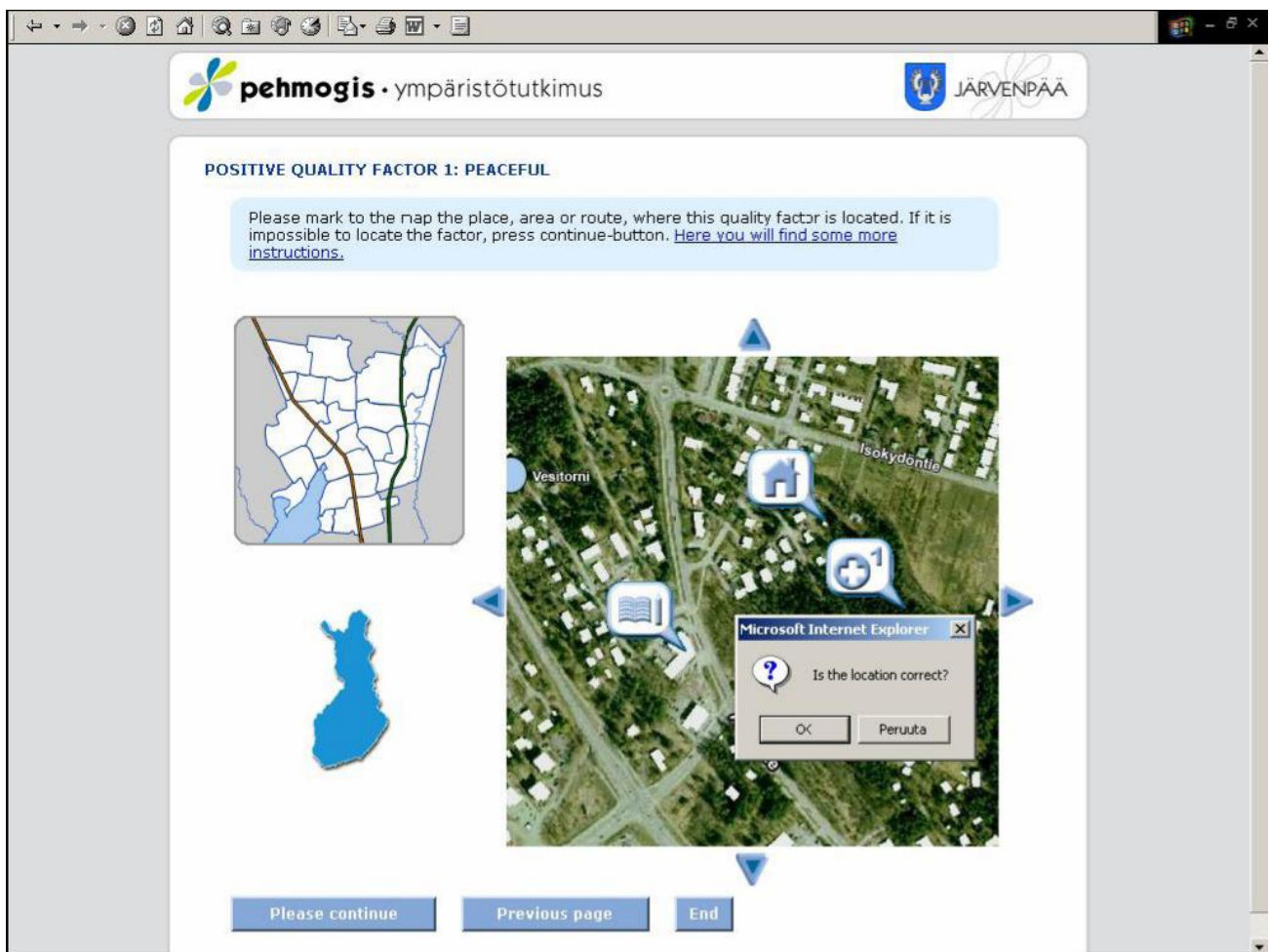
Picture 1. Page of the web-based softGIS application and the map tool (www.softgis.fi)

In Järvenpää the aim was to study carefully resident's positive and negative quality factors of the living environment. Essential was to collect this experienced-based data locally attached to physical places. This made possible internet-based method and the map application which allowed the residents to point out these meaningful places on the map (see picture 1 or visit www.softgis.fi). By producing real geographical information we are also able to utilize possibilities that GIS (geographical information system) offers.

Some research results from the case of Järvenpää

The softGIS method was designed to be easy to use and suitable for all age groups. The technical development of the JavaScript/HTML-based application was realized by media technology students. 427 inhabitants in the city of Järvenpää, a small town in the Southern Finland, filled in 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. 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 %).

The contents of the quality factors remind of other studies on the inhabitants quality factors in Finland and abroad. Most often mentioned positive quality factors were peacefulness, security, tidiness and closeness to the nature. In the negative factors, the opposite qualities dominated: restlessness, density, insecurity and untidiness. (see also Kyttä & Kahila, 2005)

Information of the coordinates for respondent's quality factors, homes, work places etc. gave us the possibility to count distances between different functions. It was interesting to see that the distance of the quality factors from home was short. Though in current discussion people are assumed to travel more and be less attached to immediate surroundings. The average distance of positive quality factors was 760 m and that of negative factors 1221 m. Within 20 metres from home (at home or in the yard) were 18 % of the positive quality factors and 3 % of the negative ones. Within walking distance (< 1 km) were 68 % of positive ones and 51 % of the negative quality factors. Only few quality factors were located outside the town: 8 % of the positive and 10 % of the negative factors was located over 10 kilometres from the home.

Furthermore by counting individually for each respondent the urban density we wanted to indicate if the degree of urban density has significant association with the actualization of inhabitant's quality factors. Our findings indicate that the degree of urban density has significant association with the actualization of inhabitant's quality factors (density measured individually inside a 500 m buffer from each respondent's home). Regression analysis revealed that urban density was negatively associated with the actualization of individually defined quality factors. The latter related positively to the general well-being (General Health Questionnaire (GHQ) -score), perceived health and perceived quality of life of inhabitants. These connections remained significant after controlling for seven different background variables. Our findings stress the importance of developing the kind of densification policy that does not threaten the meaningful affordances of the inhabitants.

Versatility of the 'soft' data

To develop collaborative urban planning further there is a need to thoroughly consider the diversity of the knowledge, in addition to just find new methods. Urban planning as a process can be paralleled to the construction of knowledge, where knowledge is created, collected and administered (Staffans, 2004; Puustinen, 2004). Informal 'soft' data that the residents produce should be seen as a part of urban planning process. As noticed the 'soft' data produced by softGIS method is very versatile by its nature and thus conceivable to use differently in research and planning practices.
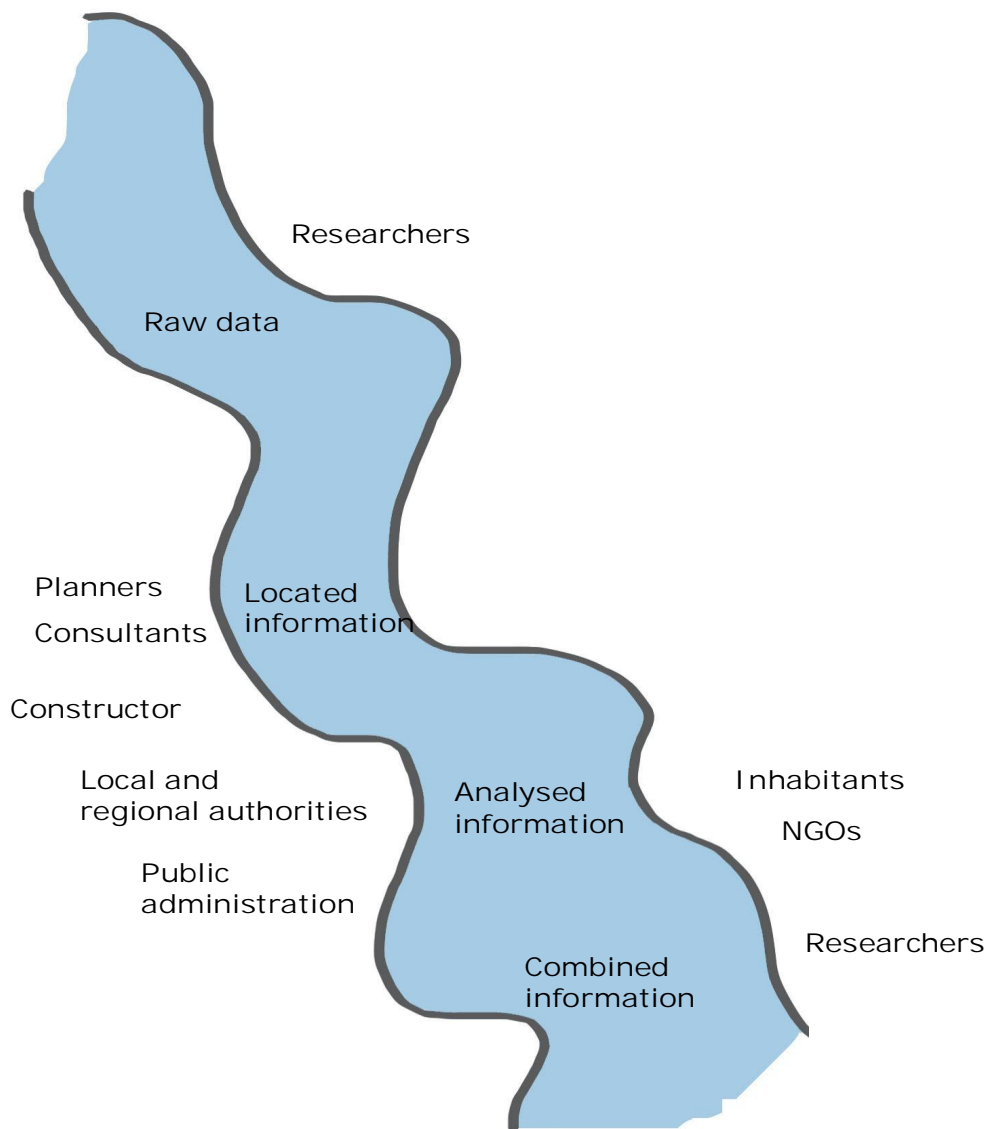
Normally the experience based local knowledge that the residents can produce from their living environment is seen problematic. This is because it is difficult to define and 'translate' to official or technical language. Because of this 'soft' data is seen more often as an opinion thus official fact

based knowledge. For this reason this knowledge is often also ignored lightly, which affects to participants willingness to participate (McCall, 2003; Rantanen, 2006). 'Hard' official knowledge based to statistics and registers is seen more accurate, reliable and measurable, than knowledge received from residents. Overall problem lies in current planning system, which leans heavily to official knowledge and expertise (Rantanen, 2006).

Internet based softGIS-method helps to collect knowledge of the resident's positive and negative quality factors. By combining traditional questionnaire and active map tool we receive a method which makes possible to collect unique experience based data. The focus to produce high quality research results in Järvenpää case was achieved. But in addition to this aim was to see how 'soft' data could be utilized in the field of decision making and urban planning.

In picture one we have visualized how conceivable this 'soft' data is, and who might be those actors who could benefit of this information (see picture 2). Knowledge collected with softGIS is saved directly to database where it is possible to transfer to some statistical program (we have used SPSS) and to software where you can explore geographical information (we have used MapInfo). This database can be explored as a regular research data with desired research methods. In the other hand in geographical information software it is possible to study 'soft' data spatially. Interesting is also the possibility to make new variables which can be transferred back to statistical program.

There are several different actors who are interested of 'soft' data in different phases. Through the process researchers are interested of the data, but especially at the beginning and at the end. Planners, decision makers and consults might be interested to see located meanings on a map and use this knowledge for example in certain planning practises. Residents and NGOs are probably more interested of the actual results achieved, as are the decision makers. We have found out that this kind of research where is a possibility to use different kinds research methods opens multiple possibilities for different analysis.

Researchers

Raw data

Planners

Located
information

Consultants

Constructor

Local and
regional authorities

Analysed
information

Inhabitants

NGOs

Public
administration

Researchers

Combined
information

Picture 2. Versatility and development of 'soft' data and the actors

'Soft' data can be integrated to different levels of urban planning (e.g. town planning, master planning) and the information can be zoomed. In town planning it is useful to study located quality factors near object of planning. When doing a master plan already information of that how the negative and positive quality factors are distributed and clustered to different areas gives interesting viewpoint for planner. This will tell already something of the nature of different neighbourhoods in the city. Study of the quality factors as one by one reveals more detailed the nature of different areas. By doing this it is for example possible to study where peaceful places and restless places are located. In addition to is possible to study the quality factors from the land use aspect. For example information of dangerous roads and crossings, condition of road system and nice pedestrian routes gives traffic planning current local information (see picture 3).
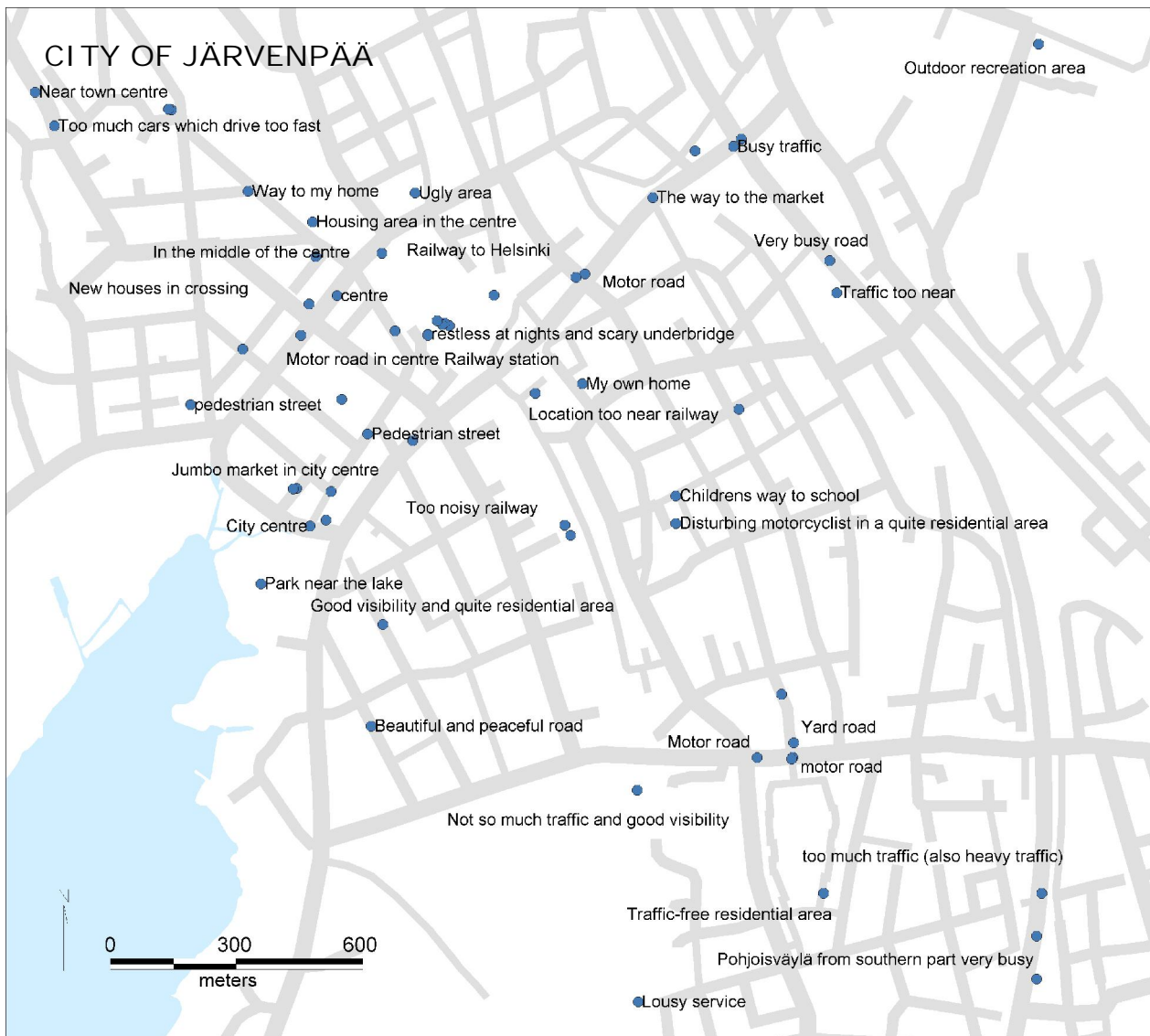
Picture 3. 'Soft' information for traffic planning.

SoftGIS in the Future

SoftGIS method and the information produces should be seen in the future as a fixed part of urban planning process. Focus should be then on how the residents could participate and actively produce information of the living environment. Other side should be studied seriously as well: are the planners ready for new participatory methods and techniques? 'Soft' knowledge should be utilized in different phases of planning and it should be continuous by nature. To collect information continuously would be valuable for research too.

To develop softGIS further there is a need to consider the possibilities and threats from residents and planners point of view. In picture 4 we have collected these viewpoints. Many aspects are parallel to both residents and planners. For both sides softGIS method offers new way for

cooperation which is not fixed to certain place or time. Due to this participation comes also more possible for larger group. Information could also be produced continuously. By operating in Internet it is possible to put more effort on user-friendliness and design. Method secures also anonymity of the participant. One special feature for planners is the possibility to produce actual geographical information with coordinates. By giving this 'soft' data an address planners can really use the data in urban planning practices.

Threats that can confront utilization of softGIS remind the general problems of the use of information networks (see picture 4). Maija-Liisa Viherä (1999) has grouped these basic elements of abilities to communicate. Three elements affect to peoples abilities: interface, motivation and know how. These elements could be considered as a thread for softGIS as well. Residents should have certain technical equipments (interface), motivation to participate and technical and verbal know-how. Threats from the planner's side are more connected generally to the participation problematic nature. Traditionally urban planning is built on expertise. The whole planning system is seen quite firm and not so receptive (Mäntysalo, 2000). In that case 'soft' data is naturally very difficult to integrate to the system and learned manners.

RESIDENTS

Possibilities
+   wide participation
+   easiness of the
    collaboration/cooperation
    (independence of time and place)
+   continuous information flow
+   user-friendliness
+   anonymity

Threats (Viherä, 1999)
–   interface (technical abilities)
–   motivation
–   know-how

PLANNERS

Possibilities
+   wide participation
+   affordability
+   easiness of the
    collaboration/cooperation
    (independence of time and place)
+   continuous information flow
+   anonymity
+   geographical information
    (coordinates)

Threats
–   technical abilities
–   planning traditions
–   closed technical systems
–   reliability/representativiness
–   information overflow

Picture 4. SofGISs possibilities and threats for residents and planners.

SoftGIS methods are suitable to modify needs oriented from general tools to more specified ones. With thematic softGIS it is possible to concentrate to certain current theme on planning or research (see picture 5). In Opus project we are developing already a special tool to study quality factors of children and youth but in addition also softGISsafety, softGISgreen, softGIShealthy

could be launched. In an ideal world living environment could be evaluated with general continuously open softGIS and with special temporal thematic softGIS-applications.

SoftGIS should be seen as a tool which cuts through whole planning process (see picture 4). These tools support cooperation/collaboration between authorities and residents by feeding the process with 'soft' knowledge produced by residents. This knowledge could be then utilized in one certain project or more generally. This requires the development of the whole planning process more open and receptive for different kind of knowledge. Eventually 'soft' knowledge could be firm part of the planning process.
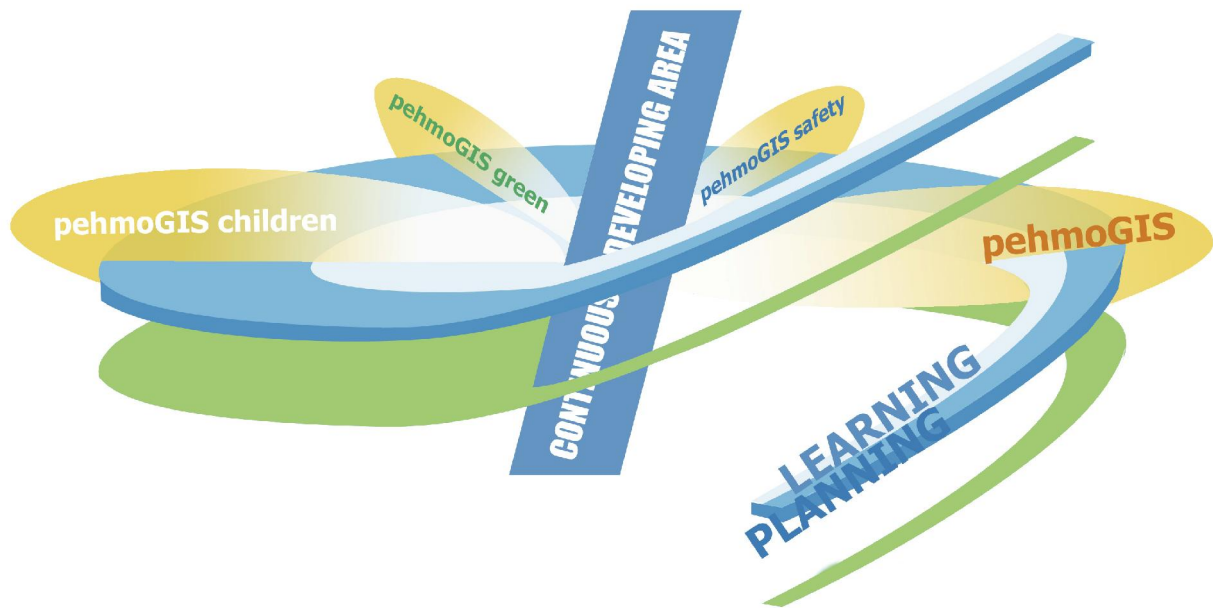
Picture 5. SoftGIS in the future.

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 ongoing 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.

Acknowledgements

Environment. This study was conducted in collaboration between the Centre for Urban and Regional Studies at the Helsinki University of Technology, the Finnish Environment Institute, Tampere University of Technology (Department of Architecture), and six case study partner cities. The city of Järvenpää has been an active and supportive partner in this part of the study. The finishing of the study was in the collaborative OPUS research project at Helsinki University of Technology financed by the National Technology Agency of Finland. The scientific partners in OPUS are the Enterprise Simulation Laboratory SimLab, Department of Computer Science and Engineering, and the Laboratory of Urban Planning and Design, Department of Architecture. The Family research unit of the Family Federation of Finland collaborates in OPUS as an affiliated partner. Finally, also Jenny and Antti Wihuri foundation has financially supported the research. The authors are very grateful for all the financers and the creative research effort of both two research teams. These strong contributions have made this paper possible.

References

Balram, S. & Dragicevic, S. (2006) (Eds.). *Collaborative Geographic Information Systems*. Idea group publishing.

Berglund, U. & Nordin, K. (2005). Including children's perspective in urban planning in GIS: development of a method. In B. Martens & A. Keul (Eds.) *Designing Social Innovation: Planning, Building, Evaluation.* Göttingen: Hogrefe & Huber Publishers.

Bäcklund, P., Häkli J. & Schulman, H. (2002). Osallisuuden jäljillä. Teoksessa Bäcklund, P., Häkli J. & Schulman, H. (toim.): *Osalliset ja osaajat. Kansalaiset kaupungin suunnittelussa*. Gaudeamus, Helsinki.

Carver, Steve (2001). *Participation and Geographical Information: a position paper Position paper for the ESFNSF Workshop on Access to Geographic Information and Participatory Approaches Using Geographic Information*, Spoleto, Italy, 68 December 2001. <http://www.geog.leeds.ac.uk/papers/013/013.pdf> 1.9.2005

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

Horelli, L. (2001) Ympäristön tutkimuksen ja vuorovaikutteisen suunnittelun metodologiasta. Ks. Kyttä, M., Kaaja, M. (toim.): *Vuorovaikutteisen suunnittelun ja tutkimuksen menetelmäpaketti.* Verkkojulkaisu. <http://www.hut.fi/Yksikot/YTK/koulutus/metodikortti/Metodit.html>

Häkli, J. (2002). Kansalaisosallistuminen ja kaupunkisuunnittelun tiedonpolitiikka. Teoksessa Bäcklund, P., Häkli J. & Schulman, H. (toim.): *Osalliset ja osaajat. Kansalaiset kaupungin suunnittelussa.* Gaudeamus Oy, Helsinki.

Kraak, MennoJan and Allan Brown (2001). *Web Cartography*. Developments and prospects.

Kyttä, M., Kaaja, M. (toim.) (2001) *Vuorovaikutteisen suunnittelun ja tutkimuksen menetelmäpaketti.* Verkkojulkaisu.
<http://www.hut.fi/Yksikot/YTK/koulutus/metodikortti/Metodit.html>

Kyttä, M. & Kahila, M., 2005. The perveived quality factors of the environment and their ecoefficient acceccibility. In Gallis, C.Th. (eds.) *Forests, trees and human health and wellbeing.* Proceedings from the 1st European COST E-39 Conference.Thessaloniki: Medical & Scientific Publishers.

Kyttä, M. & Kahila, M. (2006) (forthcoming). *PehmoGIS elinympäristön koetun laadun kartoittajana.*

Maankäyttö- ja rakennuslaki (1999). Finlex, valtion säädöstietopankki. 1.2.2006
<http://www.finlex.fi/fi/laki/ajantasa/1999/19990132>

McCall, M. (2003): Seeking good governance in participatory-GIS. *Habitat International 27 (2003) 549-573.*

Mäntysalo, R. (2000). *Land-use Planning as Inter-organisational Learning.* Acta Universitatis Ouluensis C Technica 155. Oulu University Press.

Niemenmaa, V. (2002). Asukasaktiivien ääni. Osallistuminen ja osallisuus Helsingin kestävän kehityksen prosessissa. Teoksessa Bäcklund, P., Häkli J. & Schulman, H. (toim.): *Osalliset ja osaajat. Kansalaiset kaupungin suunnittelussa.* Gaudeamus, Helsinki.

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

Puustinen, S. (2004). Yhdyskuntasuunnittelu ammattina, Suomalaiset kaavoittajat ja 2000-luvun haasteet. *Suomen ympäristö, 715. Ympäristöministeriö, Helsinki.* 3.5.2006
<www.ymparisto.fi/download.asp?contentid=21762>

Rantanen, H. (2006). From Local Knowledge Mapping to a Learning Planning Process. Paper presented 16.2.2006 in Planum Plenum -seminar (Planum.net - *European journal of planning*), as a part of conferens "CORP 2006 International Conference on Urban Planning and Regional Development", Wien (CORP 2006).

Rinkinen, K. (2004). *Rivien väliin jäävät asukkaat.* Hiljaisten ryhmien osallistaminen ympäristönsuunnittelussa. Vantaan kaupungin paino, Vantaa.

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

Staffans, A. (2004). *Vaikuttavat asukkaat*. Yhdyskuntasuunnittelun tutkimus- ja koulutuskeskuksen julkaisuja A 29, Yliopistopaino Oy, Helsinki

Talen Emily (2000). BottomUp 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.

Viherä, M.-L. (1999). *Ihminen tietoyhteiskunnassa: kansalaisten viestintävalmiudet kansalaisyhteiskunnan mahdollistajana.* Turku: Turun kauppakorkeakoulu.

Weiner, D., Harris, T. M. & Craig, W. J. (2002). Community participation and geographic information systems. Teoksessa Weiner, D., Harris, T. M. & Craig, W. J. (toim.): *Community participation and geographic information systems*. Taylor & Francis, London.