

The Future of Participatory Approaches Using Geographic Information: developing a research agenda for the 21st Century

Steve Carver

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Abstract Geographical space is an important factor across a wide range of decision-making problems, not only because many human and environmental processes vary markedly from one place to another, but also because space determines people's perception of the world and ultimately determines what we call 'local' and 'global'. The ability of individuals and social groups to map out, in a true geographic sense, their vision for the future is a key prerequisite for informed and sustainable planning. Obtaining sufficient input from a representative sample of the broad population is often made more difficult by the lack of 'connectivity' (in both the technical and conceptual sense) between the different stakeholders involved. Technological approaches to improving participation, including the use of GIS and ICTs, are reviewed. The effects of space, place and locality are identified as key factors determining public interest in decision problems. Recommendations are made for further research directions in the field.

Introduction

The current heightened research interest in participatory approaches to decision making may well be a waste of time or, at best, misplaced confidence. The effort expended is done so on the possibly false surmise that the general public want to be more closely involved in decision-making, and perhaps more importantly, that those in positions of decision-making power actually value and therefore encourage public input. A pessimistic assessment, maybe, but it needs careful consideration if we are to progress further with research and development in this field.

I have chosen to start the discussion from this point because over ten years experience of developing participatory GIS has taught me that we, as academics, tend to credit the public with more knowledge, greater rationality and enthusiasm for participation in decision making than we perhaps ought. It is surprising how little even well educated people know about a broad range of basic topics, often holding quite erroneous beliefs and irrational ideas that appear to be based largely on here-say, sensationalist media reporting and poor understanding of basic facts. The willingness to become actively involved is also lacking across the population as a whole and is symptomatic of a wider malaise in the democratic process; witness the poor turnouts in many elections and the mistrust and contempt in which we hold many politicians. The techno-optimists among us maintain that the revolution in ICTs (Information and Communication Technologies) brought about by the Internet and wireless communications will redress the balance. I must admit to sharing some of this optimism, but would however countenance caution in that technological approaches need to be carefully grounded in a good understanding of the issues involved and an application

of the technology within a framework of more traditional means of outreach and participation.

This position paper reviews the current situation in respect to public participation and the use of geographical information to both encourage and facilitate wider involvement in the decision-making process. In doing so it is first necessary to give some attention to general theories of participation and empowerment within the democratic process before examining the role of GI, and space itself, in providing a framework for active public participation. The factors that work for and against this are analysed in some detail, before drawing up a list of recommendations for further research effort in this field.

Democracy and Participation

Democracy, the government by the population through elected representatives, is perhaps the single most defining characteristic of western civilization. Public participation involves ordinary citizens in decisions about, and the implications of, social and economic change. Participation in democratic society has for most people until recently been limited to choosing elected representatives through the voting process and then lobbying them over issues of concern. However, as people have become ever more informed about a variety of issues through mainstream media they have become noticeably more critical of decisions made on their behalf. Over the last decade ICTs have massively increased the amount of information available and the speed at which it is transmitted. Yet, despite technological advances, there are still relatively few opportunities for the general public to actively participate in decision making. Current modes of participation, including vot-

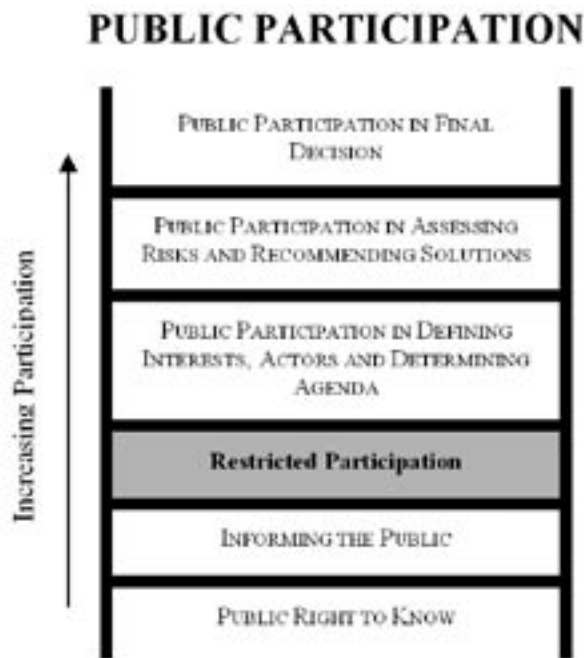


Figure 1. The public participation ladder (After Arnstein, 1969; Wiedemann and Femers, 1993)

ing in elections, protest activities, lobbying and public meetings, appear over-stretched and may not fully meet the democratic ideals and requirements of the 21st Century (Bryan et al., 1998; Friedmann, 1995).

The participation ladder

A useful analogy when considering levels of public participation is that of a ladder; the base of which represents zero opportunity to participate with successively higher rungs representing increased levels of participation and greater public empowerment in the decision making process. The top of the ladder represents full public control and responsibility for the final decision. The participation ladder is shown in figure 1. This public participation ladder is used by Arnstein (1969) to describe the transferral of political power from traditional power-holders having power over citizens, to citizens having the power to achieve their own requirements. Wiedemann and Femers (1993) adapt this theory to their consideration of environmental decisions about hazardous waste management.

Empowerment

Empowerment is the process by which stakeholders identify and shape their lives and the society in which they live through access to knowledge, political processes and financial, social and natural resources (Arnstein, 1969). Participation alone cannot, however, guarantee socially just development since the process of empowerment through participation can be undermined by the motives of the traditional power holder, power relations, and

inequalities of access to information and participatory mechanisms (Slocum and Thomas-Slayter, 1995). 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 often take place in an atmosphere of confrontation that can discourage participation by an often less vocal majority resulting in such meetings being dominated by vocal individuals whose views may not necessarily represent the wider opinions of local people. Planning meetings are often held during the evening at specific times, limiting the numbers of people who can attend. Access to relevant information is also limited, meaning that fully informed decision makers are clearly at an advantage when compared to a partially informed public. Such inequalities of access, both to information and the meetings themselves, severely limit the level of empowerment gained through participation in such meetings.

New methods of participation

Under traditional forms of participation, public involvement in decision making is only a few rungs up the public participation ladder and extends little beyond the “right to object”, though the level of placation varies from country to country. Several methods for encouraging more active participation have been developed. These include the use of opinion surveys, referendum, focus groups, deliberative polls, citizens’ panels and citizens’ juries (Fishkin and Luskin, 1999; Finney, 2000; Petts, 2001; Thompson and Hoggett, 2001).

An interesting example of geographically based public participation is “Planning For Real” (PFR). This is an idea developed and patented by the Neighbourhood Initiatives Foundation (NIF), as a means of involving local people more closely in local environmental planning problems and decision-making (Gibson, 1996). NIF is a charity whose main aim is to maximise the participation of local people in decisions that affect their neighbourhoods and quality of life. The founding director, Dr Tony Gibson, devised PFR in the 1970s as a technique of active participation based around interaction with large-scale maps or physical models of the area of interest. NIF has continued to develop and adapt this primary tool to meet both local and strategic consultation needs and as an essential process in community development programmes. The PFR approach has been adopted as method of improving participation in developing countries. For example, Integrated Approaches to Participatory Development (IAPAD) has developed similar tools for use in integrating the views of local people into conservation and development projects. Three-dimensional topographic models are used as a focal point in merging people’s local knowledge with traditional spatial information (Rambaldi and Callosa-Tarr, 2001).

In contrast to more traditional or non-digital methods, new forms of participation based around ICTs are beginning to evolve. These include online discussion, web surveys and online decision support systems. Together these form what might be termed the e-participation ladder as shown in Figure 2.

The bottom rung of this participation ladder represents online delivery of public services such as payment of rates and taxes, applications for licences and access to government information. Local government web sites and those of various national government departments are good examples. Selected examples from the UK include Brent and Wandsworth. Here the flow of information is essentially one-way; from server to client, and does not take full advantage of the possibilities for two-way communication. Further up the e-participation ladder, the communication becomes bi-directional making participation more interactive through the sharing of information, ideas and feedback. One of the earliest attempts at online dialogue was by MN-Politics email forum set up in 1995 in Minnesota. An example of a long-running web site dedicated to online discussion of ideas surrounding digital democracy is UKCOD (UK Citizen's Online Democracy) that provides access to a range of web services relating to electronic democracy and runs its own forums to discuss political issues affecting the United Kingdom as well as access to research, best practice and training in electronic democracy. The use of the web as a delivery mechanism for opinion surveys is also growing (Tsagarousiano et al., 1998). Bulmer and Coleman (2001) go so far as making the case for a "Civic Commons in Cyberspace" to create "an open-ended institutionally backed extension of people's opportunities to make contributions to public policy on those matters that specially concern them" (p.5).

Online participation promises a number of improvements. Firstly, participation is not restricted by geographical location. Access to the relevant information and ideas of other stakeholders is available from any location that has Internet access. This information is also available at any time of the day thus avoiding the problems associated with holding meetings in the evenings. The concept of "24/7" access (i.e. 24 hours a day, 7 days a week) opens up opportunities for more people to participate in public consultations. When compared with the traditional method of making a point verbally in front of a group of relative strangers, an Internet-based system also allows people to make comments and express their views in a relatively anonymous and (usually) non-confrontational manner. Thus ICTs are seen as breaking down key barriers to participation, principally those concerning accessibility and socio-psychological factors. While addressing the physical barriers to participation by online access is important, understanding the social aspects of participation is perhaps more so; particularly how people perceive decision problems and respond to them as individuals and as members of social groups.

Some thoughts on individual and group decision-making behaviour

In recent years researchers have recognised that to understand how the public respond to and participate in a decision problem it is necessary to focus on the social and cultural factors that govern this process. Public perceptions and attitudes are shaped by the "world views" shared by the groups to which individuals belong, such as work, social and cultural groupings (Dake, 1991). This recognises

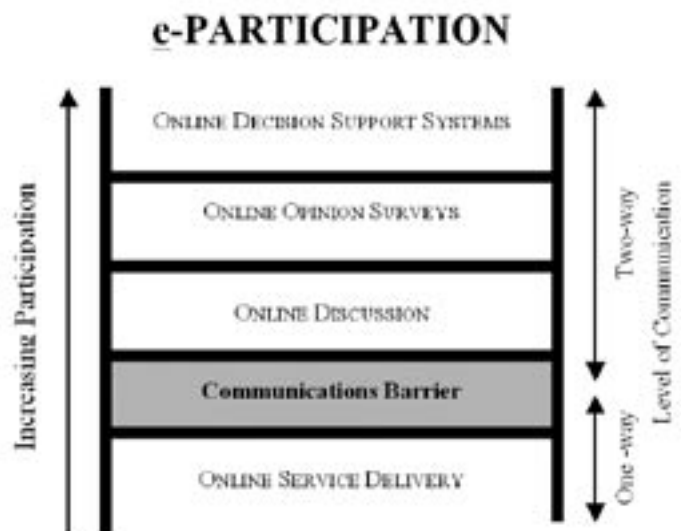


Figure 2. The e-participation ladder
(After Smyth, 2001)

that society is composed of different groups each with different world-views (Slovic and Peters, 1998). For instance, research on nuclear power shows that pro-nuclear respondents see economic aspects as most salient, while the anti group see accidents and consequences for the environment as most salient. Thus different stakeholders may hold different world-views leading to focus on different aspects of the available information. This leads to different perceptions and attitudes to the decision problem and clearly affects the ways in which different people participate in the decision-making process. Cultural theory suggests there are four stakeholder groups, each having a distinctive attitude (Douglas, 1992). These biases reflect the individual's favoured institutional arrangements, and predispose people as to their attitude to risk, the fairness of decisions made on behalf of society, and who to blame when things go wrong. Though used by Douglas (1992) to describe attitudes to risk, the four types are adapted here for decision making in general:

- Individualist/Entrepreneurs - decisions present opportunity, save those that threaten freedom of choice and action; 'the market' will provide control, so there is no need for other kinds of control;
- Hierarchists - believe technological and environmental decisions should be left to experts;
- Fatalists - feel that they have very little control over decisions that affect them, and accept whatever decisions are made on their behalf; and
- Egalitarians - fear risks to the environment, the collective good and future generations, and believe that power and influence should be spread more evenly within society. Recently a further type has been added that perhaps better describes those of us seeking to employ ICTs and GI to further our egalitarian objectives, that of:
- Technological Enthusiast - who show a commitment to the development of a high-technology society.

Groups holding these different views will often come into conflict. For instance, we might normally expect to find individualists and egalitarians in conflict about nuclear issues.

Although cultural theory provides a plausible typology, the research evaluating these ideas is more ambiguous. It has been shown individuals may not perceive and act consistently within one type in all decision-making domains. Rather, it is likely that they may show characteristics of one type in one situation and another type in a different situation (Dake, 1991). Groups, on the other hand, may be formed specifically to reflect a particular view. The group norms that determine group perceptions and actions may therefore be more stable and more reliably categorised.

From the standpoint of this theory, the search for a single, universal metric for decision-making behaviour may be futile, since the perception of the decision problem and responses to it varies across groups and between individuals as a function of social and cultural factors. Nonetheless, a better understanding of individual and group decision behaviour is clearly needed, especially when complicated by the addition of geographical space.

The role of space

Of the scientific issues involved, the role geographical space in focusing interest and shaping our response to decision problems is central to this discussion paper. The effects of space, place and locality are important in determining who is interested in a decision problem and why. People local to a particular problem or issue will, by the very virtue of their geographical position, be (in the main) interested enough to get involved or at least express a considered point of view if polled. As scale increases, a smaller proportion of the population affected will be interested enough to seek involvement, such that at national scales the proportion of the interested population is pitifully small, even though the absolute numbers may be quite large (Kingston et al., 2000). This is true even for those issues that at first glance it would seem everyone ought to hold a vested interest, like where to dispose of nuclear waste for example. Only when locational decisions are made about national issues does the problem then become "local" and so the politics of scale kick in again to create an explosion of local interest. NIMBY (Not In My Back Yard) is a much-maligned public reaction to "invasive" siting decisions - a kind of geographical version of personal space - but it does demonstrate the parochial nature of public interest in decision-making very well, particularly when concerned with controversial facilities such as those for nuclear waste (Sjöberg and DrottzSjöberg, 2001).

The role of participatory GIS is to help minimise conflict and arrive at decisions that are acceptable to the majority of stakeholders through consensus building approaches based on awareness of the spatial implications of a decision problem. Participatory GIS is well placed as a technology to explore phenomena such as NIMBY-ism and perhaps offer up some solutions.

GIS as facilitator

Although it is not uncommon for new technologies such as GIS to play an important part in the decision making process, these tools are, in the main, beyond the reach of ordinary citizens with an interest in a particular decision problem. This is true in both in a material and a cognitive sense, since GIS and spatial data are expensive and require high levels of training for competent use. In its traditional mode of employment, behind closed doors and operated by trained decision makers using 'restricted' datasets, GIS actually works against participation and empowerment. On these grounds GIS has often been criticised as being an elitist technology and one that merely enhances existing power structures (Pickles, 1995). Making GIS and appropriate datasets available to the public over the Internet, however, provides at least the potential to redress this situation by placing all stakeholders on an equal footing. This may ultimately help move public participation further up the participation ladder past the rung of restricted participation (Figure 1).

Access to GIS alone does not, however, provide the public user with a satisfactory means of active participation in the decision process. GIS is far too complex a technology to allow effective use by the non-specialist with little or no previous training or experience in this field. The following quote from Mark Monmonier's essay on "Ridicule as a weapon against GIS-based siting studies" highlights the problem very effectively:

"...in the same way that ridicule can undermine an incomplete or otherwise flawed siting study, project opponents armed with a GIS but lacking the savvy to use the system appropriately become vulnerable to sarcastic attacks from site advocates and sceptical journalists."
(Monmonier, 1996)

Putting GIS on the Internet therefore does not in its own right, constitute an effective participatory decision support solution, if only because it is such a complex beast and the data difficult to interpret. Intelligent interfaces to specific problem areas perhaps needed to allow effective interaction between individuals and the computer. Such interfaces would need to be intelligent enough to recognise the socio-cultural and educational background of the user and adapt themselves to their requirements accordingly. In addition, GIS-based decision tools need to be exploratory rather than definitive. People need the space and freedom to 'explore' the decision problem and create personal constructs (digital, spatial or otherwise) that represent their own outlook (vision) or opinion on a decision problem. GIS-based decision tools should provide the means by which stakeholders can explore a decision problem using existing information, experiment with possible solutions, view other people's ideas, formulate their own views, and share these with the wider community.

Developments in participatory GIS

There has been a blossoming of interest in public use of GIS in recent years. A recent rash of papers and research initiatives are indicative of something of a paradigm shift in the application of

GIS technology, yet the ethical and epistemological arguments have been aired in public for some time. The long running volley of articles and editorials between Stan Openshaw, Peter Taylor and others are an excellent and entertaining example of this debate between the two camps of techno-positivist GIS-ers on the one hand and GIS-hating social theorists on the other (Taylor, 1990; Taylor and Overton, 1991; Openshaw, 1991; 1992; Pickles, 1995; Openshaw, 1996; 1997). Despite this rocky start, social science and GIS are nevertheless coming together to collaborate on participatory approaches and the societal implications in and on GIS.

The US National Center for Geographic Information and Analysis (NCGIA) has run two related initiatives; Collaborative Spatial Decision Making (I-17) and The Social Implications of How People, Space & Environment are Represented in GIS (I-19); known simply as “GIS and Society”. The latter focused research efforts in two key areas concerning the inter-relationship between GIS and society: how the spread of this technology is affecting the political, economic, legal, and institutional structures of society; and how societal process affect the form taken by the technology itself (NCGIA, 1993). The emphasis on PPGIS itself comes about from a merging of the re-evaluation of the social implications of GIS by the GIS community and its critics, and existing lines of research into public participation and decision-making, principally from the planning field. The recent Varenus initiative on “Empowerment, Marginalisation and Public Participation GIS” clearly focuses the issues discussed here and identifies a broad range of issues of relevance to community representations and PPGIS. These include:

- The implications of map-based models for community representations;
- Possible distortion of grass-root perspectives by GIS;
- Methods of representing the “community knowledge base” within GIS;
- Impacts of inequalities of access to GIS technology and data;
- Information needs of community groups and role of GIS in meeting these; and
- Empowerment in the decision making process through the use of PPGIS.

Up until the formation of AGILE in 1998 research on these topics in Europe seems to have lacked a central focus although a number of early projects within the various units of the Regional Research Laboratories have addressed pertinent issues (e.g. Carver et al., 1992) and many individual papers have appeared in the literature (e.g. Doyle et al., 1998). AGILE has now identified GI policy and society as one of five research challenges including issues of access to information and organisational change. Despite these initiatives in both North America and Europe and the work of many individuals, there does still seem to be a significant gap between the experimental and the practical application of participatory GIS. Sure, the number of mapping-based web sites has exploded in recent years helped along by web mapping add-ons

to proprietary GIS packages, but there are still comparatively few instances of real-life usage of this technology within public participation exercises though a few notable exceptions do exist (e.g. Shiffer, 1995; Jordan, 1999; Kingston et al., 2000). The reasons for this can only be guessed at, but it is clear that they are likely to include political ‘difficulties’, lack of resources and expertise, and the fact that the public at large are, perhaps, just not ready for it yet.

Participation and GI – a SWOT analysis

It is clear from the above discussion and the amount of research effort being expended around the world on participation, GIS and related topics that there is considerable enthusiasm about the potential for participatory GIS of one form or another. It may be useful at this juncture to analyse its wider potential in the hope that this may provide a framework for identifying key areas for further research. A SWOT analysis is given as a means of organising some of the issues and factors promoting or acting against participatory approaches.

Strengths

People, on the whole, want to be better informed about issues that affect them. If those issues have a strong spatial component, then GIS or its derivatives would seem natural contenders for conveying that information.

From an institutional perspective, GIS has matured as a technology and is now universally accepted as the best method of handling and analysing spatial data. This level of technological acceptance is not however universal, a fact that is picked up later in considering issues of trust and understanding. Nonetheless, most decision-making organisations have adopted GIS and so ought to be in a good position to extend their operations through participatory approaches using GI as a focus for and facilitator of discussions between stakeholder groups.

Huge volumes traditional spatial data are available world-wide at a variety of scales and resolutions and covering a range of themes. These form the ‘back drop’ of most participatory GIS, but lack local knowledge and community perspectives. In this context, one of the strengths of participatory approaches has to be their aim (successful or otherwise) of incorporating local community level perspectives on a particular decision problem that may lead to different solutions than might otherwise have been reached using purely traditional forms of data. The community itself needs to be regarded as a form of database, unconventional in the IT sense, but wholly understandable from a social science perspective. Local people usually know their local area better than anyone else and so can reasonably be expected to provide detailed insights into local phenomena that are not normally available via ordinary GI datasets. Incorporation of local knowledge is clearly a major strength of participatory approaches and may go some way towards the Geographical Knowledge Systems (GKS) proposed by Taylor (1990).

From the outset it is clear that many decision problems, particularly those concerning the environment and the way we occupy it and utilise it, have a strong spatial component. Including space as a central element or framework in addressing such decisions is highly beneficial in organising both our view of the problem and our engagement with it. Despite its limitations, the map is the best way of organising spatial information and is the best available tool for interacting with it. One of the main strengths of PPGIS therefore lies in its ability to handle spatial information and communicate this to interested stakeholders, and in turn, accept, organise and reflect inputs (spatial or otherwise) that users provide during the participation process.

Finally, anything that increases public access to information and active participation in the decision making process should be seen as an improvement over existing public/decision maker power relationships. In this instance current experiments in participatory GIS are steps in the right direction; that of citizen empowerment through greater involvement and openness and accountability on behalf of decision makers. This process has recently received a fillip from the United Nations in the form of the Aarhus Convention, adopted in June 1998 and entering into force in October 2001. This international law on access to information, public participation in decision making and access to justice in environmental matters seeks to strengthen the role of members of the public and environmental organisations in protecting and improving the environment for the benefit of future generations. Through its recognition of citizen's environmental rights to information, participation and justice, it aims to promote greater accountability and transparency in environmental matters (UNECE, 2001). While the convention has been ratified mainly by eastern countries, it is expected that western nations will ratify the convention in due course.

Weaknesses

Ease of access to relevant information and the tools with which to use it are oft quoted strengths of ICT-based public participation. Equality of access creates a level playing field from which all stakeholders can operate and debate the issues on equal terms. This may be somewhat of a utopian dream. Recent initiatives in many countries have centred on ensuring equal access to information via the Internet. The reasoning behind this is the clear, if rather simplistic notion, that if everyone has access, then everyone has the opportunity to be equally well informed. Better access to the Internet will help, but it is maintained here that there will always be a significant proportion of the population who do not have the appropriate training or intelligence with which to use it effectively. It is these people - the 'Information underclass' - who always have, and maybe always will be, excluded from the decision loop by the so called 'Digital Divide' (Carver et al., 2000; Oden and Lentz, 2001). Although participatory approaches are firmly rooted in an ethos of social inclusion, it is clear that the knife cuts both ways; the majority may well be better empowered, but a small yet significant minority will become increasingly marginalized by comparison although their position in absolute terms may not

actually have changed (Althaus and Tewkesbury, 2000; Bulmer and Coleman, 2001).

This discussion leads on to issues surrounding the public understanding of science and specific decision problems. Those in positions of decision-making power have often argued that because they have access to all the relevant information, have been extensively trained in the art of decision making, and have a detailed understanding of the decision problem in question, then they are best placed to make the decisions. The public on the other hand may well have limited knowledge of the decision problem, partial access to the facts and little or no training. The professionals could be right in their assertion that they are the best people to make the final decision, but that does not necessarily mean that the public view should hold less weight or even be ignored. Nevertheless, there are significant problems in incorporating public opinion into the decision making process. For example, the public at large often conceptualise a decision problem in very different ways, using simplistic thinking routines for judging risk and uncertainty, that in turn lead to predictable errors and bias in their judgement (Bazerman, 1997; Kahneman et al., 1982). A useful illustration of this is how people consistently overestimate dramatic causes of death such as floods and homicide, while more mundane ones such as diabetes are underestimated (Lichtenstein et al., 1982).

Despite the inclusion of the spatial dimension being advantageous for our investigation of decision problems, the role of geography in participatory decision-making is not clearly understood. The NIMBY syndrome demonstrates that space and locality are important for controversial siting decisions such as for nuclear waste disposal. This is further complicated by the "sense of place" often associated with particular localities. GIS data models may be able to cope with the quantitative and deterministic aspects of space, spatial scale and distance, but may not be best suited to representing the more qualitative and perceptual effects of place since this is more of a personal construct. Traditional GIS data models and representations of space may therefore distort local and individual/group world-views. Forcing community level data into Cartesian coordinates and vector/raster data models may also not be appropriate because of corresponding distortions of space and distance in an individual's mental map of their locality (Aitken and Michel, 1995).

Opportunities

The medium and long-term opportunities for participatory approaches and GI are significant. PPGIS should not be viewed as a replacement for more traditional forms of participation in the democratic process rather its role is seen more as augmenting and supporting stakeholder dialogue and public involvement in decision making. As such PPGIS is a form of Computer Supported Real Life (CSRL). This should be viewed as an opportunity for increasing involvement and accountability.

Greater accountability in decisions made is seen as an important opportunity for participatory GIS. At present many decisions are still made behind closed doors, using restricted in-

formation and with only minimal public input. As the kind of participatory decision making procedures described here become more common place, then the decision makers themselves will become more accountable for their actions on the basis that the decision making process is more transparent and based on freer dialogue between stakeholders. Perhaps the real opportunity lies in making the public itself more accountable for decisions made by giving over greater decision-making responsibility to individual stakeholders and stakeholder groups.

Greater participation implies greater levels of social inclusion. Reasons for why this might not always be the case have already been given under the discussion of potential weaknesses, and these apply just as much here. If we subscribe to the position of 'technological enthusiasm' then developments in the information society such as Internet access for all, digital television, mobile wireless communications, etc. will mean greater accessibility of information for all, implying greater opportunity and higher levels of social inclusion.

From a technological standpoint, and assuming access problems are solved, the greatest opportunities for PPGIS perhaps lie in the development of better interfaces and data models. Some of the main criticisms of GIS are levelled at impenetrable interfaces and data models that are unsuited to public access and handling qualitative interpretations of space and personal ideas of place and locality (Aitken and Michel, 1995). It may be that from a strict GIS perspective such data models are not possible, but hybrids or pseudo-models might feasibly be developed to bridge the gap between Cartesian coordinate space and mental/personal space. This recognises that there are many different types of space - from the physical to the metaphysical - and as many personal interpretations of these as there are people. GIS cannot possibly incorporate representations of all of these within its necessarily reductionist view of the world, but opportunities present themselves for GIS to at least provide something of a framework (or interface) by which we can express ourselves and our opinions/feelings about particular issues and decision problems. This gives rise to the idea of "territory as interface" where the map (and derivatives of it) is central to stakeholder interaction and dialogue - an environment that be explored, an ethereal space in which ideas can be tested and decisions formulated.

Threats

If we were blindly optimistic about participatory GIS we would probably deny the existence of any serious threats to its development and further adoption. It may well be that PPGIS or similar approaches might actually do much to help foster a new era of greater trust through more open and accountable decision making structures. However, some quite significant and pernicious threats do exist and we ignore these at our peril.

The current political climate and the power relations that have built up around it have bred a certain cynicism and mistrust among the general electorate in the democratic process. Politics is often seen as corrupt and obsessed with power and money rather than as a democratic institution with the aims of

service, trust and the public good at its heart. Trust is essential to any participatory process. Why would anyone take the effort to get involved if they believed that their input would simply be ignored or, worse, misused and distorted? The same principle applies to the data being used, much of which is collected by or on behalf of the state, and therefore to some people an object of some suspicion (Curry, 1995). The potential for misinformation within participatory systems is quite high, and people need to be able trust the data and tools they are given if they are to trust the whole participation process.

The issue of (mis)trust in the wider democratic process is beyond the scope of this paper, but it remains an important issue. The relative positions of power in respect to different stakeholder groups within the decision making process is also an issue that threatens the potential of PPGIS. Issues surrounding relative equity within the decision-making process need to be addressed. It is perhaps unrealistic to imagine that the views of a single individual could ever hold as much power as that of a government minister or elected representative, but taken together the collective views of individuals and community groups need to be taken seriously.

We might not always be able to trust the responses gained through the employment of participatory systems either. There are significant and, to date, unresolved problems concerning the representative nature of the data generated and the validation of individual responses. Internet-based systems are especially vulnerable to being hijacked by determined individuals or groups intent on pushing a particular view. It is also difficult to distinguish between genuine responses and those submitted by whim or fancy.

Antipathy in the very people it aims to empower may well turn out to be the greatest threat facing participatory GIS. The general public may well be interested in a particular decision problem but when faced with the opportunity to take part, often adopt an antipathetic position. "Why should I bother? I can't make a difference." This fits the "fatalistic" or "hierarchical" category of decision-maker described above. It may sound trite, but "while you can lead a horse to water, you can't always make it drink". Regardless of the amount of hype and incentive, people might just not be interested enough or have the time and energy to participate (Davies, 2001). This is especially true in times of economic recession such as facing the world today, since people tend to be more concerned with day-to-day economic necessities in times of hardship than with the luxuries of playing politics and long-term planning.

The Way forward?

The industry standard strategic response to any SWOT analysis is simply to build on your strengths, address your weaknesses, exploit the opportunities and neutralise any threats. The same can be said of participatory GIS. We can perhaps use the SWOT analysis as a frame of reference in drawing up a research agenda that supplements those arising from the I-19 and the Varenus Projects.

A new research agenda

Several research directions can be identified that are to some extent 'generic' or non-location specific in the sense that they applicable as much in Europe and they are in the US. A draft 'generic' research agenda based on the above SWOT analysis might be as follows:

1. Building on existing strengths:
 - a. Raising awareness among decision makers about the potential of GI-based participation;
 - b. Further research into methods of incorporating local knowledge into GIS databases;
 - c. Further research into methods of communicating GI (and associated issues) to the lay public; and
 - d. More practical real-world applications of participatory GIS to increase experience.
2. Addressing weaknesses:
 - a. Increasing access to wide range of GI for use in public participation exercises (e.g. through copyright agreements for 'local' use);
 - b. Further research on public perceptions of space and understanding of the spatial aspects of decision problems;
 - c. Further research on public approaches to decision making when there is a strong spatial component; and
 - d. Research on how more qualitative perceptions of space, place and locality may be incorporated in to GIS databases and/or models.
3. Exploiting opportunities:
 - a. Investigate how participatory GIS approaches may augment traditional means of participation;
 - b. Develop mechanisms for demonstrating accountability of decision made using public input via participatory GIS;
 - c. Investigate possibilities of porting participatory approaches to various new media such as digital television and wireless communications; and
 - d. Research and develop adaptive user interfaces to enable content and methods of interaction to be customised to the user.
4. Neutralising threats:
 - a. Investigate methods of increasing the transparency of GI and communicating limitations to the user; and
 - b. Develop methods of verification and validation that can be applied to responses gained through participatory GIS.

A research item that cuts across all four of these headings is the multiplicity of issues, factors and concerns that characterise the whole topic of transforming GIS into a tool for the masses. So far this paper has attempted to draw the reader's attention to a range of issues from the social science of decision-making behaviour to the technicalities of serving GIS on the Internet. What is clear from this brief undertaking is the multi-faceted nature of the subject matter. When developing participatory

GIS we inevitably end up working with a range of multiples: multiple stakeholders, multiple criteria, multiple objectives and multiple scales, together with differential levels of access, training and finance to differentials in spatial cognition, education and cultural background. In short, we need to consider "multiplicity" as a universal research agenda item.

Perhaps the main route by which the GI research community can take this agenda forward is through the development of example real-world applications of participatory GIS approaches. In other words, real people using real systems to address real problems. To do so would necessarily involve answering many of the other research objectives in the above list. To date there has been a great deal of theorising and conceptualising and deconstruction about the possible role of GIS in society. Perhaps now is the time to start doing and learn by our actions. May be then, and only then, will we start to find answers to support the theory and discover just how far GI can help in promoting the ideals and facilitating the mechanics of the new deliberative democracy.

Geographical addendum

Much of the above discussion, whilst recognising that space, place and locality are of tremendous importance to participatory approaches in spatial decision-making, does not fully distinguish between the local 'truths' that exist between different communities and the parts of the world they occupy. For instance, planning law differs from one country to another, while the sense of place that shapes the way one group of people feel about a particular location also shapes the way in which they may approach a problem and the decision-making process itself.

Basic cultural differences, based on social and environmental stimuli, often mean that there are fundamental differences in the way the global 'we' may approach the same type of decision problem. Different cultures possess differing notions of hierarchy, patriarchy, honour and dependency. For example, in Asian countries there is a much stronger sense of hierarchy than is generally found in North American and European countries. This manifests itself in a greater deference to decision-making structures that are based on respect for the views of 'elders', leaders and learned 'experts'. In other instances, local people may see the intervention of other countries in giving aid or advice as meddling or to accept such help as dishonourable. The short history of GIS and ICT applications in international aid and development is littered with projects that have failed because outside organisations have not understood the basics of the local situation or heeded local opinion (Mather, 1997).

The cultural dimension further complicates our understanding of group and individual decision-making dynamics in a way that makes cross-cultural and international decisions particularly awkward - a fact made only too obvious by recent world events. While politics and religion, disputed resources and the blinkered tribalism of the 'other' may fuel these there is often a common theme of geography behind many conflicts. Armed conflict is often the inevitable result in the presence of two 'nation states' confined within one geographical area, contemporary examples

being Northern Ireland and Israel/Palestine. GIS is beginning to be used as a tool of analysis and mediation in cases of international conflict (Wood, 2000a). Two well-publicised examples are the use of GIS to redraw the boundaries of ethnic enclaves in the Balkans (Bouchardy, 2000; Wood, 2000b) and map Palestinian and Israeli territories in the West Bank and Gaza Strip (Aronson, 2000; Starr, 2000). Although this may seem at first glance to be an area ripe for participatory GIS, feelings of the potential participants are likely to be too entrenched to yield acceptable compromise solutions. Alternatively, the anonymity of Internet-based approaches to participation and GIS communication of geographical 'realities' may help break the deadlock by allowing peoples' true feelings to surface without fear of recrimination among neighbours and 'allies'.

Returning to Europe and North America, basic differences between respective constitutions create the need to investigate a range of participatory approaches; each tailored to the needs of individual countries. What works well in Europe, might not necessarily work well in North America, and visa versa. There are also likely to be regional differences due to differences in local government, such as size, resources and politics, and differences in the geodemographics of the target population. This is especially true in Europe where history has created a mosaic of very different political and social systems. For example, unitary authorities in the UK are considerably larger than their counterparts in France, Italy and Germany, while the systems of national and local government are similarly diverse. Citizen involvement in local government decisions is therefore more developed in some EU countries than in others, perhaps reflecting these geographical differences and the political and social opportunities presented. This gives rise to a number of questions that we, as GI and ICT researchers, may wish to address. For example:

- Do national and local governments in small and densely populated countries associate more with participatory approaches?
- Is there a north-south gradient in levels of participation with greater opportunities for participation in northern countries?
- How has the history of the EU and North America affected opportunities for participation?
- Does participation vary between central and marginal states, and between old and new members?
- How does this historical legacy of shifting borders in Europe affect the social and cultural dimension of participatory approaches?

These differences (if they do in fact exist) make the possibility of developing generic approaches to participatory GIS within the European scene seem rather remote. Indeed, we may identify similar differences between US/Canadian States, for example between California and, say, Tennessee or between native-Americans and European immigrants.

Whatever the answers to these and other questions on the opportunities for and potential uptake of participatory approaches

it ought to be apparent that there is some common ground within the participation and GI/ICT research agenda. It is also clear that the geographical differences mentioned above will be responsible for fundamental differences in the way we apply the results of this research at a regional and local level. The key to this is perhaps through developing a broad and detailed understanding of the social aspects of decision making and being able to apply this sensibly within the rapidly changing technological arena.

Human nature has been thousands of years in the making and cultural identities have developed over hundreds of years. Our geographical sense of 'belonging' can change over generations or an individual lifetime, and yet the technology of GIS and ICTs is developing and changing so quickly that the social and political dimensions are having difficulty in keeping pace. It is perhaps for reason that some geographers and social scientists feel threatened by GIS and ICTs. Rather than stalking each other from either side of the epistemological fence we need to work together to realise the potential benefits of GI and ICTs, but temper any trend toward 'blind' technological positivism with a social realism that understands the physical and metaphysical boundaries of essential human nature.

About the Author

Steve Carver

Corresponding Address:

School of Geography, University of Leeds, LS2 9JT, UK

Email: steve@geog.leeds.ac.uk

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