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«DEVELOPMENT OF A CONCEPTUAL FRAMEWORK FOR THE ANALYSIS AND THE CLASSIFICATION OF "PUBLIC PARTICIPATION GIS"

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Résumé

Dans le contexte actuel de démocratisation des technologies et des méthodes géomatiques, les expériences du type « Public Participation GIS » - PPGIS se multiplient. Le concept de PPGIS est, par essence-même, interdisciplinaire et multiforme. Il s'apparente, d'une certaine façon, à un déclinaison spécifique des SIG, vus comme des systèmes d'information (données, matériels, logiciels, méthodes et composantes humaines), incluant la dimension de la participation publique. De fait, les PPGIS ne se limitent pas aux simples outils logiciels. L'objectif principal d'un PPGIS consiste à accentuer/supporter l'implication des citoyens dans les processus de prise de décisions territoriaux, et à améliorer l'accès aux outils, aux données ainsi qu'à l'information (Steinmann et. al. 2004). Les applications des PPGIS revêtent des formes très variées, selon le contexte économique, l'organisation sociale et politique, la culture, mais également en fonction des problématiques traitées et des méthodologies développées (Joliveau 2006). Les exemples mettent en évidence qu'en pratique, la dimension 'participation publique' des PPGIS renvoie à des réalités différentes.

La construction du domaine des PPGISciences (Sieber 2004) est basée sur la convergence de concepts sociaux, culturels, éthiques et environnementaux avec les technologies de l'information et à la géomatique. Ce développement engendre des questions épistémologiques complexes, dans la mesure ou chaque discipline impliquée pose évidemment un regard différencié sur les PPGIS. Par conséquent, le concept même de PPGIS est ambigu. Il n'existe pas de consensus sur ses éléments caractéristiques. Ce constat pose problème, tant sur le plan scientifique que sur le plan pratique, dans la mesure où il rend difficile, non seulement la formalisation de méthodes de développement adaptées aux PPGIS ; mais aussi le développement de critères d'évaluation de succès et d'échec (Craig et al. 1999). La communauté scientifique des PPGIS considère d'ailleurs que pour comprendre la réalité sur laquelle les chercheurs doivent appuyer leurs travaux, la formalisation consensuelle d'une définition claire et précise du concept de PPGIS s'impose. Les spécialistes affirment que l'une des priorités actuelles est la conception d'un cadre théorique basé en particulier sur une typologie des PPGIS (Tulloch 2003, Steinmann et al.

2004). Malgré les quelques recherches déjà réalisées, seules quelques typologies partielles ont été développées, et le concept demeure flou.

L'objectif principal de cette recherche consiste à concevoir une typologie plus globale à partir d'une analyse en profondeur des concepts sous-jacents. Sur le plan plus pratique, cette recherche vise à concevoir et à développer un observatoire web des expériences PPGIS (ce dernier étant à la fois une composante de l'objectif et un moyen de l'atteindre). La méthodologie est basée sur la construction d'un cadre théorique (analyse de la littérature et des typologies existantes) et une analyse empirique (étude d'une série d'expériences de PPGIS). La méthodologie est complétée par une enquête sur les forums web spécialisés, de manière à solliciter la communauté du domaine et à valider nos résultats. Cette recherche a ainsi permis de construire une typologie des PPGIS, plus globale, complémentaire de celles déjà existantes. Se faisant notre travail permet d'améliorer la compréhension de ce domaine en émergence et apporte des éléments formels permettant de mieux le caractériser.

Abstract

In the current context of democratization of technologies and methods of geomatics, “Public Participation GIS” practices - PPGIS multiply. The concept of PPGIS is, by its nature, interdisciplinary and multiform. It is connected, in a certain manner, to a specific variation of the GIS, understood as information systems (data, hardware, software, methods and human factor), including the dimension of public participation. Essentially, PPGIS are not limited to simple software tools. The principal objective of a PPGIS consists of accentuating/supporting the implication of the citizens in the territorial decision making processes, and to improve the access to tools, data, and information (Steinmann et al. 2004). Applications for PPGIS take a variety of forms depending on the economic context, the social and political organization, the culture, but also regarding to the treated problems and developed methodologies (Joliveau 2006). Examples underline that, in practice, dimension of “public participation” in PPGIS echoes different realities.

The creation of the field (Sieber 2004) is based on the convergence of social concepts as well as cultural, ethical and environmental concepts associated with information technologies (IT) and Geomatics. This development generates complex epistemological questions, in a measure where each implied discipline obviously poses a different view on PPGIS. Consequently, the concept of PPGIS is ambiguous. There is no consensus on its characteristic elements. This circumstance causes some problems, both on the scientific and practical levels. It makes difficult, not having the standardization of methods of development adapted to the PPGIS; but also the development of evaluation criterions of success and failure (Craig and al 1999). Besides, the scientific community associated with PPGIS considers that in order to understand reality that the researchers must rely on their works, the agreed formalization of a clear and precise definition of the concept of PPGIS is inevitable. Specialists affirm that one of the current priorities is to design a theoretical framework particularly based on a typology of PPGIS (Tulloch 2003, Steinmann et al. 2004). In spite of some research work already carried out, only a few limited typologies were developed, and the concept remains unclear.

The principal objective of this research consists of conceiving a more global typology starting from an in-depth analysis of the subjacent concepts. From a practical level, this research aims at designing and developing a web-based observatory of PPGIS experiments (this one is a component of our objective and at the same time a means of reaching it). Our methodology is based on the construction of a theoretical framework (literature review and an analysis of existing typologies) and an empirical analysis (study of a series of PPGIS experiments). Methodology is effectuated by an investigation into the specialized Web forums, so as to solicit the community of the field and to validate our results. This research thus made it possible to build a typology of the PPGIS, as a hole, complementary to those already existing. Doing this work improves understanding of this field in its infancy and elicits formal elements for better characterization of PPGIS.

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To my beloved father, Kemal Turkucu

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List of Abbreviations

GIS	Geographic information systems
PPGIS	Public Participation GIS
PGIS	Participatory GIS
GI	Geographic information
GIT	Geographic information technologies
GPS	Global Positioning System
ICT	Information and communication technology
PRA	Participatory Rural Appraisal
RRA	Rapid Rural Appraisal
PLA	Participatory Learning Appraisal
SK	Scientific Knowledge
LK	Local Knowledge
CGIS	Community GIS
P3DM	Participatory 3 Dimensional Modeling
PGRM	Participatory Gender Resource Mapping
CIGIS	Community Integrated GIS
MIGIS	Mobile Interactive Geographic Information System

CHAPTER 1: RESEARCH PROBLEMS, OBJECTIVES AND METHODOLOGY

1.1. Introduction

Recently, Geographic Information Systems (GIS) have been presented as decision support systems. Evidently, the innovations in computing, Geographic Information (GI), and Geographic Information Technologies (GIT) have become central elements in this epoch. In such an ambiance of prevailing elements, the computer is a dominant technology as well as a means for describing geographical phenomena that can't be ignored (Veregin 1995). In effect, as Chrisman (1997) argued, technology has been a driving force acting on the construction and dissemination of geographic information. Further, this opportunity, especially the computer revolution, has been pictured as a means of achieving a more democratic society and improving a larger base of understanding of social, political and economic issues (Veregin 1995).

Such favourable aspect of these technological novelties in computers and GIT leads to secure its popularity among decision makers and policy authorities. In contrast technology is not 'always' adequate in actual implementation (Pinch and Bijker 1987). Ideally, in order to achieve a certain level of social and cultural goals; technology should be integrated with these vital environments.

The situation in GIS, which is the key issue for our concern, seems not so exceptional. The transfer of GIS between different actors is dependent upon the interaction between technology and the context in which it is located (Campbell 1996). Once Wegener and Masser (1995) mentioned that, in general, the principal users of GIS are at various levels, utility companies and central and local government agencies. In fact, it tends to change direction through its diffusion in many sectors and its rapid adoption in time. The potential applications and the impacts of GIS on many disciplines as well as in practice have gained serious momentum. In the context of the innovations mentioned before, GIS have served an important role in different disciplines as an integrating technology between these applications. For example in Geomatics; which is a fusion of various disciplines like surveying, cartography, geodesy, photogrammetry, remote sensing, etc., and in many other disciplines such as civil engineering, statistics, computer science, operations research, artificial intelligence, demography, and many other branches of the social sciences, natural sciences, and engineering have all contributed as well, aiming to improve the way that we make decisions (NRC - National Research Council of Canada; Pickles 1995).

Unfortunately, these technologies are not evenly distributed (Openshaw 1996). Therefore in a social and cultural context, the majority of the public still do not profit from the benefits of these technological innovations. As a consequence some segments of society don't share the same possibilities to realize the efficacy of these technologies. Not surprisingly, we can obviously visualize that when the people realize the benefits of GI technologies either in their life or in the public, it will become more widespread, consequently the period for absorption of technologies will be shorter (Rogers 1995). Regarding to these theories, Campbell (1995) considers the diffusion and the broad acceptance of new technologies as having powerful effects related with the reasons and impulses of the change and the progress of the societies.

While GIS and related technologies have spread in decision making processes, some segments of the society, such as ordinary citizens or in some societies especially women or first nations, etc. (Aberly and Sieber 2002), are marginalized from decision making processes. Another circumstance is that since GIS requires high level of training for competent use. Even with an interest in a particular decision problem, this technology is beyond the reach of ordinary citizens. Accordingly, it leads the technology to take its place in a professional sphere away from the participation of the ordinary citizens. These aspects let GIS be employed in an isolated manner and be accessible only to elite technologists (Pickles 1995), also termed 'top-down spatial analysis' including an undemocratic character by supplying single solutions to multiple realities (Cinderby 1999).

The complexity within GIS, where GIS seems to be adapted only for an expert use, makes GIS reinforce existing power rather than being accessible to the public (Pickles 1995). In this context GIS ignores its social side, through marginalizing some people and communities and simultaneously empowering others (Weiner et al. 2002). From the ignored ones' side, GIS leaves a gap between its technical and social role. Despite much evidence of technology as a social process (Schuurman 2000), this gap seems irrational. Therefore, this hiatus should be overcome by developing the social role of GIS.

At this point, attaching its conceptual base in GIS to society issues becomes apparent within a new concept (Weiner et al. 2002). This new concept studies the applications of GI and/or GIT used by members of the public for participating in some processes (i.e. data collection, mapping, analysis and/or policy making, etc.) about the issues affecting their lives (Sieber 2004). This new concept, public participation GIS (PPGIS), intends to promote a bottom-up component of public involvement and democracy and to empower marginalized people as well and will allow an effective interaction between the individuals (public participation) and the computer (GIS).

Public will use these GIS-based tools to construct their decisions with the existing information, inform themselves about other people's idea, formulate their visions and let these visions be distributed to other communities. This public participation processes can be carried out by community residents, community-based organizations and members of the local business community as well. Participation processes can be performed also through the Internet (web-based PPGIS). Kingston (2002) strongly believes that if the suitable conditions can be supplied, these web-based systems can improve future decision making processes profoundly.

So far, the problem encountered here in PPGIS, is definitional conflicts remained to be settled. In the literature there are numerous ambiguities on various concepts of PPGIS (Sieber 2004; Tulloch 2003).

Since PPGIS is a very broad concept which is based on the convergence of many disciplines, the domain faces complex and diverse epistemological questions which make the concept ambiguous. Within such context attention to the definition may be helpful for practitioners and scholars illuminating the domain.

Our research, examines the relations between the underlying elements of the concept with the intention of better understanding exactly what PPGIS means. In doing so, we are offering a review of key relevant literature about the concepts and finally proposing a tentative typology of PPGIS. Our approach pursues some epistemological treatments of the concept.

Chapter 1 describes the existing problems in the domain including our specific research problems, our objectives and the methodology employed as well.

Chapter 2 reviews the literature on PPGIS and the related fields and especially concentrates the origins of PPGIS.

Chapter 3 is devoted to the understanding the different sources of our data addressing the identification of the characteristics of PPGIS for the typology. The remainder of chapter 3 is concerned with the important elements of the analysis and describing the typology followed by results of the research and finally conclusions of the research (chapter 4, 5).

1.2. Problems and Existing Questions in PPGIS

Participatory demands began to develop around local planning issues in the early 1970s, when various urban revitalization and transportation projects provoked public efforts to have an authority on planning decisions. Nelkin (1977) gives several examples especially from the European Countries in which the public discussions and initiatives succeeded in influencing a number of planning projects in these days.

In United States and Western Europe, the efforts to promote broader public involvement in policy-making seem to be older in comparison to that of other countries. We observe numerous attempts to raise some debates on political level and some voice especially on the issues with science for the citizen in 1970s trying to permit public interest groups to acquire the basic technical skill to deal with the science and technology aspects of public policy issues. And for the most part, the efforts to promote participation in technical areas emphasize education says Nelkin (1977). Since the early 1970s the questions are the same in the participatory avenues, seeking the ways to meet public demands and trying to find ways to increase direct participation in planning first, and in other domains next. And the other important question is about who should participate in this process.

It is obvious that the efforts to encourage collaboration among scientists, planners, governments, etc. and the public through public discussions or some other methods for the participation, persist since the beginning. Thus, this may be the origin of all existing questions concerning participatory projects.

PPGIS deals with particular difficulties such as trying to expand to a wider public level and full participation of them as well as attaching them the use of the technology. Even if PPGIS is intended to broaden access to GIS it is still questioning that who has access to PPGIS and accordingly by accessing these systems who benefits from such systems (Weiner et al. 2002).

The problems with access appear in a form such as individuals who don't have any access to the Internet or access to data or who can't afford the software. The dilemma can be seen as the problems with the complexity of computers, GIS tools or Internet. There still exist many people who don't have any basic levels of training in computer or in Internet media. Even though Internet has infiltrated almost every areas of our daily lives, it is still an unsolved puzzle for some. Hence, since we cannot assume that everyone is using GIS, access to information and resources, availability of GIS at a community level has serious limiting factors, particularly in some rural areas.

Weiner et al. (2002) also call our attention to the difficulties with the political side of PPGIS which may cause complications to some extent. They mention that PPGIS projects are political because they involve community participation, which is again essentially a political process. And it was mentioned that community GIS is a reflection of the politics of the builders and users of such systems, although these politics extend beyond the local impacts on participating and non-participating communities. Another problem or a difficulty with PPGIS is the participation as mentioned before. Despite the fact that the practices advance the value of public participation GIS or participatory GIS as well, they also emphasize that even if the theoretical model of participation seems good on paper it is rarely easy to achieve the desired participation. It is known that the outcomes are often less than the expected.

As well as the traditional type of public participation there are several problems in the web based type of public participation. The public participation is still limited in many issues that need to take into account the opinion of the public for the democratic decisions. Despite the increasing popularity of the Web and consequently the Web-based GIS and the PPGIS as well, as a means to disseminate information in the form of maps and digital data, there are many barriers remain. The difficulties with web based systems emerge during the development. First of all, we may have some major problems in relation with the data which is obviously a vital part of the system as well as the considerable amounts of copyright costs of the data which can cause some major problems in terms of the feasibility of the project. In addition to the problems with data we may also have some problems regarding the necessary skilled staff. The development period of these web-based systems surely requires skilled personnel on the Internet and IT who area to be able to put GIS on the web.

Besides these technological difficulties, there are some other difficulties which may be considered less technologic. These concern the social values or the psychological profile of the participants, such as persons who don’t want to express themselves in the public, hesitate or don’t have an eagerness to participate even they have the chance to participate. Thus, it seems that the motivation factor is a key issue in participation.

In fact, the general view in the literature demonstrates that access and the participation are the major and tough problems. These two issues often emerge as linked to each other in a way that sometimes the difficulties with access result with insufficient participation. At the bottom of the participation issue there are several facts need to be considered for a wider participation because we have not observed effective and dynamic participation in a good number of recent applications (Jordan 1999).

Within this framework, other problems are; the lack of consensus on certain terms and concepts of PPGIS. Since the definition of the concepts and interrelation between subdivisions of PPGIS need an improvement, with this in mind, we may simply raise a general question of our research such as; how can we develop a conceptual framework for the analysis and the classification of PPGIS, aiming to highlight and to better understand it?

1.2.1. Specific Research Problematic

As mentioned several times, the PPGIS has a potential to give power to local communities, enhance global civil society, and contribute to public advocacy. Besides all its recognized value, yet the concept of PPGIS lacks clear and precise definition.

Since the domain is situated on the convergence of many concepts and variety of disciplines, the influence of these contexts constitutes the major characteristic of the domain. This fact generates complex epistemological questions, in a sense that each discipline involved presents a specific vision for PPGIS. In this framework the concept becomes multifaceted, making its ambiguity more complex. Additionally, in the literature, the definition of PPGIS, the concepts and interrelation between the subdivisions of PPGIS are still unclear and needs improvement.

So, the concept of PPGIS is vague and there is no consensus on its underlying elements and this may leads to problem of misunderstanding the concept. More specifically, this circumstance may cause some problems, both on the scientific level and the practical level, it makes difficult, not only having the formalization of methods of development adapted to the PPGIS; but also the development of evaluation criterions of success and failure (Craig and al 1999). Besides, the scientific community of PPGIS considers that in order to understand the reality on which the researchers must rely, a clear and precise definition of the concept of PPGIS is essential. So the problem in here is: how to define more precisely and clearly the concept? In response to this problem, a theoretical framework that takes into consideration the both theoretical and practical sides of the field of PPGIS could help. At the same time, specialists affirm that one of the current priorities is to design a **theoretical framework particularly based on a typology of PPGIS** (Tulloch 2003, Steinmann et al. 2004). In spite of some research already carried out, only some limited typologies were developed, and the concept remains unclear.

1.3. Research Objectives

On the whole, we can define our objectives to develop a conceptual framework in order to analyse and to classify the PPGIS studies. As an overall research objective we are aiming to conceive a tentative typology addressing PPGIS, based on a conceptual framework that covers both practical and theoretical studies.

More specifically, in order to reach our overall research goal, several objectives were defined as follows:

- Understanding the theoretical assessments of PPGIS study, its origins, its evolution in time
- Understanding a practical process of PPGIS through analysing numerous PPGIS case studies and put these practices in web-based observatory

In terms of conceiving and to develop a web-based observatory of PPGIS practices, the idea of observatory seems another absence in the field. There are some sources of case studies but they are quite limited, both in terms of the number of the cases and the information they hold. With this idea in mind and some validation in the domain (see figure 1), the research concentrated on variety of case studies. The information about different case studies will be put in an observatory of case studies. The initial purpose of this observatory is to make an inventory of case studies that use the terms as PPGIS, PGIS or other acronyms such as CIGIS etc. And then make them accessible to the community.

The development stage of the database has realized by some collaboration. My particular concern with the observatory was the selection of the characteristic variables with the help of a survey-questionnaire in the domain, exploring a range of cases in an organized manner and finally the enhancement part of the database.

This kind of theoretical structure supposed to highlight the existing situation in PPGIS at the same time it may let us perceive the practical character of PPGIS studies and supply a better comprehension of this developing domain.

1.3.1. Justification of the Observatory

As well as the functional benefits of this observatory in our research it will also satisfy the necessity of such database for the PPGIS community. Moreover, the necessity of this interactive database of case studies was confirmed by some of the practitioners who are in the electronic forum (ppgis.net), through a survey (Fig 1). This survey was made by the moderator of ppgis.net (Rambaldi 2004). The forum ppgis.net gathers more than 700 experts and researchers around PPGIS and related concepts; an investigation was made in order to identify the future expectations of the people in the forum. The results clearly manifested demand for an interactive database of PPGIS case studies (58 over 89 respondents voted as very important, 11 respondents skipped the question). The need for an observatory of case studies was consolidated by this feedback within the community.

As case studies play a role of reflecting reality, they clearly nurture the concept in some measure. They give us a very meaningful feedback and put forth the realities in our consideration, the realities of PPGIS. And concerning the results of the investigation done in the domain, the importance of developing an observatory of PPGIS case studies and the related concepts (i.e. PGIS) became clear.

7. The following features may be added to PPgis.net in the future. Please rate their importance.

	Very Important	Important	Somewhat Important	Not Important	Response Total
Community mapping / PGIS case studies interactive database	**65% (58)**	31% (28)	3% (3)	0% (0)	**89**
Expert contact database	**45% (40)**	34% (30)	20% (18)	0% (0)	**88**
Organisations' database	**38% (32)**	35% (30)	26% (22)	1% (1)	**85**
Community mapping training resource database	**55% (48)**	36% (32)	8% (7)	1% (1)	**88**
Community mapping / PGIS newsletter	38% (33)	**50% (44)**	13% (11)	0% (0)	**88**
				Total Respondents	**89**
				(skipped this question)	11

Figure 1 ppgis.net survey results, December 2004

1.4. Research Methodology

Our methodology mobilizes especially a qualitative (descriptive, interpretative) approach. Some of these data can be expressed in numbers and some quantitative analysis. In particular the survey results in numbers or the analysis of case studies in numbers, as seen in the ladder of public involvement (fig 8). Based on these explanations, the defined methodology is schematically illustrated in Figure 2.

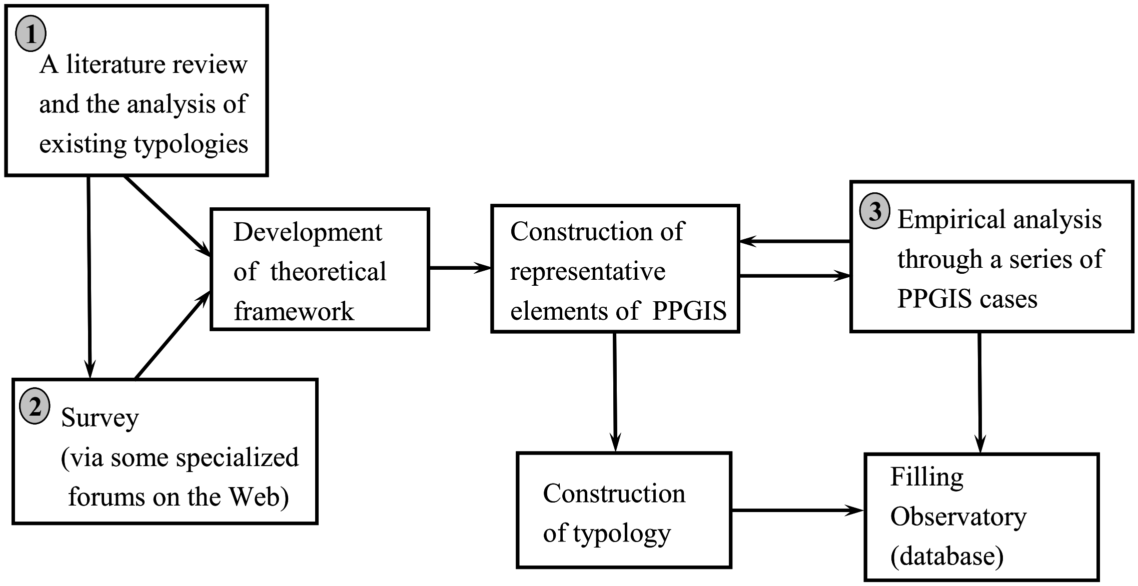

Figure 2 Methodological Framework

The overall process is based on three major components. The first step is to assimilate the information given in the available literature. With the assistance of literature, we were able to figure out the concept in-depth. The literature review made it possible to prepare the most vital questions for the next step of our methodology, the survey-questionnaire. Thus, the second major step involves the preparation and the administration of the survey via some specialized forums on the Web. The construction of theoretical framework, which is particularly based on literature review, has become filled out with the feedback coming from the survey. Finally we were able to prepare a skeleton of the essential variables for PPGIS cases. With this first part (steps 1 and 2) we were able to pre-define some of the characteristics of PPGIS. However, the analysis and the selection of variables are enriched by the third major step which can be seen as an empirical component of our methodology. This third major step comprises a detailed analysis of variety of cases. The analysis of case studies improved our awareness of PPGIS and enriched the outline of characteristic variables we were searching for. As the analysis of case studies served for the enrichment of the observatory, at the same time, this analysis contributed to the construction of a typology.

CHAPTER 2: REVIEW OF AVAILABLE LITERATURE - Evolution of PPGIS and its Origins

Despite the fact that PPGIS is tied to a debate on "GIS and Society", it has a richer history that comprises several different sources which have fostered its emergence (Weiner et al. 2002). Critics have had considerable impact on GIS and the discipline as a whole (Schuurman 2000). In fact, except the critical issues about GIS, which has emerged in NCGIA's Research Initiative 19, "GIS and Society" (Harris and Weiner 1996), there are some other phenomena that we need to consider to understand how PPGIS has emerged and taken shape.

PPGIS has multiple origins and it has been supported by various technologies and different variety of science. Since GIS technology has been questioned for ignoring public service and social concerns, this has stimulated the emergence of PPGIS accordingly the PPGIS has been spoken out explicitly. According to Chrisman (2004) during the last forty years, the researchers gradually became aware of the size of the implied network of GIS. At the beginning, the researchers focused on the technical aspects of it but recently, the studies relating to the interactions between society, organizations and GIS technology became more widespread.

The objective of this chapter aims to study diverse origins of PPGIS through an approach in which PPGIS has been seen as a bridge between different sciences, technologies and social aspects as demonstrated in Figure 3. However, rather concentrating merely on three elements, this approach deals with the mutual influence between these elements in this complex system. In other words interactions between these elements have become the major focus in this chapter. Many sciences have taken a part in PPGIS, particularly the GIScience, advances in technology have contributed to these sciences and PPGIS as well, and today PPGIS refers to a range of practices raised by the intersection of community/society (their interests, their participation, their knowledge) and variety of technologies. It is hard to separate science and technology from social context since science and technology are both developed in social context (Schuurman 1999). This is why these three major axes and their interaction have been chosen to refer PPGIS. In addition to our focus on origins, this chapter is also important in terms of providing a review of available literature.

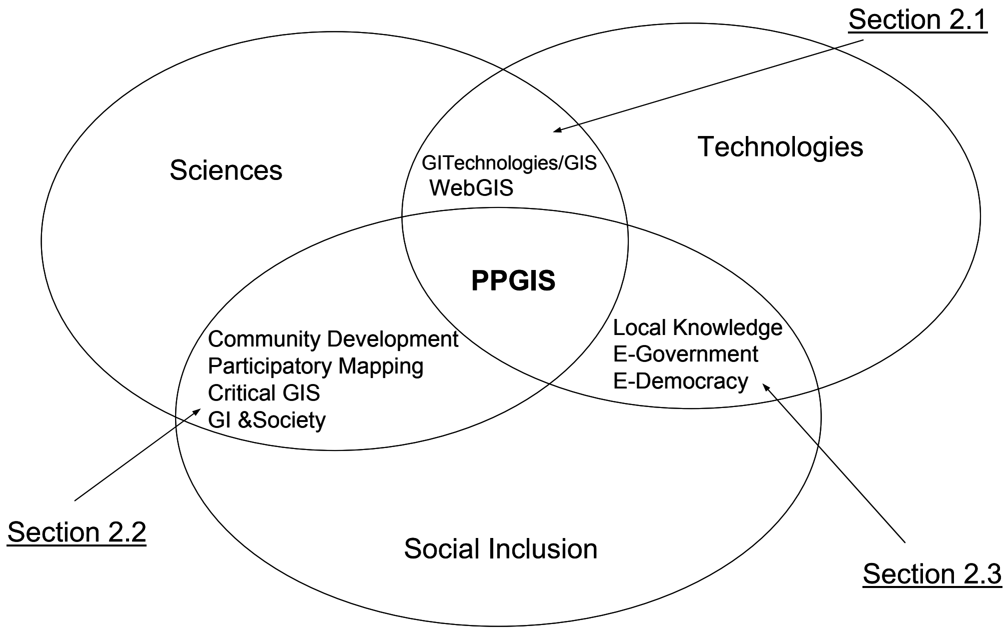

Figure 3 Intersections between three entities (technologies, sciences and social inclusion)

It has been tried to reconsider PPGIS, especially in terms of its development and emergence in time. Doing this, it has been needed to consider the historical steps in the development process of the concept. Thus it is required to explore the role of these critical issues, steps, which are intertwined in the emergence of PPGIS (technologies, sciences and social phenomena). In this emergence the debates on GIS have played an important role such as; disempowerment of public by some facts like being uncomfortable with GIS technologies or critics about (un)democratic nature of GIS (Harris, Weiner, Warner and Levin 1995) and the final criticism of traditional GIS before its emergence.

Finally this chapter is organized into four sections. The first section introduces science and technology movement in GIS and its different forms, such as; Web-based GIS. The second part deals with the meeting points of social impacts by analysing some important effects such as issues of community development, participatory processes and the previous critics on GIS, which can be seen as a stimulating factor in the emergence of PPGIS. The third section focuses on the crossroads of technology and social inclusion which is followed by the fourth section that provides a brief summary of these three major elements, science, technology and social impacts, with respect to their mutual relations.

2.1. Science and Technology

In the domain of GIS, earlier, when computers and their applications were seen as tools, the idea of technology driven research was new for GIS researchers (Goodchild 1997). But, today, with the advancements in computers and related technologies and dynamic interest in the Web, it seems necessary to acknowledge the considerable effects of technology on science and as well as on society. As computer technologies influence science and society, we observe many changes in our daily lives which are unquestionably technology-driven. At least, as Pickles (1995) notes that even if the effects of computer revolution not been totally positive, we need to gain a better understanding of its effects in order to manage this technology appropriately while these computer technologies will have worthy effects on many disciplines, geography as well, and become more widely accepted and adopted (Pickles 1995). Goodchild (2003) mentioned the new technologies have always been a key driving force in science and society as they have in "Geographic Information Science". And consequently, the mutual effects of science and technology, once again take our attention since the focus has become PPGIS in which the science tries to connect society with technology. Moreover, as information technology advances, corresponding public expectations of its application in participatory activities increases (Jordan 1998). In this manner, PPGIS combines the use of social science participatory techniques with technology and obviously with another science, GIScience. Thus its origins as well as its methodology seem interdisciplinary and have an important platform which turns around the mixture of different sciences and technology in greater part.

Accordingly, first of all we will try to focus on the union of the science with technology, particularly GIScience with technology, which is a critical combination in allowing access to decision making through the use of GIS and lately by taking the advantages of Web.

2.1.1 Geographic Information Science

As Thomas Edison once said; “I find out what the world needs, then I proceed to invent”. In fact, it seems that is where the inspiration comes from for the innovation process as it was for GIS once. In the late 1950s and early 1960s, there was a need for geographic data handling in Canada, because of the highly potential natural resources that provide different types of geographical data for the maps. And the manual methods of map analysis were not easy at all in terms of effort, time and necessity of enough trained people to carry out these analyses. From this necessity, in the early 1960s under the leadership of Dr. Roger Tomlinson, and with the sponsorship of the Canadian government, the first industry-scale computer based GIS were developed (Tomlinson 1998). Unofficially it is described as geo-information system or Geo-IS and officially geographic information system which was also known as Canadian Geographic Information System (CGIS) at that time. Eventually, in 1966 it became Canada Geographic Information System. Today the term has been modified as ‘Geographic Information System, (GIS)’ or ‘Geographical Information Systems’ (Chrisman 1999, reconsiders and discusses these definitions in an exhaustive manner)

The GIS field, as Chrisman (1998) mentions, also comes from the academic sector and is also in the crossroad of many disciplines. The two huge impacts in its development are academic sector and technological development. These are the fundamental elements which supplied a proper environment in its development (Chrisman 1998). This fact explicitly put forth the first inclusion of impacts of science and technology for our consideration.

Regarding the impacts of technological developments, especially with the increasing availability of information in digital format, today’s reputation of computerized spatial analysis is likely. In the early periods of GIS, the situation was different from today, the cost was high and only major government agencies were able to afford it, also only skilled people were able to handle it (Craig et al. 2002). Perhaps, these were the most critical reasons of why GIS had to ignore the ordinary citizens, obstacles related with price and expertise. However, it has started to change in time, as hardware and software prices drop, most probably as a result of competing environment in commercial. Besides, we notice other modifications in time, especially; application area of GIS is shifting to different fields little by little. We see this diversity very clearly in its application area. And despite it is known as a tool for land-use planners today some researchers pronounce as geographic information science (Goodchild et al. 1999; Elwood 2006).

Goodchield et al. (1999) discuss and outline GIScience as an information science and a systematic study according to scientific principles of the nature and properties of information. From this point, they consider that it is easy to define GIScience as the subset of information science which is about GI (Goodchild et al. 1999). In fact it stays a little unclear defining as a subset of information science. It will be more helpful to repeat the words that Mark (2000) once pronounced for GIScience, which claims that GIScience is rather concentrated on research field and its direction than application field, and it gives more satisfying affirmation which is as follows: 'GIScience is the basic research field that seeks to redefine geographic concepts and their use in the context of GIS. It also examines the impacts of GIS on individuals and society, and the influences of society on GIS. GIScience re-examines some of the most fundamental themes in traditional spatially oriented fields such as geography, cartography, and geodesy, while incorporating more recent developments in cognitive and information science. It also overlaps with and draws from more specialized research fields such as computer science, statistics, mathematics, and psychology, and contributes to progress in those fields. It supports research in political science and anthropology, and draws on those fields in studies of geographic information and society.' (p.48)

With this clarity in the definition, we become aware of that this description of GIScience also refers to the term Public Participation GIS, because GIScience takes into consideration the individuals and the society and the impacts of GIS on society. The underlying essentials for the construction of PPGIS are the elements such as science and technology and the social inclusion which we will concentrate mostly on the following section, in general these three corposants; science, technology and society are the basic motivations for the research in GIScience (Goodchild et al. 1999). And from these points some arguments have been emerged. In order to underline some justifications which are carried out by Sieber (2001), who argues that the model projected for GIScience, which is seen more than a tool (see section 2.4), also fits for PPGIScience. And she resumes whether science, system or study, many of the PPGIS researchers seem to apply/study the impacts of GIS technology (Sieber

2001). If PPGIS apply/study these impacts this event once again brings us to the melting point of both GIScience and technologies. Thus, it seems that one of the ongoing motivations for PPGIS is the dynamic and inter-connected relation between the science and technology. And further, the advances in today's technology having different variants, such as Internet, seem to favour the widespread GIS adoption (Dangermond 2002) and future PPGIS applications as well. This integration of GIS with World Wide Web (WWW) seem holding a great potential for the PPGIS applications in future.

2.1.2. Integration of GIS with WWW

With the use of the World Wide Web (WWW), GIS can allow more people to have access to GIS functionality and to enhance community participation in planning. Public participation is an approach in which the public is brought to play an active role in planning processes. The major concern is to use GIS as a tool to allow communication between different groups of society, such as planners, decision makers and public.

As previously mentioned, earlier before PPGIS, GIS was being designed primarily for expert use or it has been made accessible to the professionals but with today's technology it has moved a step closer to "increased accessibility" for general public. Web GIS industry as well; with many GIS vendors and third-party companies developing software that enables the widespread distribution and retrieval of Geographic Information via the Internet (Plewe 1997). Therefore, the Web can be considered as a powerful media which combines traditional GIS methods with novel tools for visual data analysis and decision making. Kingston et al. (1999) focused on the potential of Web and GIS for the public use in decision making. Thus, GIS can put its elitist form aside and may let wider involvement in decision making through web which has a potential for a wider participation as well (Bosworth et al. 2002).

Progressively, the use and the availability of GIS has become extremely popular and easy for some parts of the society. Global mapping services became available on the web and many GIS applications can be done free or open source software. With the Google Maps, using open source process enabled the GIS field become less mysterious. Like Google Maps many open source applications are on the core.

Although online - GIS address some of the issues, like GIS which has often been criticized as being an elitist technology such as the problems with access to data, being an expensive software, requiring high levels of training, etc. (Pickles 1995), and tries to concern with these issues by making some data easily available and giving free access to GIS software, this is still highly dependent on the intended user having Internet access and necessary IT training in the first place (Carver 2001). Associated with the fact of putting GIS online, there are some problems continue for PPGIS.

Despite these problematic issues of Web-based PPGIS, there are numerous reasonable applications where the web has been used. It would be very favourable to reinforce the concept with one of the well known online PPGIS application that integrates GIS, web and public. The Slaithwaite Participatory Planning System (see Annex, templates of case studies) took place in 1998, is one of the first online PPGIS allowing the community to interact with digital map area around West Yorkshire Village of Slaithwaite, UK. This exercise took place in order to identify the views and opinions of local residents regarding the environment in which they lived and how they would like their village to develop in the future. In this application public can view a map of Slaithwaite, perform zoom and pan operations, they can ask some questions to identify the buildings, roads, etc., they can make some comments and suggestions regarding the selected features in the map. The analysis of this study has already finished. Finally, all user input were stored in order to use for future analysis and feedback into planning process and in this way a community database is created.

In the Slaitwaite project, one of the major problems in these kinds of PPGIS applications, the problem of access to GIS technology, has been solved by supplying some Windows NT machines with Netscape Communicator (Kingston and others 1999; Kingston 2002). In fact, not all the applications are able to provide this opportunity for the public. Hence, this can be counted as one of the aspects of Web-based PPGIS to overcome in the future Web-based PPGIS projects. This project was developed by the members of The Centre for Computational Geography at The University of Leeds in the UK. Therefore, as mentioned above, this experiment, like many others in the domain of PPGIS, was initiated by the scientists. It can be easily seen in number of examples which allow us to examine these attempts by scientists (Craig et al. 2002). As we observed from several different case studies, it can’t be wrong to mention that it wasn’t the public who asked for it, actually it was the awareness of the needs of society which motivates the scientists to develop technological solutions for the society and then to test these solutions in terms of their feasibility in order to advance in science and technology. So, indirectly the desire for improvement in science and technology can be counted as one of the stimulating factors in such applications.

Keeping in mind these different perspectives, we need to remember that geographic information can be made available to the general public using the Internet but we need to consider that access to the Web is still relatively limited in some areas (Carver et al. 1998). Another issue with access, Laituri (2003) points out the complexity of access which is more than material connections to the virtual world and also becomes a matter of skill, contacts and education. Accessibility has several dimensions; access to the technology, access to the data, and also access to the knowledge which makes it possible to acquire the data. In this point, we also recognize the fact about another origin or especially cause for this emergence. PPGIS as conceived by these scientists, was precisely for supporting the access and participation of ordinary citizens in a way to promote a more bottom-up approach rather than dedicating to top-down strategies (Craglia and Onsrud 2003). However the idea of bottom-up approaches seems not so easy to realize in practice.

Erik de Man (2003) discussed, access and participation depending on social conditions, particularly culture and institutions. Several studies exist which demonstrate these different conditions and their effects on the distribution of these technologies such as the gender or age on the use of Internet as well as some inequalities in education (Hansen 2004 a). We can continue to multiply the factors having an effect on access. These additional factors make the context more exhaustive and once again remind us the difficulty of restricting these concepts to fixed limits.

Web based PPGIS appears technical and sophisticated to the public. To overcome the problem of access, which has multiple dimensions, solutions are needed that are not technically oriented, so that we can improve the adoption by citizens (Roche 2003).

That is also suggesting to focus on the questions to be answered including the user's age, gender and social background, the user's opinion about the systems and how they use them as well as how the user's feedback is handled by the authorities. So that this kind of approach may help to fulfill the citizen's expectations for better results, for the further developments in PPGIS research (Hansen 2004 b). Consequently, it seems that it is required to consider social truths more carefully in GIScience or PPGIScience, since the science is socially constructed, to find feasible solutions that are able to respond the citizen's needs and expectations.

2.2. Science and Social Inclusion

The term science can mean any of the following: the organized, well-founded body of knowledge of natural phenomena; a field of systematic inquiry in which knowledge is sought or a distinctive form of human cultural activity (McGinn 1991). Scientific claims and ideas have an influence on social values informing policy and on cultural ideas as well (Longino 1990). Regarding the most dominant relation between science and society, science has been expected to communicate its discoveries to society. However Gibbons (1999) mentions that a new contract between science and society must guarantee that scientific knowledge is socially robust and that its production has to be both transparent and participative to the public. Formerly the communication between science and society was science to society. But today this communication is shifting. This shift enables public to speak to science which may help to produce socially vigorous knowledge (Gibbons 1999).

Which earlier studies demonstrate the inevitability of evaluating social aspects and science as a whole, and since that the science was socially constructed, the scientific ideas should not be treated in a way as being somehow free from social influence (Webster 1991). This interpretation was also recognized in the domain of GIS (Schuurman 2000). Because, the same was true and the same combination was valid and necessary for a fair and proper science. Consequently one of the concepts in which GIScience addressed societal issues was through Participatory GIS applications (International Conference of Geographic Information and Society - GISOC' 1999). As seen from the definition of GIScience proposed by Mark (2000), GIScience examines the impacts of GIS on society and the influences of society on GIS. However PPGIS does not only overlap with GIScience also with the other sciences such as social sciences which often emerge with the issues like community development and participation.

2.2.1. Community Development, Participation and Planning

Community development is a long term process aiming at improving various aspects of local communities. There are several factors having an influence on this process of community development. We can count some of these influencing factors as well as the domains involved, such as; social lives of humans, groups, societies, ethnic relations, education, demography, public policy, social psychology, social mobility, and so on.

Equally, it would be complementary to clarify the participation and participatory GIS (PGIS) concepts beside the concept of PPGIS. Starting with participatory GIS (PGIS), the essential objectives of the participatory GIS, as Harris et al. (1995) described, are: enhanced community/development planner interaction in a research and policy agenda setting, the integration of local knowledge with technical expertise, the spatial representation of relevant aspects of local knowledge, genuine community access to and use of advanced technology for rural land reform and the education of expert rural land use planners about the importance of popular participation in policy formulation and implementation.

Earlier, while PPGIS was seen as a practice in neighbourhood problems, in planning and also in development (Craig et al. 2002), today some researchers apply the term in a different way. Keeping in mind the descriptions above, we notice that according to some researchers/practitioners PPGIS is seemed to involve planning rather than development even if several examples occur in development. So, it seems interesting to observe this shift in the domain. At this point another term participatory GIS (PGIS) seems to engage more with development projects. The slight distinction between the concepts of PPGIS and PGIS, especially in terms of their application areas, has to be highlighted to diminish the conceptual ambiguities in the domain.

PPGIS mainly takes inspiration from GIS as a way that GIS technology or GIScience could support public participation or as what GIS can do for the society, for the development of a community. Consequently, in this long term community development process, for an enhanced, well developed community, it is necessary to have transparency in the decisions taken. With the word “transparency” we mean the decisions which allow people, who are interested in a decision, to understand what is being decided, why and where (Drew 2003). This necessity of transparency in decisions can be ensured by participation in decision making so that the public can directly participate in every decision which affect their lives. Susskind (1994) defines participatory decision making, a process of public participation that involves people in particular decisions, problems, projects, or consensus building. Nyerges (2005) mentions that participatory decision making is a very old issue like democracy. According to him participatory decision making exemplifies the practical truth of democracy that those affected by a decision outcome should participate directly in decision making processes.

We have tried to mention a few concepts directly or less directly linked to community development. These concepts are also related to the GIScience and society since they are aiming to work for community development under the concept of PPGIS.

GIScience, participatory methods and social sciences are the fundamental factors for the inspiration and the design of PPGIS. The following section covers other forms of participatory methods like participatory methods in mapping as well as their interaction with GIS. Following it will also be emphasized the combination of these social aspects through the criticism and social impacts of GIS.

2.2.2. Participatory processes in mapping

Apart from some recent forms of participatory methods such PGIS and PPGIS, in fact participatory methods started to appear in mapping during the late 1980s as a result of participatory rural appraisal (PRA) (Chambers 2006). Among the other PRA methods participatory mapping has been the most widespread and adopted method (Rambaldi and Callosa-Tarr 2000, 2005). As it is seen in its acronym it implies appraisal and emphasizes local knowledge and enables local populations to make their own assessment, analysis and plans. Human can create maps in their minds with their own knowledge (Brody 1981). This knowledge about the environment can be presented in a variety of forms often involving non-linear notions of space, references to stories, myths, etc.

PRA, which highlights the local knowledge, was originally developed for use in rural areas of less developed countries. It prescribes healthy communication and transfer of shared knowledge between local people, practitioners and government officials. Actually, participatory rural appraisal was built on Rapid Rural Appraisal (RRA), which was started in the 1970s; with some more additional concepts to RRA it has gained a new structure. Participatory Rural Appraisal involve with local people in the development of their communities, and of their participation in construction of data and information in projects through many techniques which let them to identify and mention their priorities (Chambers 1994). These participatory techniques such as mapping, transect walking and ranking are flexible, simple, inexpensive and rapid (Williams and Dunn 2003). Participatory mapping is a tool which is supposed to involve members of the community in mapping their land and resources which are important to them. These maps are hoping to respond to the needs and expectations of the community.

These simple participatory techniques somehow coalesced with GIS. With the rapid growth in GIS, it has been recognized that system such as GIS can facilitate the management of local knowledge and enhance the usefulness of these participatory processes. It is possible to mention this aspect of GIS as a social process as well as the technological process since it supports integration of local knowledge with GIS and Information Systems.

Although it is commonly overused, it remains valid to say that, GIS and parallel evolutions in technology "made it easier to create meaningful and attractive maps" that can respond to the needs of community. And this idea of using GIS, which has some great facilities in the inclusion of knowledge of community, has been come out in decision making processes (Tripathi et al. 2004). Thus, there are a number of reasons of being conscious of the social world in GIScience. Accordingly this awareness of society let the concept of public participation GIS to be emphasized and pronounced formally after some critics on GIS.

2.2.3. Critical GIS: How GIS gained a different form?

The term critical GIS was first used during the meeting which took place at Friday Harbor, in 1993. And the questions rose at that meeting were about critical perspectives of GIS technology such as; how GIS can be represented in a social context since paying attention to the statement that technology is a social process (Schuurman 2000).

That meeting led to the NCGIA, to revise the social effects of GIS. Participants at this meeting discussed some important points such as; development of bottom-up GIS, successful incorporation of community participation into a GIS and also limits of participation in top-down decision making. These questions followed by another further question, which lead to appearance of another term “GIS2” (Minnesota meeting, 1994-95), the question was: “what an alternative GIS might look like?” And this is led the new concept public participation was emerged and finally was developed at a meeting held in Orono, Maine in 1996. Consequently, it is important to draw attention to the time of this event, which seems to be the formal origin of the PPGIS, at least the origin of the term PPGIS even if it has multiple origins. As it is mentioned, the critics of GIS had considerable influence on the discipline. They have tried to alert GIS scholars to the social consequences of the technology as well as the ways in which culture is written into technology (Schuurman 2000).

In a top-down approach, GIS empowers the powerful and marginalizes the weaker, through the participation of some selective groups or individuals (Harris et al. 1995). Thus, PPGIS aims to incorporate the ones who were previously disenfranchised and incorporate their local knowledge into decision processes. Openshaw (1996) argued that the use of GIS is one-sided and thus clearly unfair. So it needs to become more available to all in order to have an influence on decisions that affect them. As a result, the interaction of the people with geographic information may affect many decisions taken. The more the citizens are involved in the construction of geographic information process, the more they can participate in decision making (Roche 2003). Since the public interact with it, they own it and participate and this success can lead us towards more democratic decisions.

2.2.4. Impacts of GIS to Society and vice versa

GIS is one of the important mechanism used for the analysis and presentation of information about the physical environment. The development of this mechanism continues in many ways, mostly in a technical way. However, the advance should not be carried out only in a technical way. The perspective can be broadened by taking its social practice into account. That is also the ideas of what is aimed with the study in the mid 90s on theme "GI and Society" and mostly about impact of GIS on society.

Efficiency of the implementation processes has been one of the issues of the previous research done in this area. However, for better understanding of these implementations; the effect of these systems on the public economically, politically and culturally should be understood. The measurement techniques and theories should be developed in order to point out the effect of spatial information on policy decisions. This type of application will let us predict how geographical information technology has an influence on the communities and organizations that implement them (Pickles 1995; Roche 2000). Studies of the current and potential applications of GIS, especially in epidemiological studies with its immense impact on the social concern, permits to define these impacts quantitatively as well as qualitatively (Carver 2003).

According to the research done on the evaluation of the behaviour of the individuals, a complicated situation emerges for the perception of the individuals about decision making domains because of their various acts for these areas (Carver 2003). These individuals act one way for a situation and in another way for another situation. On the other hand, groups are formed in order to transmit a more reliable vision. Thus it can be said that the decisions taken by groups are different from the individuals and group performances are more consistent, more established and decisions taken by an agreement.

These discussions can support the uselessness for searching for a global decision making behaviour since social and cultural factors play a crucial role for the groups and individuals in understanding problems. Thus the research should be assembled with the behaviour of these bodies which is highly concerned by social sciences.

Schuurman (2002) states the situation from a different perspective, one of the main obstacles for collaborative research on the social aspect of GIS is the difference of the methodologies used by the human geographers and the GIS community. This factor limits the possibility for investigating social influences on GIS. It has been argued that “all technologies are affected by culture” and “GIS is clearly a social technology” in the sense that it both reflects and can direct institutional policy. Several examples can be found in urban planning, forest management, and modern warfare demonstrate this influence (Smith 1992).

A different approach comes from Schuurman (2002) who argues model-building as a social process. Modelling in GIS is applied in the same manner as applied in other domains which states that it is differentiated from other forms of description such as graphics (Casetti 1999). Modelling is used for linking geographical ideas to the mathematical form. However, models are not realist reflections, but ways of simplifying reality so that we can better understand environments. Similarly, in many geographical researches, one of the main focuses is translating geographical questions into mathematical variables in order to analyze variables in relation to each other in physical processes in somehow once again to simplify the realities with models, these models do not pretend to be the real-world, but are used to determine critical properties of a given system (Herring 1991; Worboys 1995).

Finally, it will be meaningful, to pay attention to judgment of Sarewitz (2000) which re-examines the impacts of society on science. According to Sarewitz, theories may become programs and models are able to generate information for us to understand the world. And finally the context for the use of scientific knowledge is creating by society.

2.3. Technology and Social Inclusion

Technology involves with the environment to meet human needs. The development of various technologies has been affected by and has affected the environment, society, and as well as science. Further, Campbell and Masser (1995) mention that the technologies are not independent of the environments in which they are located but rather only gain meaning from their context. They also identify technology as combining machines, methods and knowledge and suggesting that technology is a socially constructed reality.

Various methods and knowledge used for public participation GIS applications. There exist technologies which are combined with these methods and knowledge. Spatial Information Technologies are being used for the many cases that involve public participation GIS. If we mention briefly, these Spatial Information Technologies involve Global Positioning System (GPS), Geographical Information (GIS), and remote sensing (Airborne and Satellite). These categories are often employed in an integrated fashion (several examples exist in the literature, i.e. participatory GIS for community forestry user groups in Nepal, Malaysia's case study, Bujang 2004). Brodnig and Schönberger (2000) mentioned that the developments in spatial information technologies can not be separated from the trends in information and communication technologies. In particular the use of computers and software is to convert, store, transmit, and retrieve information from anywhere at anytime. Furthermore, with the beginning of the Internet in the late 1960s, many things have changed both in the case of dissemination of these technologies and in our lives, and finally reached its current form. After Internet has been launched, it has gained an amazing popularity in many different areas. Internet has enabled quick transfer of information and data and moreover, with today's Internet it is possible to supply two-way communication, by wired or wireless communication networks (Peng and Tsou 2003).

GIS technology has followed a similar path as other information-based systems such as faster, cheaper hardware and software. These have allowed for a variety of applications available to users. And likewise, the new mapping tools of GIS have moved cartography away from the authority of specialized technicians (Morrison 1991)

In the evolution of PPGIS, the most significant technological trend to affect the development of PPGIS is probably the rapid adaptation and evolution of the World Wide Web. Since the Internet technology has captured popular attention, it can be used as a firm base on which to build the future technology. In web-based PPGIS systems, a web-based form imitates the traditional survey form utilized by public involvement programs. These systems combine GIS and WWW to increase participation in decision making processes. The difference between Online GIS and Online PPGIS has become apparent in the context of public participation. The participation of the public becomes a crucial point in online PPGIS in order to make the public more active in the decision making processes and more sensible to their environment and things going around them. Thus the technological advances can be used for the benefit of the society.

In today's technology, the web enables users to use simple commands to easily see and obtain information about a particular location in space. With the applications of location-based services such as car navigation systems, realtor services, etc. mobile GIS has become a platform for these kinds of services, which is usually coupled with GPS. Another attractive application is a very new Google Maps (http:www.maps.google.com) which is another example of dissemination of information which offers street maps and satellite images and provides this information freely on the Internet.

There are many examples of Internet GIS for transportation, such as MapQuest and Yahoo! Maps which are very practical tools supplying online information of location maps and driving directions. Another port information system such as Milwaukee Freeway Traffic Management (http:www.travelinfo.org/milwaukee.html) provides traffic information on a web while another transformation information system provides freeway speed information (http:www.dot.ca.gov/traffic). We can multiply the examples of these kinds of information systems which utilize both GIS and the Internet (Peng and Tsou 2003) such as The California real-time freeway speed information which displays freeways, streets, and real-time driving speed or another example; The Traffic View program, Smart Trek at Seattle, Washington which is designed to present real-time traffic information on the Web. As we stepped into the wireless era with GPS and wireless modems, we have discovered amazing capability of technology. Peng and Tsou (2003) give some evidence of the potential of wireless technologies to play a major role in new applications. As we see from the examples in terms of dissemination of any kind of information, GIS, Internet and other related technologies have a booming popularity in society. Expanded availability and democratization of information is an important fact for citizens who want to be active in the processes needed to take decisions concerning their needs and expectations.

As well as the information systems, participatory interface can combine the Web and other technical developments. Kingston and others (2001) demonstrated that the use of PPGIS on the Web helps to improve the public opinion on the issues proposed by helping to reflect their real agenda and also by attracting participants to the public participation process. Peng (2001) mentioned that the Internet GIS offers a special and potentially important resource to facilitate public participation in the planning and decision making process.

Like Internet technology and other technologies, also GIS technology has showed great value in empowering citizens and communities as the prices and availability of the technology and digital data increasingly become easier than before. GIS is seen as “tools” for empowering communities and individuals, for some it is considered such an invasive advantageous technology and at the same time a kind of marginalization for others (NCGIA, I-19 1996; Deichman et al. 2001; Craig et al. 2002). Since the information is important for sustainable development, scientists and experts started to pay attention to new innovations and technologies and tried to adapt these technologies to the local knowledge that was overlooked before. Thus these new technologies can bridge the gap between science and local knowledge (Macnab 2002; Tripathi and Bhattarya 2004). Accordingly, the social transformation is connected to these technologies, as Ball (2002) pointed out that the technologies developed rapidly in public participation and planning are the mechanisms behind the social change. Consequently, the interaction between technological developments and society has several perspectives. They both influence each other. Society has an impact on technology and the technology is one of the factors of social change.

Except the widely used examples of information and communication technologies that we have mentioned above, there exist some other forms of communication technologies which are still in their infancy, such as; E-government and E-democracy, which we will examine in the following section.

2.3.1. E-government and E-democracy

There exist other forms of communication technologies which are used to bridge the gap between citizen and government. With the use of technologies like Internet, the word E-democracy has started to be used. E-democracy is still in its infancy and it sometimes is referred to as digital democracy, cyber democracy or techno-democracy as well. It has the purpose of enhancing democratic processes; such as electronic voting, chats, forums, online town halls, etc. This kind of citizen participation and interaction has an ability to provide direct input into the democratic process (Riley and Riley 2003). Gross (2000) believes that technology to support citizen participation and e-democracy can influence a whole political system. There exist few governments which have been able to involve the citizens electronically in the democratic process. Outside groups and citizens try to change government's top-down work and the current system of engagement between the government and the public by using online tools (Riley and Riley 2003).

E-Government aims at improving quality of the service rendered to exchange information and services with the citizens, businesses and other sections of government via information and communication technologies (Zhao and Coleman 2006). Hansen and Reinau (2006) mention the importance of improved decision making in E-government and to obtain acceptance by citizens about these decisions. In this challenge Public participation GIS and the Internet seem to be a good solution.

E-government offers the interactions between sectors of government, business and citizens. Citizens may receive benefits from the information and services offered. In fact as we mentioned the problem of access concerning the citizens having difficulties to access to computers or Internet as well, to this point, the important key component that motivates e-government becomes relatively problematic, citizens who don't /can't access to the technology. So, the barrier can be either the citizen or the technology. In this case, the social, cultural and economical differences urge us to evaluate the concept differently in each part of the world. E-government and E-democracy present opportunities for the development of society and the enrichment of democracy. However for its success the new technologies must be widely used and trusted by the public. They must be willing to use these technologies as well. These online methods offer good alternatives to the public however this will only work if the public is ready to participate and if they believe that their views are being listened by the authorities (Kingston 2002).

Another problem with these e-democracy services is about electronic voting. Electronic voting offers many advantages. Citizens do not have to go to the poll. They can vote from anywhere else where they have an access to the Internet. And electronic counting saves a lot of time. However, this type of voting involves several challenges in terms of security and protection of these online communications such as the authentication of the voting person and guarantee of privacy (Gross 2000).

This new form of democracy seems to have the similar barriers as the other forms of methods which tend to use the communication technologies aiming to bridge the gap with different parts of society. Certainly the lack of access has to be considered in an extensive manner. Keeping in mind the difficulties with access, it appears that the requirement to put the society and the technology together to make them experience these new forms of government and democracy can be exhaustive in certain sections of the populations.

2.3.2. Integration of Local Knowledge

Local knowledge relates especially to the context of the countries in the process of development or related to indigenous people or marginalized populations. Participatory methodology typically pays attention to the inclusion of local knowledge and social information which aims to empower the most discouraged and weak social segments of a community. And the appropriate mixture of GIS and local knowledge can allow access and empower such disadvantaged and marginalized groups, marginalized both in a social context and as geographic location. Laituri (2002) gives some examples of this kind of challenge, which tries to combine indigenous knowledge with Western technology aiming to supply more efficient natural resource management and conservation strategies.

In the context of PPGIS it situates GIS within participatory methods and it also takes an inspiration from the method that allows the integration of local knowledge with GIS. This combination allows the integration of local knowledge with scientific knowledge. This integration can be very favourable as we see from the several applications (Macnab 2002; Laituri 2002). GIS seems to play a scientific role which is more technical, spatial, more accepted and more precise for the local knowledge since the local knowledge is often considered as being qualitative and unscientific (Macnab 2002). Local knowledge can be characterized as "the sum of the data and ideas acquired by a human group on its environment as a result of the groups use and occupation of a region over many generations" (Mailhot 1993, p.11).

Fisher (1995) points out the dynamic structure of local knowledge and mentions that technical knowledge can stimulate the development of local knowledge focusing on environmental problems, and according to Fisher, technical and local knowledge can be complementary. Despite the fact that the distinction between technical knowledge and local knowledge is not clear it seems that local knowledge tends to be holistic and contextualized whereas technical knowledge identifies general principles. While searching the solutions to our environmental problems, we need to see the whole system because the technical issues proposed are sometimes distinct from social and economical factors, which do not always fit in with the economic and social realities in the area concerned (Fisher 1995).

Laituri (2002) gives some evidence of scepticism besides an intense interest in the use of GIS in marginalized groups. Consequently, despite some who are sceptical about these new technologies, for many observers, these new technologies can provide empowerment of local knowledge systems (Haklay et al. 2002). In fact, as we have mentioned above, the integration of technology with local knowledge and vice versa can be accepted as a constructive alliance for the resolution of the environmental problems in more realistic way. The dialogue between different partners is important and advantageous in order to integrate direct concerns of the local populations to external people who bring technical and financial support (Clouet 2000). The knowledge of indigenous people coupled with appropriate technology can serve as proper information for their needs. At the same time, the objective to indigenous and western-based knowledge systems is to support participatory development through knowledge-sharing (Brendlinger 1992).

2.4. Debates about Tool or Science? - Mutual effects between science, technology and social facts

The increasing role of the public in public participation concerning the field of science, technology and society has been seen as one of the most interesting developments in social control of science and technology (McGinn 1991). This role has brought in many ways by ensuring that the views of public are taken into account in decision making processes which involves the public more directly in policy making. He also gives some examples of how societal forces attempt to exercise control over the issues of science and technology. The field of science, technology and society began to appear later in the academic environment (McGinn 1991).

The mutual effects of science, technology and society have been discussed during the debates on GIS. The ambiguities about GIS have caused some arguments and turned to the debates on “GIS and social implications” which finally produced the new term PPGIS. Pickles (1997) claims that, these debates have been started due to the ambiguity of “GIS as a tool or a science”. In order to answer this question, first of all we need to consider that which issues comprise the science. These understandings may lead us to the confirmation of GIS in terms of science, tool or maybe a tool-making activity (Pickles 1997). Wright et al. (1997) find the question extremely important in the operations of geography departments. They believe that it is important to know whether it is a tool or a science, in terms of its legitimization.

The result of the discussions on this question (science or tool) which is conducted on GIS-L electronic listserver in late 1993 was very remarkable. As a result of this kind of thinking in GIS-L (Wright et al. 1997), debates have led some powerful agreements which point the strong connections between GIS and the geographical science. Whether GIS is a science or not, this "technology" is powerful and widely successful in many areas and is contributed to the society and the culture to a great extent.

There are some conditions for the emergence of a science out of technology: such as a sufficient significance of driving technology, it has to be challenging the issues raised by its development and its use, insufficient interest and support for research in the existing disciplines and finally existence of satisfactory shared aims among the issues to create considerable synergy (Wright et al. 1997). With these conditions, according to Wright et al. (1997), debates arising out of the ambiguity of GIS as a tool or science must be understood within the context of broader trends in science and society. To the question "were GIS constructed as a tool representing and manipulating geographic concepts?" the answer should be "GIS can not be only constructed as a tool". Thus, it also represents some other alternative issues which allow GIS to step out the rungs of the necessities of "science". In this challenge, GIS encourages some of the current trends. Among these trends, its marriage with society under the title of PPGIS plays an important role.

In this chapter different approaches about diverse origins of PPGIS and previous arguments which are parallel to the available literature helped to understand the domain in depth before placing PPGIS in a typology. The available literature was definitely one of our major key sources to define different steps required in our research. Especially while underlining important factors in PPGIS study, the literature was the starting point. In the flowing chapter we will precise these different sources by mentioning their utility all the way through the realization of our research goals.

CHAPTER 3: CONSTRUCTING A TYPOLOGY

3.1. Identification of the Variables for Typology

Incorporating all the factors that distinguish PPGIS studies, an attempt has been made to determine the essential characteristics of this very complex subject. Toward this end, a methodology was followed covering the information originating from different sources. During the classification process of the variables, these different sources were examined in the following manner: first, a structural approach focused on the literature underlying the fundamental factors of PPGIS studies, and second, the detailed observation of PPGIS case studies concentrating on these underlying variables. Through these two steps, the survey-questionnaire facilitated the investigation done on the case studies, to validate and consolidate the decisions through a shared knowledge (Fig. 4). In this section, it will mostly be examined how work progressed through these different steps addressing the identification of the variables.

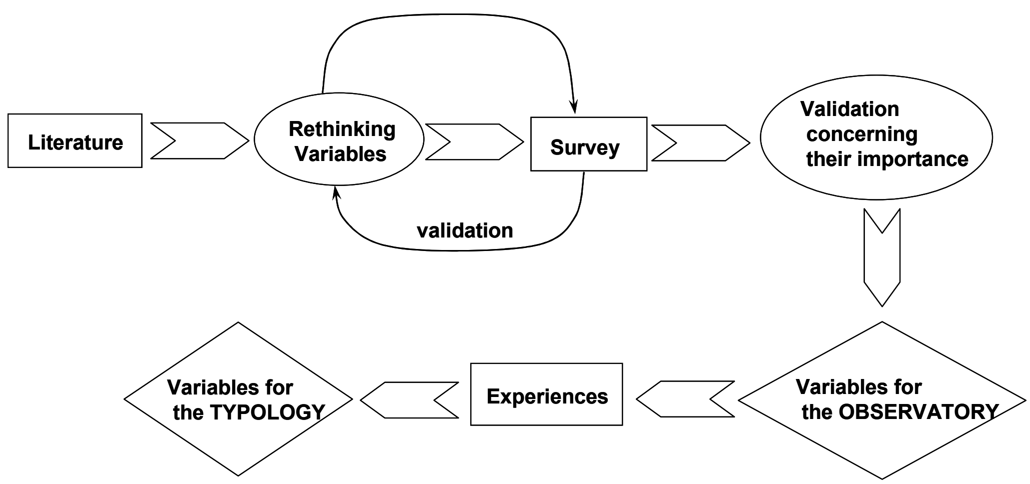

Figure 4 Sources for PPGIS variables

3.1.1. Literature

Key structural variables can be identified on the basis of the available literature. These variables along with the interaction between them were explicitly identified. However, the identification of these components was found to be difficult because of the complex concepts and sophisticated relations between sub-components.

Sources of the variables may be classified into two groups. The first group of sources can be called as theoretical framework for the identification and classification of the variables that potentially satisfy the requirements of a PPGIS study. In general this one has been achieved by the literature review.

The second group of sources is the empirical approach (case studies). A variety of case studies were analysed to be able to observe the numerous variables that play a crucial role in PPGIS.

In the first step, the literature review made it possible to pre-observe the variables and facilitate the second step, which is the preparation of the questionnaire. The research carried out has been supported and coalesced by the questionnaire results, followed by the analysis of numerous case studies relating to the variables of a PPGIS study.

Since it has already been attempted to present a state of the art for the research concept (see chapter 2) considering the findings on prior works, trends, debates, limitations and interaction between basic concepts, etc., instead of reiterating the literature we will rather make a point about the past efforts for the development of PPGIS categorizations or typologies (Table 1).

3.1.1.1 Categorizing PPGIS system – previous literature

The idea of using different kinds of categorization, taxonomies or typologies, firstly in the GIS field (Obermeyer 1989; Calkins and Obermeyer 1991; Calkins and Weatherbee 1995) and secondly in PPGIS can be illustrated by some examples in the literature.

Calkins and Obermeyer (1991) presented their attempt at taxonomy study to investigate the use and value of geographic information. Their general objective was to understand the use of geographical information and geographical analysis in decision making. Taxonomy presented is defined in terms of set of questions. These 3 major questions were: what successful uses are being made of geographical information? How effective is the use of geographical information? What are the benefits attributable to successful use of geographical information? This taxonomy had an aim to answer these questions as well as to some other additional ones and finally to foster further discussion. This taxonomy supposed to assist as a tool in determining the value of geographic information.

Another taxonomy presented by Calkins and Weatherbee (1995) was taxonomy of spatial data sharing. The aim was to provide a descriptive and analytical framework for spatial data-sharing activities, which has been defined as an objective for geographic information systems developed by governmental agencies and private firms.

The idea of developing the taxonomy was inspired from the development of an organized body of knowledge and experience about data sharing that basically needs a descriptive taxonomy in order to offer a common language.

Calkins and Weatherbee (1995) determined four primary components comprising their taxonomy. Each of these categories has their sub-classifications as well: characteristics of the organization (data use function, type of activity, departmental function, organizational identity, data-sharing role), characteristics of the data (data mode, importance of data, organization of data, data type, nature, quality assurance), characteristics of the exchange (structural, operational, functional), Constraints (access, data confidentiality, liability) and Impediments (communications/network cost, price of data, format/structure incompatibility, conformance with standards, documentation).

In particular, the categorization of the characteristics of organizations which identifies who is participating and the role played and also constraints and impediments can be very useful and practical for PPGIS as well. Calkins and Weatherbee (1995) distinguish that, the constraints depend on the nature of the data, nature of the participants, national, state, and local legal environments while the impediments are more universal and time-sensitive. This categorization is not far-reaching but it is quite useful in so far as it provides a common framework for the description of spatial data sharing.

There are other models and taxonomies in the literature concerning PPGIS studies (Table 1). First of all, Leitner et al. (2002) provided six different way of PPGIS delivery. In fact Tulloch (2003) mentioned the flaws in this model even though many public systems hoped to employ all of these mechanisms. So the problem is, as a system, these categories do not stand as mutually exclusive categories.

Barndt's (2002) model uses qualitative approach which is based on three basic principles. This model originates from both geographical and social issues. The first principle suggests understanding the value of PPGIS project results. In the management of PPGIS projects it is needed to pay attention to the sustainability, replicability, efficiency and the complexity of the system. In the third principle which is PPGIS and community development principles, it takes our attention to the accessibility of information, priorities of community and increasing the capacity of communities through the use of GIS.

In another study Schlossberg and Shuford (2003) were concentrated on domains of public and participation for PPGIS. They have constructed a matrix between two axis: horizontal axis referring broad types of public, ranging from simple to complex and a vertical axis referring domains of participation also ranging from simple to complex.

The matrices presented in this model represent a particular PPGIS project. There are four numbered cells described by four scenarios. This study presents a potential model to exploration of PPGIS. Despite the fact that PPGIS have several realizations the proposed scenarios in this model represent a few types of PPGIS activities in the domain.

Tulloch and Shapiro (2003) proposed a simple categorization that brings out the issues of participation and access and their relation with the degree of success of the project. This categorization is quite a simplified scheme consisting of four different types. They compared participation and access which allowed a categorization of successful and unsuccessful projects into eight categories. According to this categorization, no or low levels of participation and no or low levels of access may result with Type one which is least likely successful and most likely unsuccessful. The type two having high levels of access with no or low levels of participation seems more likely successful. Type three with high levels of participation but no or low levels of access will probably be less likely successful and somewhat likely unsuccessful. The type four which is most likely successful and less likely unsuccessful has a high levels of participation and high levels of access. These categories may be helpful for PPGIS. However they may serve better in the case of e-participation. They hardly serve to represent the entire PPGIS projects.

The last typology observed in the literature is the one suggested by Hyde et al. (2004). This recent study proposed four categories of PPGIS supported by few examples for each category. According to them there exist two basic components under which PPGIS seems to revolve: level of decision-making power and level of external participants involved in the process. These tasks are important however seems that they are not the only tasks PPGIS revolves around. This approach points the role of community participation in the process through supporting the idea that more control of the community and less external involvement on the final outcome.

Table 1: Earlier Attempts for PPGIS Models and Typologies

Author (date)	**Study**	**Types**	**Variables**	**Strength**	**Weakness**
Leitner et al. **(2002)**	Means of PPGIS delivery	6 different availabilities	1.community-based (in house) GIS 2.university-community partnerships, 3.GIS facilities in universities and public libraries, 4.'Map Rooms', 5.Internet Map Servers 6.Neighbourhood GIS centre	Provide insight into different models of GIS access	Limited to the issue of availability
Michael Barndt **(2002)**	Evaluation of PPGIS	3 different components	1.The Value of PPGIS project results (appropriate information, action oriented, timely, accurate, insightful, time perspective, synergetic, combining qualitative and quantitative information) 2.Management of PPGIS projects (sustainability, replicability, efficiency, integral, system complexity) 3.PPGIS and community development principles (Integrate the components of working CIS, rights of information access, community priorities and capacity building, the value of co-production increase the capacity of local community system to use the technology, integrate into a broader community development process)	Can be used as an assessment tool, discuss the alternatives. The ideas raised in this model are important, they consider both geographical and social issues.	Assessment rather than a typology
Schlossberg and Shuford **(2003)**	Domains of public and domains of participation for PPGIS	4 different scenarios	Matrix of 8 X5 (*Domain of participation:* inform, educate, consult, define issues, joint planning, consensus, partnership, citizen control; *Domain of public:* Decision makers, implementers, affected individuals, interested observers, random public). Each scenario is descried by the following variables: Public Participation Expected Output Expected Outcome Description	Provides a good contextual starting point for the domains of "public" and "participation"	Limited scenarios (few types of PPGIS activities)
Tulloch and Shapiro **(2003)**	Issues of participation and access concerning their degree of success	4 different types	Simplified comparison of access and participation which allowed a categorization of successful and unsuccessful projects into 8 categories. Successful (least likely, more likely, less likely and most likely) Unsuccessful (most likely, somewhat likely, less likely)	Provides a simplified comparison of participation and access which allowed a quick categorization of successful and unsuccessful projects into categories	Merely concentrated on participation and access issues
Hyde et al. **(2004)**	Different types of PPGIS which focus on the purpose and methodological aspects of PPGIS.	4 categories (by observing their level of internal expertise and nature of involvement)	Unassisted PPGIS Assisted PPGIS Consultative GIS Informational PPGIS	Gives supporting examples. Scoring system may allow the user to classify their project.	Limited tasks

As seen from Table 1, existing typologies concern several aspects of PPGIS such as means of PPGIS delivery, types of public, participation techniques, access, etc. All these tasks are those considered mostly by researchers as needing intense study and improvement as well. In these approaches mostly the issues regarding the level of participation / public involvement have been raised which generally turn around the Arnstein's (1969) universal ladder of participation.

These views were state of art of previously realized typologies. Since the objective of this thesis is to highlight if these typologies respond the needs of PPGIS or not. In most of them it was seen that PPGIS has not been taken as a system with all of its elements. Thus in our typology it will be tried to eliminate this absence and approach to the domain as a system. However these typologies broaden the perception and make us aware of other works regarding the process for the selection of tasks and the variables under each theme. The insight gained from this review of existing typologies was useful in the understanding of their dominant and outstanding aspects for the process of creating our typology.

3.2. The Survey-Questionnaire

In addition to our specific objective of constructing a typology, on the whole, this research intends to provide a better comprehension of PPGIS, and at the same time to its practical aspect as well. Under these circumstances, besides the literature survey in its epistemology, the research also pays attention to PPGIS applications/case studies. The information on various practical applications will be useful to broaden our understanding of the domain and will also serve as an online resource database/web observatory of PPGIS case studies. Accordingly, within the agenda of the observatory, it was necessary to define the important elements of case studies as well as the specifications of cartographic interface, navigation and query tools of the observatory. Hence, a survey-questionnaire was prepared and advertised in three different forums on the web, for the most part, on ppgis.net. We used the survey for two purposes: First, to determine the elements of observatory as a secondary issue for this thesis and secondly, as a means to achieve the main objective of this research.

3.2.1. Survey and Results

The survey has been divided into different sections. The first part consists of the characteristics that help us to describe a PPGIS case such as name, localization, objective, etc. At the time of the investigation, the participants to the survey had to choose the level of importance attached to each characteristic. For this, they had to choose between four levels ("very important", "important", "somewhat important" and "not important") concerning the level of importance of each characteristic, selected by considering the reviewed literature. Moreover, at the end of this part of the questionnaire, they were given the possibility to suggest ten other characteristics that seemed relevant to them. They had the possibility to make some suggestions also. In this first part the results voted as "very important", by more than 50% of the participants are listed below.

<u>Results (% rated "Very Important"</u>):

Background of case (52)

Objectives of the case (66)

Subject of the case (62)

Method of participation (62)

Degree of participation (53)

Geospatial technologies (61)

The other 'important' ones can be summarized as name, state, date, location of the case, the organization responsible for the case as well as the participants involved in the case. The results of the survey mostly served toward the development of the observatory. However the results were also taken into consideration for the categorization of PPGIS both directly and indirectly.

The second part of the survey, the definition of the structure of the website, mainly consists in determining the type of access to the observatory and to the information concerning case studies. Future users were asked if access to the observatory and the PPGIS case studies should be reserved for registered members or opened to the all visitors. 64.9% voted that the observatory should be open to the public. Furthermore, we wanted to know about the necessity of a forum on the website. And next, to envisage or at least to measure the participation of the users, they were asked how they would contribute toward the enrichment of database. The response to this question was very satisfying. 83.2% of the participants expressed their willingness to provide new case studies to the database, which is important for the future improvement of database. In this way, the observatory will become more effective and more beneficial for future users.

The third and the final part involved specifying cartographic interface tools. Toward this end, the participants had to choose among some navigation tools of the cartographical user interface which seem useful to them, in order to select and/or visualize PPGIS case studies, such as; zoom or pan operations. For other tools that were not mentioned in the list they had the possibility to indicate supplementary tools as well. In this section of the questionnaire there were also a few questions related to queries which they wish in the database. Finally it appeared that it is sufficient to restrict the queries on certain fields like the localization and the theme of the case study.

By taking these results into consideration, the observatory was developed according to the needs of future users. Web interface was developed in ASP script. It has been chosen an open source, MySQL database that is linked to Google Map API for the cartographic interface. The online observatory is accessible at the following address: http://ppgis-obs.scg.ulaval.ca/. This online version of the observatory is quite functional and allows users to consult, enrich and update the database.

In addition to the first three parts of the survey, there was another set of questions that was devoted to the identification of future users of the website. This section was labelled as "your personal information". So, we would be able to identify the future users of the observatory. Therefore, concerning the results of this section of the survey, we were able to answer the following question: "According to whom?". Ultimately, the results were interesting in terms of understanding who were involved. As observed from the results, the majority is represented by researchers, followed by GIS experts who are mostly located in North America, and operate in Europe and North America. The general age range and the gender of the participants were 26 to 39 and male. And %97 of total respondents expressed themselves as concerned to the question of their level of concern with PPGIS.

The online questionnaire has needed the collaboration of external persons and the questionnaire remained accessible during a two-month period (May-April 2005). After three reminds on the forum, in order to mobilize a maximum number of people, a total of 108 participants answered the questionnaire. The results of the survey were satisfying and well representative in terms of number of participants and the results obtained regarding the external opinions those active in the PPGIS community.

3.2.2 Concern with the Survey Results

In particular, the survey results made it easy for us organize the characteristics of PPGIS and to delineate the data we need for the next step.

Since PPGIS take different forms, when we consider the variety of cases, it is obvious that each instance comprises multifaceted forms of information. These differences may result from the variety of methods, data, material used or the variety of other sophisticated factors that play an important role in PPGIS, such as the host culture which may affect the study or the participation process itself. For each case study it was preferred to choose a single form. This model or template is supposed to facilitate our classification of cases. This kind of classification would be useful for understanding similarities as well as the differences between several kinds of PPGIS.

The results of the survey were very helpful in the original evaluation concerning the representative variables, which helped us to prepare the template for the analysis of case studies. Then we worked on the same template for each case. The result is the synthesis of 30 cases (see Annex) that will be the first 30 cases which contribute to the observatory of PPGIS case studies.

3.3. Case studies

We made a selection of case studies by applying some criteria of adequacy such as: satisfactory of information exist (precise definition, less ambiguity) as well as the distribution of cases in terms of their geographic location (Fig. 5) in order to have a reliable sampling of case studies. However the redundancy on certain location (North America) was inevitable. This concentration also delineates the effective area of PPGIS.

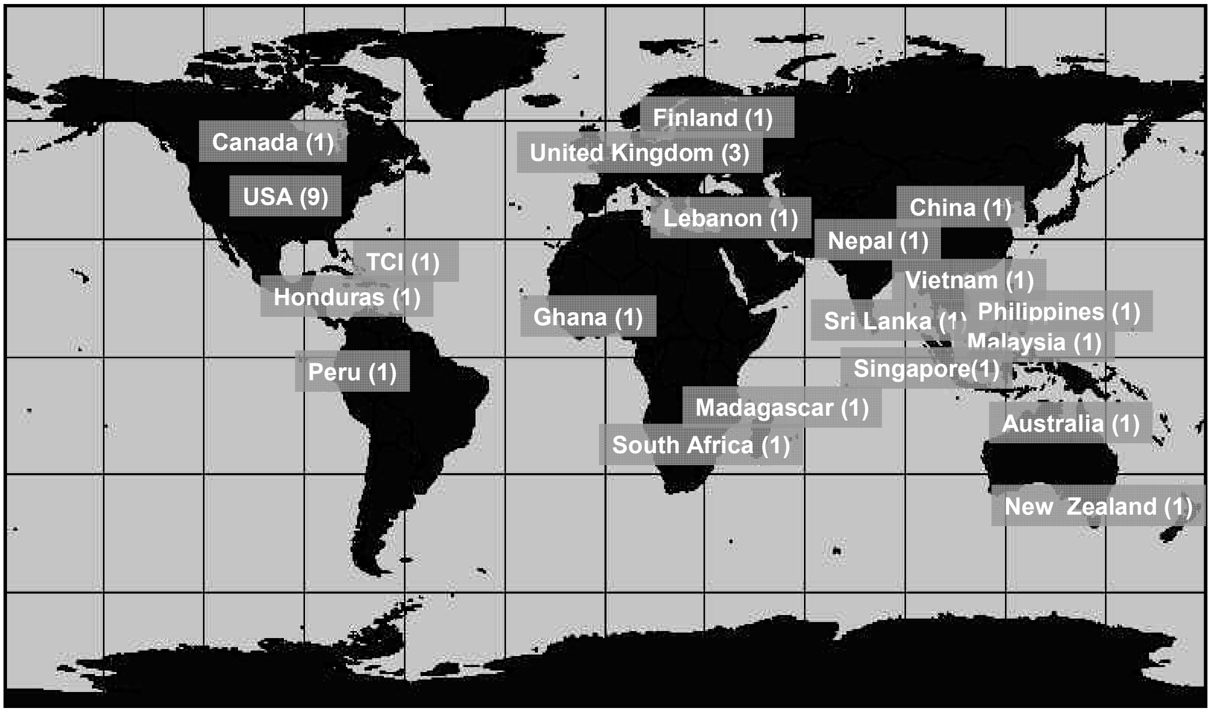

Figure 5 Geographic Distribution of PPGIS Case Studies Selected

In total we have chosen 30 case studies to be explored (Table 2). Data coming from these cases offered a comparative knowledge and understanding to the PPGIS studies. The titles in the list below are sometimes defining the purpose of the project which does not necessarily serve as a title of the project. Additionally, some distinctions about their theme/subject are made by their authors. That's why we preferred to use their choice of theme about the project (i.e. planning / urban planning).

Table 2: List of Case Studies Selected

Title *(purpose)*	**Discipline** *(theme)*	**Period**
1 Community GIS and gentrification battles in San Francisco	Planning	1998-99
2 Mapping Philadelphia's neighbourhoods	Planning	1994-95

3 Impact of GIS use for neighbourhood revitalization in Minneapolis	Planning	1990
4 The Atlanta Project	Planning	1991-96 (1st phase)
5 Virtual Slaithwaite	Planning	1998
6 GIS-enhanced land-use planning (Land information system in Dane County)	Planning	1998-00
7 Portland Metro's dream for public involvement	Planning	1995
8 A community-based and collaborative GIS joint-venture in rural Australia	Planning	1993-98
9 Promoting local community in forest management through a PPGIS application in Southern Ghana	Development-forest management	1997
10 GIS for community forestry user groups in Nepal: Putting people before technology	Environmental management-community forestry	1999
11 Implementing a community integrated GIS: Perspectives from South African fieldwork	Participatory land reform planning	1999
12 The North Hokianga Maori Development Project	Development	1995
13 The Cherokee Nation and tribal uses of GIS	Development	?

14 Participatory gender resource mapping: a case study in a rural community in Honduras	Participatory gender mapping	1995-98
15 Integrating local knowledge and spatial information technologies for marine species management: A case study on the Turks and Caicos Island	Resource management	2003
16 Misconstrued land use in Vobazaha: participatory planning in the periphery of Madagascar's Mantadia National Park	Conservation	1997-01
17 GIS and RRA in local level land use planning: A case study in Sri Lanka	Land-use Planning	1996
18 Orange County Interactive Mapping	Interactive mapping	?
19 Virtual London - CASA	Urban planning	1st phase finished 2006
20 Woodland Online Decision System (WOODS)	Planning	?
21 Participatory GIS in a Newfoundland fishing community	Environmental management	1994-97
22 Public participation GIS (PPGIS) for town council management in Singapore	Housing-Estate management	2000

23 Using GIS to produce community-based maps to promote collaborative natural resource management in China	Natural resource management-conservation	2002
24 Using GIS to facilitate public participation in access management issues: A case study in Florida	Transportation planning	1999
25 Participatory GIS-based natural resource management in Lebanon: Experiences from a country of the South	Natural resource management	1995-03
26 A spatial approach to participatory planning in forestry decision-making in Finland	Planning	2002
27 Explorations of participatory GIS in three Andean watersheds in Peru	Community-based natural resource management	2003
28 Community Mapping in the Philippines: A case study on the Ancestral Domain Claim of the Higa-onons in Impasug-ong, Bukidnon	Community mapping	2001
29 A case study with Village Development Planning in Bach Ma National Park buffer zone, Vietnam	Participatory development planning	2004
30 Malaysia's case study mapping Dayak's customary lands in Sarawak	Community mapping	2004

The major issues emphasized during the classification and creating the typology of PPGIS can be summarized in Table 3. The issues mostly analysed in the literature deal with public, access and participation. These issues seem not always very clear and often raised with complex problems. The survey results highlight other issues or other variables such as the problems encountered, theme of studies and their purpose as well. According to survey results the degree of participation, study methods including geospatial technologies used are also very important. However the analysis of case studies brought out other realities on the practical side. They emphasized the role and the effects of other issues like socio-political issues, the role and the variety of institutions and how cultural differences play an important role in a PPGIS. The results manifested some similarities in these sources. Especially the issue of participation has been the one which emphasized the most. While literature has been taking our attention to the ladder of participation, the survey emphasized the degree of participation and case studies concentrated most on the tasks in which public plays a role or participate.

Table 3: The Issues Predominantly Emphasized

Literature	Public (epistemological or ontological ambiguities - who is the public?) Participation (nature of public involvement, ladder of participation) Level and the role of expertise (sometimes as facilitator) Access issues (access to data, software, method, material, knowledge) Degree of success and failure
Survey	Problems addressed, variety of objectives in case studies Different methodologies developed Degree of participation Geospatial technologies used
Case Studies	Tasks in which public plays a role Different social and political circumstances Variety of institutions Cultural effects

3.4. Analysing the variables for the typology

There exist many different ways to construct a typology that is supposed to provide insights into the subject focused by doing classifications according to the chosen purpose-related key parameters (Mintzberg 1984; Obermeyer 1989). Obermeyer (1989) suggests that these classifications and typologies are a way of summarizing information in an intelligible form. They have a capacity to help us to evaluate and categorize organisms, objects or phenomena.

It is possible that other researchers will prefer to describe the system in a different way than we preferred here and to make different distinctions among them. So, the importance is to search for new categorizations that better reflect their purposes (Mintzberg 1984).

The following sections will concentrate on our categorization which we believe fits PPGIS and will examine the significant variables of the system, as well as the existing relation between these variables considering that how they might shape the process.

3.4.1. Significance of typology

In the literature, there have been some efforts to develop typology that distinguishes several types of PPGIS. These categorizations used different aspects of PPGIS. In all these different models developed, they led to a simplified understanding of PPGIS from different perspectives.

Tulloch (2003) draws our attention to what PPGIS really needs rather than what PPGIS really is. Hence, the question is what PPGIS really needs, the response might be: it needs to include the entire public including both individuals and groups or may need to be defined regarding the process or activity in which the public is participating. These remarks are important in terms of situating the PPGIS domain such as; if current practices qualified to be a PPGIS or if they are very far from the assessments which we define PPGIS through them. In other words can we define current "PPGIS practices" really a PPGIS. So it seems that illustrating the concept would be a constructive issue since it lacks clarity in several issues in the domain (Tulloch 2003).

To improve PPGIS research, Tulloch (2003) suggests two key elements: the lexicon of PPGIS and a simple systematic categorization of PPGIS cases that brings the idea of taxonomy or a typology to the mind.

Our motivation for PPGIS typology is to associate conceptual structure with experimental medium, represented by those of case studies.

3.4.2. Arranging characteristics for typology

The human sciences are considerably more multivariate than the other sciences and it is much more difficult to control those variables. Since the domain PPGIS is strongly based on the human sciences encompassing combinations of various disciplines (e.g. anthropology, geography, history, linguistics, political science, sociology, psychology as well as the many other aspects of different sciences), it's rational that the PPGIS process has to involve countless variables.

In this context, all the past studies on typologies may ease the complexity of work in the domain of PPGIS, for practitioners and researchers. Basically, because these categories reduce information.

In the case of PPGIS, defining PPGIS systems by means of a typology, in which the major variables will be identified and used to link or separate the central system into a smaller set of classes basically distinguished by some characteristics. The literature lacks a comprehensive and methodological definition of the available PPGIS systems, arguing their similarities and their differences as well. So, the role of typology is to diminish the excess of examples into a small number of classes, within which each example shares certain key attributes. Defining and arranging the major attributes are a difficult task, given that PPGIS examples vary on a vast number of attributes since they involve numerous problems, made for different purposes, involve a variety of public component and methods, use different amounts and types of resources, the existing differences in process regarding the manner, their time period, etc. On the other hand, it is expected that some of these sources will be more vital than others in terms of affecting the value or the efficacy of the experience and some sources will have no or less significant impact on the efficacy. This efficacy can also be seen as the effectiveness of the practice in achieving its intended goal or, in other words, the success/ failure of the study. So, achieving our objectives, some aspects are more likely to affect the efficiency of the study than others. This is the basic condition during the creation of the typology which doesn't mean that the other variables do not influence the process.

In our approach it has been discussed some aspects of PPGIS including the ones examined before, by many other researchers in the domain, such as access, participation, and public, etc. It was preferred to separate the more significant characteristics and aspects as seen in the following classes, which are being invented and proposed by this research and based on our understanding about PPGIS.

Composing Elements (Data, Software, Method/Mechanism, Materials and Equipment)

Connector Elements (Access, Participation)

Influencing Elements (Cultural, Socio-Political, Institutional, Technology)

Composing elements emphasize PPGIS as a system. In this system there are data, software, Method/Mechanism and material/equipment which construct this system in its general form. Connector elements draw our attention to the element of Public Participation in PPGIS. All these elements with influencing ones which once discussed and used for GISystems by Chrisman (1996) have been illustrated in a relational nested scheme and grafting one on the other.

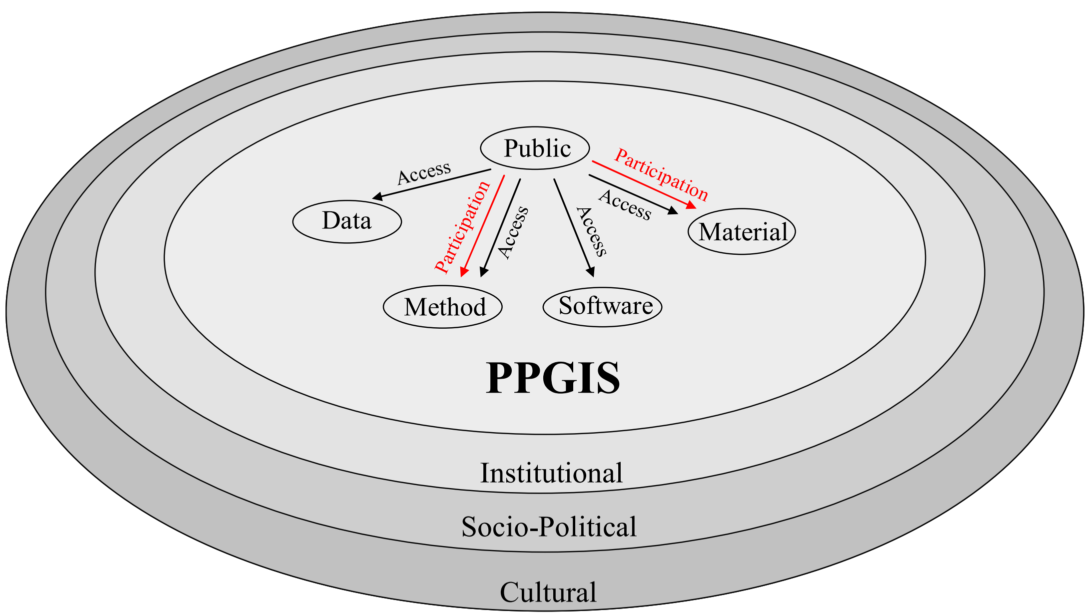

Figure 6 Major Components of PPGIS

3.4.2.1. Composing Elements

These elements are the central elements and mostly are easier to define in contrast to the others. These elements constitute a PPGIS, and can be seen as components of GISystems that comprise more than GIS software.

As for data, we mean different forms of data in PPGIS such as data coming from scientific knowledge (i.e. aerial photography, satellite images) plus data coming from local knowledge (i.e. through some field survey, interviews, questionnaires, sketch maps, cultural maps, etc.).

The material may vary regarding the application, it may have different forms such as; hardware (i.e. PC, laptop), GPS, digital camera even the raw material at hand such as papers, colour pencils or push-pins. Another important component for PPGIS involves logistical material (i.e. meeting place) for different methods used for the participation process. The software component is in general, as the name implies, GIS software such as ESRI products (ArcViev, ArcPad, ArcGis, ArcInfo, ArcIMS, ArcScene, etc.) or Idrisi GIS, MapInfo, etc. The other software can be the visualisation software such as Freehand, MaPublisher, etc.

Methods/ Mechanism make a difference in PPGIS. The methods developed seem extremely diverse and rich. While some of them use sophisticated technology, others use non-technological solutions. The importance is to find the method that may best fit the community in a specific site where the application will take place. Some of the methods or mechanism used often in PPGIS can be summarized as follows;

- Internet/WWW (web-based GIS, web-mapping, etc.) (*The Virtual Slaithwaite project*)
- GPS combined with Sketch Mapping: Using the combination of GPS with sketch mapping and topographic information is for identifying the coordinates of boundaries, perimeters or locations. The use of GPS is linked to GIS technology. Data are stored in digital format and used for producing maps containing geo-referenced information (*Participatory GIS-based natural resource management in Lebanon*).
- Participatory Photo Mapping: The aim is to allow the public to carry out the interpretation of aspects of their land resources that are of significant importance to them. In this process, the public delineate their land use on transparencies laid over an orthophoto. The data will

subsequently be scanned or digitized and geo-referenced (*The project of participatory GIS for community forestry user groups in Nepal*).

- P3DM: Generating participatory 3-dimensional models merge traditional spatial information with people's knowledge. The objective is to visualize/exchange of knowledge (usually between Locals and Scientifics) (*Community Mapping in the Philippines*).

- Participatory Learning and Action (PLA) which is an umbrella term for a wide range of similar approaches and methodologies, including Participatory Rural Appraisal (PRA) and Rapid Rural Appraisal (RRA) (Pretty et al. 1995; Chambers 1999).

Participatory Rural Appraisal (PRA) and Rapid Rural Appraisal (RRA) use of representations produced by the community that legitimize local knowledge and encourage empowerment (Chambers 1999, 2006). They have several sub-sets as follows:

a. Priority ranking (*Participatory GIS-based natural resource management in Lebanon*)
b. Solution analysis
c. Transect walk (*A case study in Sri Lanka*)
d. Making problem tree
e. Brain-storming
f. Sketch mapping (*The project of participatory planning in Madagascar's Mantadia National Park)*
g. Semi-structure discussion/interview (*The project of community-based and collaborative GIS in rural Australia*)

These are informal methods for collating and plotting information on the occurrence, distribution, access and use of resources within the economic and cultural domain of a specific community (Rambaldi 2006, www.*IAPAD.org- participatory mapping toolbox*).

The other methods can be counted as survey (*The Atlanta project*), meetings (*Participatory planning in forestry decision-making in Finland*), planning sessions, and workshops (*A case study in Florida*).

Another composing element is the public. With this corposant, the question "who should be involved?" in public participation arises (Thomas 1995). In its largest form the public may be seen as the citizens, which simply means all of us. The public could be community residents, community-based organization representatives or members of any local business community (Sieber 2004) Moreover, with the access to WWW, the range of public becomes wider. In PPGIS guiding principles it is saying that PPGIS endeavours to involve youth, elders, women, first nations and other segments of society that are traditionally marginalized from decision making processes (Doug and Sieber 2002). This one can be seen as the public with whom PPGIS attempts to work with as well.

Scholossberg and Shuford (2003) think that understanding who the public is important since this will help place a PPGIS project into an appropriate context. They preferred to present public ranging from simple to complex. According to them a simple public constitutes the one, which the actors are relatively well defined and small in numbers. A complex public constitutes the one that is either less well defined or one having a substantive size and/or heterogeneity. This public definition ranges from simple to complex starting with decision makers, implementers, affected individuals, interested observers and ends with random public. The explicit identification of the public was done by dividing it into three groups where these groups were categorized as those affected by a decision or program, those who can bring important knowledge or information to a decision or program and finally those who have power to influence and/or affect implementation of a decision or program. In the third group the public who possess power were named as stakeholders who can change over time according to goals and interests (Mitchell et al. 1997). The concept of public may attain much diversity which comes to the conclusion of the existence of different levels of public (Aggens 1983). Current practices present some examples for these different kinds of citizens which may be found in Chapter 4, Table 6.

3.4.2.2. Access

Access to geographic data has an important connection with the social and political implications, particularly for marginalized institutions and social groups (Ghose and Huxhold 2001; Ramasubramanian 2001; Elwood 2002; Harris and Weiner 2002; Sieber 2002). Diversity of access can be characterized according to Laituri (2003) in different ways. First of all access to data/information seems as a vital issue. It ranges between availability of data to the potential users, their access to data in terms of technological facilities and understanding of this data. This may cause some problems, because data can exist but may need to be downloaded or having some language barriers and technical framework (i.e. understanding maps; i.e. *The Virtual Slaitwaite)* may leave them incomprehensible to potential users.

Another difficulty can be the cost of the data, which could be too expensive to collect and maintain (*A community-based and collaborative GIS joint venture in rural Australia and a community integrated GIS in South Africa*) can be counted as an availability issue of access. In another example (*The North Hokianga Maori development project*) we see some failures resulted by the issue of access. In this case, access to data, to technology, became necessary to assure the implementation of the project. Another access issue is access to software. We need to assure that the software is understandable by the community and it is affordable (cost) by them as well. Access to method or mechanism raise with some problems especially for online PPGIS, ability to navigate in Web and being able to access to Internet are important in these kinds of applications. Access to equipment may appear with some problematic issues related with the lack of some computer literacy or basic computer skills (*The Virtual Slaitwaite*).

Regarding the problems with access to Internet, researchers suggest that public access points in libraries, community centers and other public buildings should be encouraged (Carver and others 1998-99). Systems can be set up by allowing access only to information on the specified issue. This resolves the problem of providing unlimited WWW access which encourages people to get distracted by other web sites.

Traditional public participation methods, such as: meetings can cause some physical access problems for disabled, the elderly and infirm as well as those who maybe deaf. These meetings usually take place at specific place and times which can also limit the other people to participate as well.

Merrick (2003) mentions that access to hardware, software and data does not guarantee access to knowledge. Knowledge implies information with understanding, such as mentioned before understanding the language of maps. Merrick (2003) defines this type of access as cognitive access.

As we may see from the examples, accesses to data, software, method or mechanism, equipment and the knowledge are the major issues that need to be discussed and resolved.

3.4.2.3. Participation and Related Social Factors

In the early 70s, public participation has been recognised as a desirable element of the planning process (Dennis 1970,72; Goodman 1972), there exist such cases where the public became involved in participatory planning actions especially in Europe and North America (Pugh 2005 ; Friters and Leentvaar 2001) , but traditional consultation and communication methods have not always been able to engage a sufficiently broad section of the public to be truly representative (Innes and Booher 2000; Gudes et al. 2004). Participatory planning methods, have rarely been used in decentralised planning processes. Like national plans and projects, regional and district plans, as well as integrated rural development projects, have usually been developed in a top-down approach (Maetz and Quieti, 1987; Belshaw, 1988; Bendavid-Val, 1990 and 1991).

One factor behind this is the relative complexity of much of the information used in the planning process, and the difficulty of presenting it to an audience. Visual communication is a well-established way of trying to overcome this barrier, and while computer visualisation, particularly which is based on GIS databases, is a fast-emerging part of that field, the benefits of these visualization tools are beginning to be observed. In the case of PPGIS, the use of PPGIS on the Web will enhance the participation of the public and their presentativity. Kingston and others (1999) presented that the use of PPGIS on the WEB enhances the public opinion and helps to reflect their real agenda and increase the number of participants in participation process. Internet GIS, serving spatial data and GIS functionality on the web, offers a special and potentially important means to facilitate participation in the planning and decision-making process (Peng 2001).

The benefits of increased public participation in the planning process are well recognised as well as in other domains in order to realize sustainable development (Klimpt et al. 2002; Carlson 2004). DETR's (Department of the Environment, Transport and the Regions, UK) 1999 annual report states that the land use planning is based on democracy and participation. However, implementation of the participatory process has not always been done well. Earlier before, participation was about public relations and making life easier for the planners (Damer and Hague 1971), recently it has been seen by some authorities as easier to explain their existing planning procedures than to improve them and invite real participation (Hague 1999). There is therefore still a need to find ways of making public participation more effective, but in order to determine what effective participation might involve, it is first necessary to know when it might occur.

One of the current projects at Laval University is ‘Pacte Myrand’, which can be a good example in planning efforts. It is a new participative project that aims to arrange a new residential district in the north-eastern sector of the campus, close to the Myrand avenue and announced in 2005. In order to carry out this project in a participative manner, various interested people are involved. During the participative process more than 100 people were interviewed to express their concerns and to work out a consensus. In addition, a group of students, teachers, residents, community groups and organizations of public management, etc. currently take part in consensus workshop (http://www.pacte.ulaval.ca/). This new project seems to concern different ideas. In addition to previous participative consultations, a research group that runs this project will soon launch an online consultation as well.

In such planning projects, at all stages, it is very important to avoid decisions based on misunderstandings which can easily occur if non-experts are exposed to information intended for expert use (such as reports or plans). Furthermore, exclusion of groups such as ethnic minorities, the old and the young has been, and still is, a barrier to truly effective involvement (NPAC -National Planning Aid Conference 1999).

The language is another vital consideration, which is very much related with cultural factor; the information provided is important, but the way in which it is communicated strongly influences the decisions made (Rydin 1998).

There exist some opinions which support the need for effective ways of focusing on small group or individual-level interventions which raise concern regarding the ability to initiate positive changes in physical activity at the level of the population. Rambaldi mentions (www.iapad.org), he has experienced that in conducting community-based work, small groups are better and grassroots participation works at its best among cohesive groups or socially and culturally akin individuals. Despite the issue of participation in small groups, Surowiecki (2004) presents lots of opinions in his book named “The Wisdom of Crowds” about benefits of large groups in decision making. He supports that having a diverse group of decision makers can make a good difference on decisions among diverse set of possible solutions. According to him diversity matters because it adds perspectives. He also mentions "…in small groups it's easy for a few biased individuals to exert undue influence and skew the group's collective decision" (p.30). Besides the diversity of perspectives, the quality, offered by crowds, in terms of participation also the numbers of people, the quantity, matters to some extend. PPGIS also needs a detailed investigation on different communities. These investigations need brief explanations about relations between the individuals and the physical and social environment. This social and physical environment may have been influenced by some other factors. These factors related with the concept of being human may have some effects on participation. These factors are numerous but one can summarize some of them such as culture, age, gender, degree of education, profession, origin, and etc. (Buchecker et al. 2003). These factors and many of others have a huge impact on participation and accordingly have a significant influence on PPGIS as well.

3.4.2.4. Public Participation Figure

The most enduring figure has been provided by Arnstein (1969) in citizen participation. She wrote about citizen involvement in planning processes and illustrated with a ladder of participation (Figure 7). In this ladder, Arnstein identified the eight types of participation which differed according to the degree to which public is empowered.

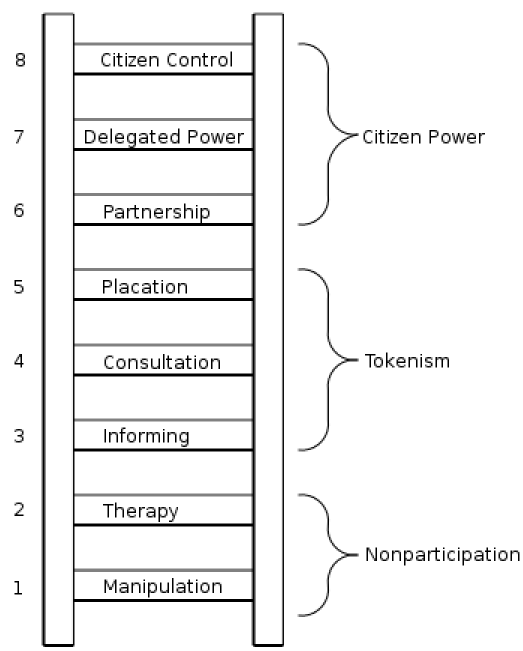

Figure 7 Ladder of Citizen Participation (*Arnstein 1969*)

In this ladder the bottom rungs (1) manipulation and (2) therapy represent levels of non-participation. In these two rungs the aim is to enable power holders to educate the participants not to allow people to participate. In third and fourth rungs (3, 4) levels of tokenism, informing and consultation enable to have voice. Citizens may be heard. However there is no guarantee of their views will be considered carefully. Rung (5), placation is a higher level of tokenism. In the upper levels of this ladder, citizen can enter into a partnership (6) that enables them to negotiate with power holders. And other rungs (7) delegated power, (8) citizen control have a citizen power in decisions.

After Arnstein, another ladder proposed by Weideman and Femers (1993) and later adapted by Kingston (1998) for web-based public participation GIS (Figure 8), later it has been suggested that these different types of the ladder are based on a similar principle of empowerment (Webler 1999).

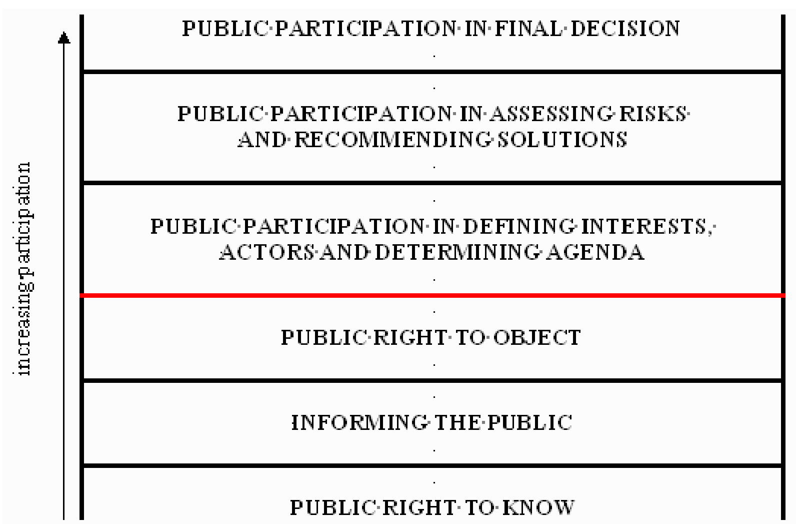

Figure 8 Public Participation Ladder (*Adapted from Wiedemann and Femers 1993*)

Others such as Glass (1979) identified the different objectives of participation as information exchange, education, support building, supplemental decision making and representational input. Glass also categorized the variety of corresponding techniques (e.g. citizen advisory committee, drop-in center and citizen survey). On another axis, Nelkin and Pollak (1979) categorized public participation according to three definitions of the problem of public acceptability (lack of confidence, alienation and inadequate information), they associated these categories with certain models and they considered some variables that might be used to differentiate the models such as who participates, who conducts the procedure, general intention, what is the distribution of technical expertise and is there a really choice. Especially in the planning process, Ball (2002) observes the change as shifted from small elitist groups to broad communities by means of the emergence of public participation. McCall (2003) and Trang (2004) have studied on the intensity analysis of participation. They made some important points on the who, what and how questions about the issue of participation. The table below which is adapted from their study makes some important determinations and clarifies this aspect of PPGIS. The who question, as we discussed in the previous sections, and as will be seen from Table 6 appears in a collaborative fashion, which can also be categorized as stakeholders, general public, experts and higher authorities, which is different from the categorization of Scholossberg and Shuford (2003) in terms of specification of categories. McCall (2004) mentions that having a good balance in all dimensions (who, why/what and how) may be seen as a good participation. Which means that the balance between three elements; number of people involved (who), scope of tasks (why/what) and the level of participation (how), may help us to recognize the degree of quality of study in terms of participation. Thus, the high level of interaction through the whole system, with large number of people involved and large extent of tasks shared leads to the ideal participation (Table 4).

Table 4: Intensity Analysis of Participation

<table>
<tr><th colspan="4">Participation
(Adapted from McCall 2003 and Trang 2004)</th><th>Intensity
(the balance between quantity and quality)</th><th>Result</th></tr>
<tr><td colspan="4">Who</td><td rowspan="2">Number of people involved</td><td rowspan="6">Good balance in these classes may result with Ideal Participation</td></tr>
<tr><td>Stakeholders (individuals or communities)</td><td>General Public (individuals or communities)</td><td>Experts (universities, practitioners)</td><td>Higher Authorities (Politics)</td></tr>
<tr><td colspan="4">Why/What</td><td rowspan="2">Scope of tasks</td></tr>
<tr><td colspan="4">•Needs expressing and sharing ideas
•Propositions, problem and solution analysis
•Discover problems and approval of solutions
•Analyse situation, support map making
•Learning, observing and exploring GIS, etc.</td></tr>
<tr><td colspan="4">How</td><td rowspan="2">Level of Participation</td></tr>
<tr><td colspan="4">The ladder of public participation
(information giving, public feedback, consultation, etc.)</td></tr>
</table>

3.4.2.5. Culture

When we observe groups of people, if we start to identify the factors, diverse elements can be summed up as "culture". This is one of the factors that has a great effect, especially on the accessibility and sharing of information within the participation process. The research of Hofstede, makes an interesting link between culture and participation, in studies of people in many countries (Hofstede 1980 and 1997). Through the analysis of many questionnaires and interviews, he created a model which suggests that national culture has four dimensions and cultures can be described in terms of several combinations of these dimensions.These four dimensions are:

1. Power distance index (PDI) that focuses on the degree of equality or inequality between people in the society. A high power distance ranking indicates that inequalities of power and wealth have been allowed to grow within the society. A low Power Distance ranking indicates the society de-emphasizes the differences between citizen's power and wealth.
2. Individualism (IDV), which can be describe as individualism versus collectivism. A high Individualism ranking indicates that individuality and individual rights are superior within the society. A low ranking indicates societies of a more collectivist nature with close ties between individuals. These cultures support enlarged families and collectives where everyone takes responsibility for members of their group.
3. The third one is the Masculinity (MAS), masculinity versus femininity. A High Masculinity ranking indicates the country experiences a high degree of gender differentiation. In these cultures, males dominate a significant portion of the society and power structure, with females being controlled by male domination. In a Low Masculinity cultures, females are treated equally as males in all aspects of the society. These masculine and feminine values can be easily seen in the example of *Rural Community in Honduras* which is realized to provide a framework for community members and outsiders to become aware of and sensitive to unequal gender and generational relations in a small rural community.
4. The last dimension is Uncertainty Avoidance (UAI) which focuses on the level of tolerance for uncertainty and ambiguity within the society. A high UAI ranking indicates that the country has a low tolerance for uncertainty and ambiguity. This creates a rule-oriented society that institutes laws, rules, regulations, and controls in order to reduce the

amount of uncertainty. A low ranking indicates the country has less concern about ambiguity and uncertainty and has more tolerance for a variety of opinions. This is reflected in a society that easily accepts change, and takes more and greater risks.

Hofstede added a 5th dimension after an additional study, and described this 5th dimension as follows:

5. Long-Term Orientation (LTO), focuses on the degree the society embraces, or does not embrace long-term devotion to traditional, forward thinking values. High LTO ranking indicates the country ascribes to the value of long-term commitments and respect for tradition. A Low ranking indicates the country does not support the concept of long-term, traditional orientation. In this culture, change can occur more rapidly as long-term traditions and commitments do not become obstacles to change.

These dimensions may easily explain that each community or individual has different socio-cultural behaviour and for the common problems, each culture has all different solutions and they can accept certain level of change in their environment (Hofstede 1980 and 1997). National cultural differences can be diverse. These cultural differences affect the public behaviours and influence perceptions of people (Koszegi et al. 2003).

We observe that it is not reasonable to ignore the huge influence of culture on the access and participation issues. There are other researches done that prove the impact of culture on individual behaviour. Such as, the social science research of Buchecker et al. (2003) concerning some methods (Oevermann's -objektive hermeneurik method- 1991) demonstrates that, like many other theories, the participation behaviour is determined by culture, social groups and the identity of the individual.

In PPGIS projects, sometimes these different dimensions become very obvious, especially concerning participatory expectations. In some cultures we observe that gender differences and the power degree of equality, or inequality, between people in the society may easily be seen during participation, as we may seen in one of the examples, *a PPGIS application in Southern Ghana.* In this case we see how the power degree presents a major barrier during PPGIS project, due to the influence of state officials and prominent people in the community.

3.4.2.6. Socio-Political Issues

As the case studies demonstrate, GIS discipline became more conscious of the local context. And the literature has started to consider the social and political impacts of GI systems in society at least 20 years ago (Chrisman 1987; McCusker and Weiner 2003).
Since maps have played and continue to play an important role in politics, both map-making and map-using processes are also highly attached to the politics and these processes are extremely important since the role of space and place is so important (Black 1997). McCusker and Weiner argued that the interpretation of landscapes and participatory mapping are inherently political processes.

Besides the other issues, social issues are always harder and more contentious than the technical ones and the notion of social space is a politicizing concept. And the social realm links with many other issues such as the economy. As the sociologist Henri Lefebvre (1991) has argued; every society has developed a particular social space that matches its economic and social needs.

The concept of PPGIS is also a political issue, first of all concerning the maps used. Black (1997) puts forward realities of maps and their relation with politics. The comparison made by him is quite interesting considering the similarities between caricatures and maps. He concludes by mentioning that they are very similar in some respects. According to him, like caricatures, maps are political and politicizing texts that need to be read with care.

PPGIS are mobilized in development projects especially for planning. Law and planning intersect in many issues such as land development, community development, housing or issues of property framed with the law, which is highly linked with socio-politics. PPGIS practices take place under different socio-political contexts and one of the challenges to successful results is dealing with socio-political issues (Harris and Weiner 2003). Likewise, many researchers and practitioners pointed out the importance of socio-political issues and their undeniable influences on PPGIS (Aitken and Michel 1995; Miller 1995; van de Toorn and De Man 2000; Berry 2001; Weiner, Harris et al. 2002; De Man 2003). In our analysis, different cases have been investigated in terms of understanding their socio-political conditions. The idea was to see how this socio-political context takes place in different practices. The list below summarizes the existing socio-political issues in the applications observed:

1. Parcel politics

2. Political mobilization /existing political power for community change

3. The process of land- use decisions, influenced by many factors including political, legal, bureaucratic and social pressures, Landscape policy (general principles, strategies discussed with the community), The existing questions about land use planning

4. Collaborators and representative groups who play a key role in local politics and governance

5. Legal jurisdiction (limited authority)

6. Conservation issues

7. Politically sensitive study sites (The study areas like military, conflict national boundaries or national restricted areas)

8. Receiving material and services is a question of political power

As Weiner and Harris (1999, 2003) experienced from their studies in South Africa and as observed from some of the cases, the power and politics are strongly connected (*The Atlanta project, Citizen-Based Land Use Planning in Dane County, A case study in Sri Lanka*). The existing power structure plays an important role in the community change which is not always positive. Especially in projects related to development, political power plays a vital role (*The Cherokee Nation and tribal uses of GIS, A case study with Village Development Planning in Bach Ma National Park buffer zone, Vietnam*).

The mapping of indigenous lands to secure tenure, manage natural resources, and strengthen cultures has begun in Canada and Alaska in the 1960s (Chapin et al. 2005) and than appeared in other regions of the world (i.e. *The North Hokianga Maori development project, 1995, New Zealand).* As seen from the current projects (*The Cherokee Nation and tribal uses of GIS)* mapping indigenous lands may have some problems regarding legal jurisdiction. In the case of legal jurisdiction, since courts are created by municipal, county, state, national and international political entities, their authority may have some geographic limitations that can affect the process.

There exist some questions that needed to be raised about land use planning which may count as another issue in the socio-political context such as who controls the land resources, who is in charge of land use planning, etc.

In addition to this, the politically sensitive sites such as we see in the case of *Collaborative natural resource management in China* may cause some challenging issues which are also extremely political. Such as the study areas like military, disputed national boundaries or national restrict areas.

Another issue is about receiving goods and services, which is also an important question of political power. As we may see in *Three Andean watersheds in Peru* or *Malaysia's case study*, these issues may appear in a form that the availability of some scaled topographic maps and aerial photographs, whose distribution which the government may restrict by law.

In generally, as Weiner et al. (2002) mention, PPGIS projects are political because they involve community participation, which is again essentially a political process. And we may finally see that the politics, power and social factor have a great influence on success and failure of the project (Miller 1995; Barndt 1998).

3.4.2.7. Institutional Context

As Haklay and Harrison (2002) once mentioned, institutional context can influence public opinion of the usefulness of PPGIS. Local societies are connected together through culture and institutions (De Man 2002). Institutions deal with subjective perceptions about the world. In local institutions the flows of communication and information are often in terms of stories and images rather than in texts and tables.

Institutions can be an obstacle in some studies such as in the example of "*Local community in forest management through a PPGIS application in Southern Ghana,"* in which formal and traditional Ghanaian institutions of land resource administration were disconnected. As seen in this study, an effective PPGIS application requires a coalition of formal and traditional institutions and a will to work in collaboration.

In richer countries the formal institutions complement the informal ones. And in world's poor regions, informal institutions play a primary role in running their affairs. Usually, embodies local knowledge which posed a challenge for local spatial information management. And these institutions play a role on the result of a project. De Mann (2002) considers that, an effective result of this institutional element can be supplied only if both formal and informal institutions reinforce each other and are embedded within the host culture which the formal institutions are constituted by formal law while informal institutions operate by informal norms or rules.

Sawicki and Peterman (2002) identified 67 organizations in 40 cities in the United States that claimed to have some form of PPGIS as a result of survey done. They identified four types of institutional location for PPGIS delivery. These are: non-profit organizations (31), universities (18), government agencies (16), and private companies (2). In this context public institutions such as schools, libraries and town halls, would offer a problem-solving context capable of linking spatial technologies with other networked information resources and utilities. The institutions like community learning centers may also expand the strengths of these public institutions in the case of PPGIS (Schroeder 96-7).

Case studies from throughout the world show that local communities, non-governmental organizations (NGOs), Universities and other organizations can significantly affect the outcome of efforts given in PPGIS. Particularly NGOs play an important role in helping marginalized groups, raising public awareness, and environmental education as mobilization of funding resources. For a better PPGIS practice and a meaningful participation, institutions need to work in a way of collaboration. Objectives have to be achieved in close collaboration between governments, NGOs, Universities and the private sector.

Finally, understanding PPGIS needs to be realizing each one of these diverse contexts having an effect on PPGIS. It has been tried to present all these different concepts briefly. Some of these diverse elements regarding PPGIS have been used while placing cases in a typology which will be discussed in the following chapter.

CHAPTER 4: RESULTS AND DISCUSSION

For the majority of the cases analysed during our research, the characteristics of PPGIS (i.e. objectives, subject, methods, people involved, materials and equipment used, etc.) were quite varied. After having examined number of case studies and with the help of literature and questionnaire, several variables have been sorted out which were thought to be representative for the basics of a PPGIS practice. Table 6 applies these variables to each case.

These variables (data, materials and equipment, interaction with software, method/mechanism, participation and public) are extremely broad elements where the scope of the investigation on these elements had to be narrowed. So, these elements have been limited by gathering them under some generic groups. For example for the materials and equipment component, four basic groups have been chosen: logistical (i.e. meeting place), raw (paper, pencil, pushpins, etc.), technological and mixed. The last one, the mixed type implies a component of more than one type (i.e. raw and technologic or logistical, raw and technological, etc.) The same categorization has been made for the method/mechanism column. For this element, the following groups have been determined: Participatory Learning Appraisal (PLA) methods, Participatory 3 Dimensional Modelling (P3DM), Internet, and once again a mixed type. With this categorization, the table contains primary elements that were found more dominant than the others in the documentation of each case.

4.1. The Extensive Variables of the Final Typology

In summarizing the PPGIS cases, the data, materials and equipment, interaction with software, method/mechanism, public and participation seem essential (Table 6). The public element takes diverse forms, so it is hard to offer any categories that generalize this component. The reason is that the public element needs several sub-sets of task definitions. The scope of these tasks may have numerous forms. The analysis done with different case studies has provided several definitions for the public, starting with community members, non-profit organizations, universities and continue with the citizens such constitute large groups like; the local indigenous people, teachers, farmers, even the tourists or sometimes the virtual tourists, etc. In consequence it was decided to take into consideration some relevant, prior definitions for the public. Few examples were suggested for each group which seem to be quite descriptive concerning these groups.

As mentioned before the definition of public given by Scholossberg and Shuford (2003) seems pretty harmonic for the public identities which have been acquired from the analysis of the case studies. They simply divided the public into three groups: the public who are affected by a decision or a program, the public who can bring important knowledge or information to the decision or a program and finally the public who have power to influence these decisions or programs.

Those most affected by a decision should have the greatest voice in the decision (Sanhoff 2000). From the cases examined the affected groups can include neighbourhood leaders, concerned residents, governments, etc. We will call this group Group1.

The second group constitutes all the participants who could contribute pertinent information, which can be also a very large group including experts, universities or indigenous people in the case of local knowledge. We will call this group Group2.

The third group consists of stakeholders who hold power in some manner in society, government or other organizations. We will call this group Group3.

For the group of public which constitutes more than one of these groups (Group1, 2 or 3) we will call this group Mixed.

However, for the future studies, it may be a useful attempt to identify the public in terms of variety of tasks such as mapping process, data acquisition or decision making. Public element of PPGIS may need another comprehensive study concentrating on several tasks realized / fulfilled by different sections of society.

Table 6: The Central Variables of PPGIS

Key: (SK: Scientific Knowledge; LK: Local Knowledge; Logistical Material: Meeting Place)

Case 1: [G-SoMa] **Data:** SK **Materials and Equipment:** Mixed (tech., logistical) **Software (Interaction with Software):** Indirect (facilitator or GIS technicians mapping the community 's feedback) **Method/Mechanism:** Mixed-PLA Public hearing, meetings (educational and informative), mapping, GIS based methodology **Participation:** Public feedback (community voice was heard) Public hearing (400 people) **Public:** Community members, non-profit organization SoMa developed a GIS (Group1,2,3 - mixed)
Case 2: [M-Phi] **Data:** SK **Materials and Equipment:** Mixed (tech., logistical) **Software (Interaction with Software):** Not **Method/Mechanism:** Internet, 3DModels (public records GIS) **Participation:** Public Feedback (Through Internet) **Public:** The city, PAFID (NGO) and University of Pennsylvania (Group1,2,3 - mixed)
Case 3: [NR-Min] **Data:** SK-LK **Materials and Equipment:** Technical **Software (Interaction with Software):** With Facilitator-High (public used some GIS tools) **Method/Mechanism:** Mixed (Internet - e-mail, GIS Methodologies) **Participation:** Public Contribution **Public:** Individuals (neighbourhood residents), experts, volunteer based non profit organization (Group1,2,3 – mixed)

Case 4: [TAP]

Data: SK-LK

Materials and Equipment: Mixed (tech., logistic)

Software (Interaction with Software): Not

Method/Mechanism: Survey, meetings, planning sessions

Participation: Public feedback, educative

Public: Neighbourhood leaders, residents, City of Atlanta, Non-profit firm through University of Georgia Tech. (Group1,2,3 - mixed)

Case 5: [V-Slw]

Data: SK

Materials and Equipment: Mixed (Technical, Internet, raw mat, logistical)

Software (Interaction with Software): With Facilitator-High (126 people used the system)

Method/Mechanism: Mixed (Planning for Real (PfR) and Web)

Participation: Consultation (online)

Public: Individuals, University of Leeds, NIF- National charity organization (Group1,2,3 - mixed)

Case 6: [LIS-Dane]

Data: SK

Materials and Equipment: Mixed (logistical, tech.)

Software (Interaction with Software): With Facilitator-High

Method/Mechanism: Mixed (PLA- Internet)

Participation: Public Engagement

Public: Individuals-Citizens, Government (Group1,2,3 - mixed)

Case 7: [POM]

Data: SK

Materials and Equipment: Technical

Software (Interaction with Software): Direct interaction with software

Method/Mechanism: Workshops, Web

Participation: Information Giving – public feedback (long term program)

Public: Individuals- Residents, Organizations - DRC (Group1,2, 3, - mixed)

Case 8: [RU-Aus]

Data: LK- SK

Materials and Equipment: Technical

Software (Interaction with Software): Not

Method/Mechanism: Interview (Semi-structured face-to-face interviews)

Participation: Public Contribution

Public: HRIC staff, partners, University of Queensland, participants involved in the establishment of HRIC (representative bodies, general public, government, industry) (Group1, 2, 3 - mixed)

Case 9: [FM-Ghn]

Data: LK-SK

Materials and Equipment: Technical

Software (Interaction with Software): Not

Method/Mechanism: Mixed (Mapping sessions, interviews, questionnaire)

Participation: Public Contribution

Public: Members of the local forest committee, Charitable Organization- Rockefeller Found. (professional foresters, natives, civil teachers, civil servants, traders and representatives of various interest groups) (Group1, 2, 3 - mixed)

Case 10: [CF-Nep]

Data: LK-SK-aerial

Materials and Equipment: Technical (GPS)

Software (Interaction with Software): With Facilitator-High

Method/Mechanism: Mixed (PRA, Participatory photo mapping session Participatory inventory, semi structured interviews, group walks)
Participation: Public Engagement

Public: Forest user groups, Local people (Group1, 2, 3 - mixed)

Case 11: [CIG-Mpu] **Data:** SK-LK **Materials and Equipment:** Mixed (tech., raw, topo. map) **Software (Interaction with Software):** Not **Method/Mechanism:** PLA, meeting, workshop, mental map **Participation:** Public Contribution, Independent Federal Agency-NSF, Independent Research Consortium-NCGIA, WVU Regional Research Institute **Public:** Local people (Group1, 2,3 - mixed)
Case 12: [MDP-Nhok] **Data:** LK-SK **Materials and Equipment:** Mixed (tech., raw) **Software (Interaction with Software):** With Facilitator-High **Method/Mechanism:** Participatory mapping exercise, meeting and interviews **Participation:** Public Engagement **Public:** Local indigenous people, University of Auckland (Group1, 2,3 - mixed)
Case 13: [NTU-Chk] **Data:** LK-SK **Materials and Equipment:** Technical **Software (Interaction with Software):** With Facilitator-High **Method/Mechanism:** GIS utilisation **Participation:** Consultation **Public:** Cherokee people, tribal personnel, U.S. Census Bureau (Gov) (Group1, 2, 3 - mixed)
Case 14: [PGM-Hon] **Data:** LK-SK **Materials and Equipment:** Mixed (tech., raw) **Software (Interaction with Software):** Not **Method/Mechanism:** Mixed (Participatory Gender mapping (PGRM), Interviews, resource mapping,

labor mapping and allocation analysis)

Participation: Consultation

Public: Household members of the community (41 households and approx.273 people), University-CIIFAD (Group1, 2, 3 - mixed)

Case 15: [LK-Tur]

Data: LK (interview)-SK

Materials and Equipment: Mixed (tech., raw)

Software (Interaction with Software): Not

Method/Mechanism: PRA, Verbal and map-based Interviews

Participation: Consultation

Public: Individuals (Fishermen), University of waterloo (Group1, 2, 3 - mixed)

Case 16: [LAU-Mdr]

Data: SK-aerial LK-field survey

Materials and Equipment: Mixed (tech., raw)

Software (Interaction with Software): Not

Method/Mechanism: PRA

Participation: Consultation

Public: Local Residents. (Group1, 2 - mixed)

Case 17: [LUP-Sri]

Data: SK LK-Field survey

Materials and Equipment: Raw (for sketch maps)

Software (Interaction with Software): Not

Method/Mechanism: PRA

Participation: Consultation

Public: Indigenous people (Land users, peasants, caretakers, owners), University of Zurich - Irchel. (Group1, 2,3 – mixed

Case 18: [MAP-Orl] **Data:** SK-aerial **Materials and Equipment:** Technical **Software (Interaction with Software):** Direct **Method/Mechanism:** Internet-Online discussion **Participation:** Consultation **Public:** General public, citizens, Government (Group1,2, 3 - mixed)
Case 19: [VIR-Lon] **Data:** SK-satellite **Materials and Equipment:** Technical **Software (Interaction with Software):** Direct **Method/Mechanism:** Internet 3D modeling, web **Participation:** Consultation **Public:** Professionals, concerned citizens, virtual tourists, Government (Group1, 2, 3 - mixed)
Case 20: [WOODS] **Data:** LK-SK **Materials and Equipment:** Technical **Software (Interaction with Software):** Direct **Method/Mechanism:** Internet **Participation:** Public feedback (through Internet) **Public:** Local communities, people living within the park, tourists, visitors to the area (Group1, 2-mixed)
Case 21: [P-NewF] **Data:** SK-LK **Materials and Equipment:** Mixed (tech.-raw) **Software (Interaction with Software):** Indirect, "have it mapped for them"

Method/Mechanism: PLA, mapping sessions, meetings, sketch mapping

Participation: Consultation

Public: Fishermen's committee members (Group1, 2 - mixed)

Case 22: [PPGIS-Sin]

Data: SK

Materials and Equipment: Technical

Software (Interaction with Software): None

Method/Mechanism: Meetings, feedbacks with fax and email, user training workshops

Participation: Consultation

Public: Residents, town council staff, property managing agents (Group1, 2, 3 - mixed)

Case 23: [RM-Chn]

Data: SK-LK

Materials and Equipment: Technical

Software (Interaction with Software): Indirect, "have it mapped for them"

Method/Mechanism: PLA methods - Interviews -with mobile interactive GIS (MiGIS)

Participation: Consultation

Public: Farmers, Local villagers – university, government, organization collaboration (Group1, 2, 3 - mixed)

Case 24: [CS-Flo]

Data: SK

Materials and Equipment: Technical

Software (Interaction with Software): Not

Method/Mechanism: Meetings, workshops

Participation: Consultation

Public: General public - business associations, neighbourhood groups and public collaboration (Group1, 2, 3 – mixed)

Case 25: [NRM-Leb] **Data:** LK-SK-satellite **Materials and Equipment:** Mixed (raw, techno., GPS) **Software (Interaction with Software):** Indirect, "have it mapped for them" **Method/Mechanism:** PLA Hand-drawn maps on a paper are provided, sketches, diagrams rankings **Participation:** Public Contribution **Public:** Local people- researchers, organization, government collaboration (Group1, 2, 3 - mixed)
Case 26: [PF-Fin] **Data:** LK-SK **Materials and Equipment:** Technical (GIS and multicriteria preference analysis tools) **Software (Interaction with Software):** Not **Method/Mechanism:** Public meetings, interviews, feedback forms **Participation:** Consultation **Public:** General public -government, organization (Group1, 2, 3 - mixed)
Case 27: [CS-Peru] **Data:** LK-SK (aerial) **Materials and Equipment:** Mixed (techno., GPS, raw) **Software (Interaction with Software):** Not **Method/Mechanism:** PRA participatory resource mapping, sketch mapping, photo mapping, semi structured interviews and meetings **Participation:** Public Contribution **Public:** Community members- University, NGO (Group1, 2, 3 - mixed)
Case 28: [CS-Phil] **Data:** LK-SK **Materials and Equipment:** Raw **Software (Interaction with Software):** Not

Method/Mechanism: Construction of 3D models, the perimeter survey **Participation:** Public Contribution **Public:** Indigenous people –NGO, government organizations (Group1, 2, 3 - mixed)
Case 29: [CS-Vtm] **Data:** LK-SK-satellite **Materials and Equipment:** Mixed (raw, tech.- ipaq, GPS) **Software (Interaction with Software):** Not **Method/Mechanism:** PRA meetings, sketch mapping, informal interviews **Participation:** Consultation and Initiative Action **Public:** Farmers, villagers, Netherlands Organization for Cooperation in Higher Education (Group1, 2, 3 - mixed)
Case 30: [CS-Mlys] **Data:** LK-field survey SK-aerial, topo. maps **Materials and Equipment:** Mixed (raw, tech.-GPS) **Software (Interaction with Software):** Not **Method/Mechanism:** Field survey, Scaled hand-plotted maps were produced **Participation:** Public Contribution **Public:** Indigenous Dayak Community, NGOs and CBOs (Group1, 2, 3 - mixed)

4.2. The Ladder of Public Participation

The participatory process is an active process where the expected beneficiaries are the central actors in the entire process. And very often the facilitator is one of these central actors who benefits as well. In most of the examples, it was observed that the researcher played the facilitator's role during the process (i.e. The impacts of GIS use for neighbourhood revitalization in Minneapolis, Elwood 1990; The North Hokianga Maori Development Project, Laituri 1995; Virtual Slaithwaite, Kingston and others 1998).

Ideally, the participatory process calls for a more different model, than the usual model for policy making particularly a bottom-up approach rather than a top-down one. Moreover,

the communication mode as well, needs a different model; instead of a monologue type such as executing tasks, based on western knowledge rather a dialogue type that based on traditional knowledge, i.e. listening to people and sharing the knowledge.
During the process, the objective should be demystifying the technology and science by explaining what it is all about, connecting theory and practice, transferring control, communication, and finally democratizing information and practice.

To better understand the participatory process, the ladder of participation proposed by Arnstein (1969) and Weidemann and Femers (1993) was adapted. These models emphasize the degree of a citizen's power and control which begins with manipulation by others and ends with citizens having power over a decision. These participation ladders are the essence of nearly every discussion on participation in PPGIS. Often, promises are made about high levels of engagement, reality drops down the ladder. This public involvement ladder can be seen as a relationship between centralization and the decentralization. In the sense of this ladder, to reach the top level, decentralization implies increased power of an empowered public. Figure 9 summarizes the level of participation of selected case studies examined during our research. The numbers on the right side of the ladder (pyramid) demonstrate the number of cases belonging to the position on the ladder given on the left side. As seen from the figure below, the majority of the applications in PPGIS can be considered in the consultation level of public involvement.

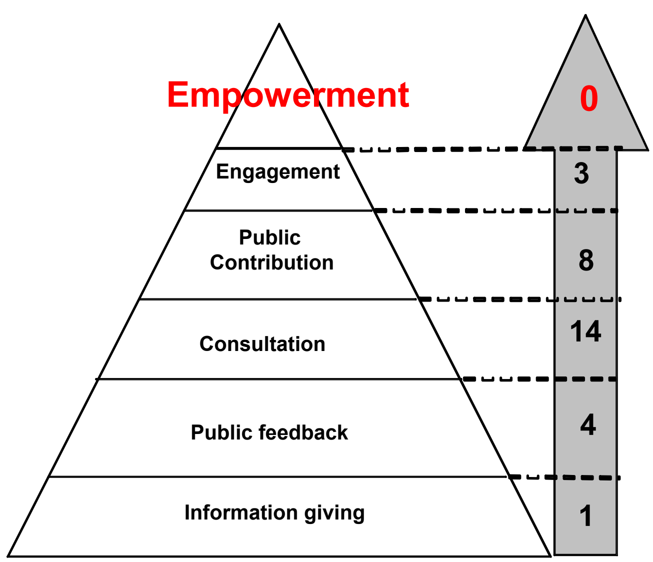

Figure 9 Public Involvement attained by the case studies - *(Adapted from Arnstein, 1969 and Weidemann and Femers, 1993)*

The consultation level of public involvement for the selected PPGIS case studies corresponds to 14 cases over 30. This level can be seen as the most frequent public involvement category among the selected cases. The more far-reaching mechanism of this ladder can be seen in Fig. 10.

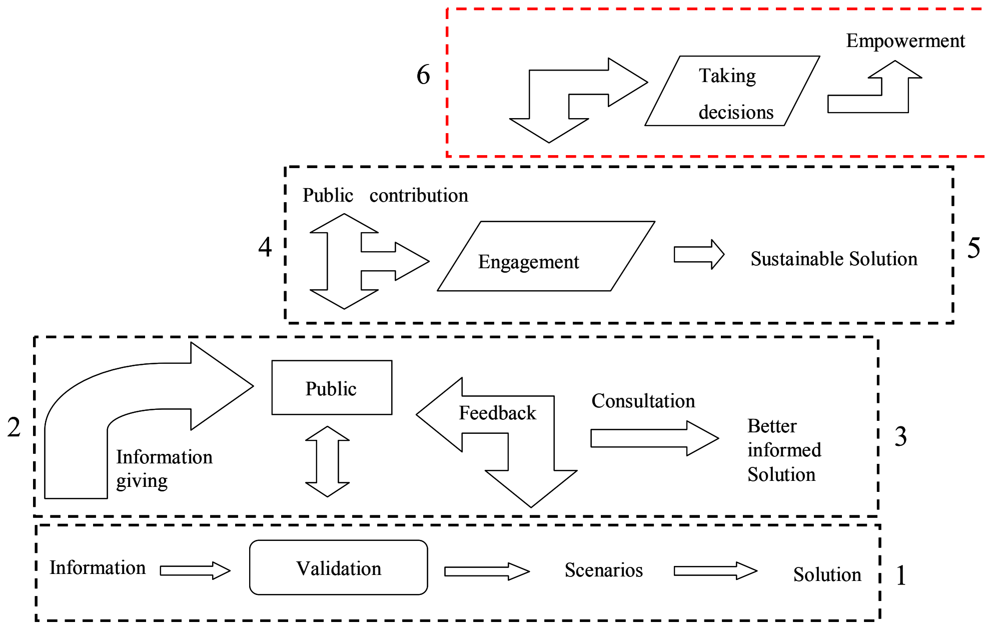

Figure 10 Generic model of public involvement

As seen from the figure, the first level concerns with one way flow of information about the issues and the problems. This level focuses on creating some scenarios and proposing solutions without getting any feedback from the public side. The second and third steps supposed to have better solutions since either we get some feedback from the public, prepare some scenarios and make our decision (2) or apply an additional consultation step with public (3). The level of public contribution (4) may be seen as a transition step between engagement (5) and consultation (3). This contribution step is more than consultation since the public is partially involved in the action by using their local knowledge. And their contribution to the process is more than the other lowest rungs of the ladder or a pyramid. The significant point is all the upper levels have a cycle around the first step. So the first step, which is an information step, has to be included in the upper levels. As mentioned before an effective public participation at any level requires the public to be well informed and kept aware of the possibility of participation (Hansen and Prosperi

2005). Before public can discuss and resolve the problems, they must be informed about the facts. Thus the information is crucial.

4.3. The Typology of PPGIS

Regarding the public involvement issue, Table 7 illustrates some of the properties of each element in PPGIS. This table is mainly focused on the public involvement level coalesced with other elements observed in each type.

Table 7: Ladder of Public Participation Concerning PPGIS Cases Selected

Type	Example
Democratic Decisions: No information	Not observed
Public Taking Part : We see a high level of interaction with software accompanied with facilitator at the same time the other participatory methodologies are quiet diverse. And we observe participatory process in every step of the process except decision making.	[CF-Nep], [LIS-Dane], [MDP-Nhok] (3/30)
Public Contribution: Can be seen as a transition step between consultation and involvement steps. This step is more than a consultation. The public partially involve in the action. Especially with local knowledge public collaborate. The public take action with the collaboration of scientific knowledge and this stage can be seen as a passage since the secondary data local knowledge is seeing as a primary data. The majority of cases having the data in the order of LK and SK.	[NR-Min], [[RU-Aus], [FM-Ghn], [NRM-Leb], [CS-Mlys], [CIG-Mpu], [CSPeru], [CS-Phil] (8/30)
Consultation: We see SK and LK and using rich variety of methods and mechanism especially PLA, PRA, Internet. In terms of interaction with software we observe none, direct and high level of interaction with facilitator. The material used is also diverse, mixed type (Internet, raw material, logistical)	[V-Slw], [NTU-Chk], [PGM-Hon], [LK-Tur], [LAU-Mdr], [LUP-Sri], [MAP-Orl], [VIR-Lon],[P-NewF], [PPGIS-Sin], [RM-Chn], [CS-Flo], [PF-Fin], [CS-Vtm] (14/30)
Public Feedback: Can be seen as a transition step between information giving and consultation steps. This step usually have none or direct interaction with software. Especially SK type of data is concerning the most. The LK seems like a secondary source. The methods used can be diverse such as different types of PLA methods, public hearing, meetings , mapping, GIS based methodology and Internet. Frequently, use logistical material and Internet. Through internet seems more successful in terms of reaching broad quantity of participants.	[G-SoMa], [M-Phi], [WOODS], [TAP] (4/30)
Information Giving: This step usually have scientific knowledge and may have none or direct interaction with software in general. This type usually uses logistical material or Internet. It implies one-way flow of information. Usually, concerns various types of methodology, especially focused on workshop and Internet.	[POM] (1/30)

Table 7 should be seen as having a generalized definition of each type in order to reduce the variety into certain classes. For each level there may have some exceptions in a certain measure, the intensity may differ for each case even if they have been situated in the same level. For example; some cases which use Scientific Knowledge (SK) more than Local

Knowledge (LK) or vice versa doesn't always mean that during the practice they used LK and don't have any data coming from SK. Also this doesn't mean that the data is the only key element that we searched for while placing case studies within the ladder.

The typology definition given here comprises the study of types, in other words the classification of PPGIS according to its characteristics. Up to a certain extent to organize or classify the system for better comprehension.

In the literature, a very common type of typology seemed to be the matrix ones, such as Porter's (1980, 1985) or Ansoff's (1965). The typology figure shown below has five leading characteristics. A kind of form was sought for that represents better its nature as a system that includes various interconnected elements. For the reason, the hexagonal form seems more convenient for our classification (Fig. 11).

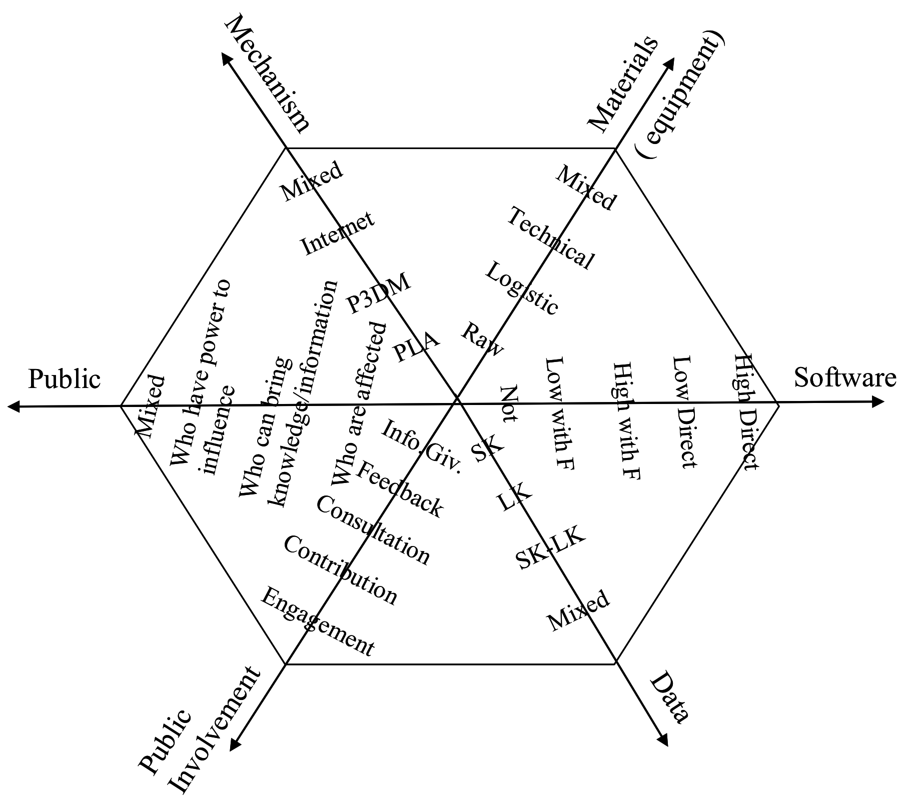

Figure 11 Six Leading PPGIS Characteristics

The axes of Method/Mechanism, Materials and Equipment and public are nearly always mixed, so they can be neglected. For that reason, we did not include these two elements in the following figures. However the full details were previously given in Table 6.

Finally we have restricted the typology headed for this variation. Fig. 11 changes into the new form (Fig. 12). The arrows in Fig.12 indicate flow of diversity within each element. This new form covers the elements: public involvement, data and the interaction with software. In data element, the variable which is named ‘Mixed’ has been divided into two categories (SK-LK and LK-SK). This distinction highlights their order in process. SK-LK means that the primary data is Scientific Knowledge, and quite the reverse LK-SK refers that the primary data is Local Knowledge. While the public involvement and the data mostly increase in a one way flow direction. However we can not run the same logic for the interaction with software.

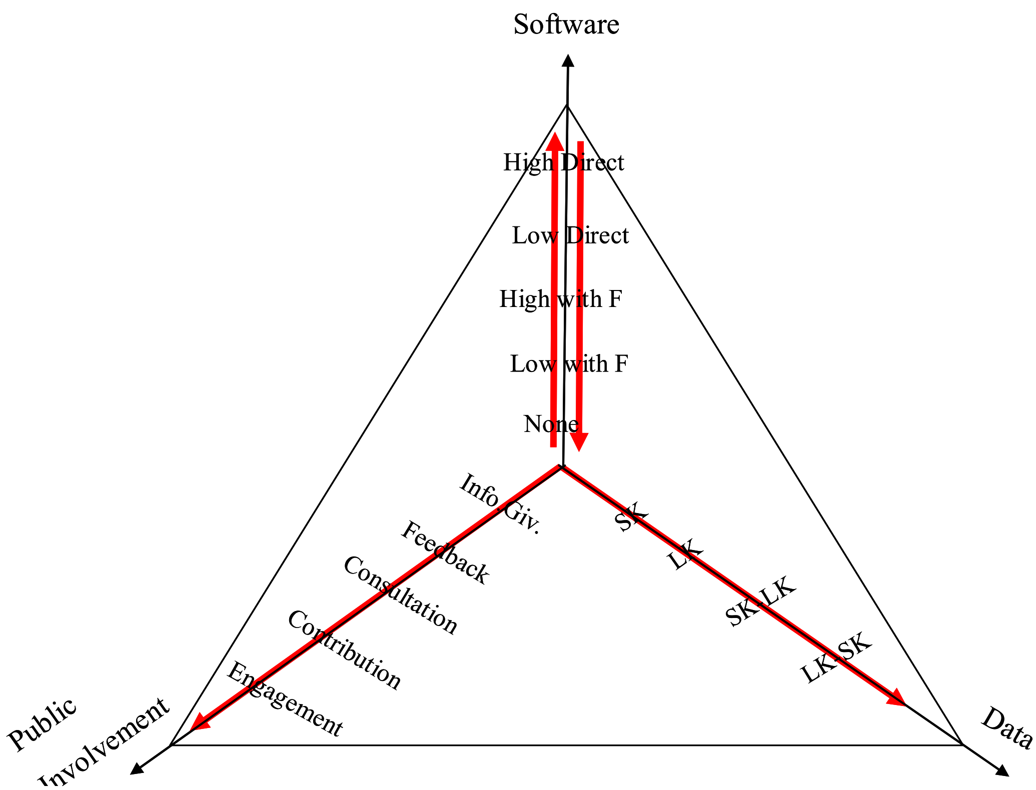

Figure 12 Trends towards Three Axes

Concerning particularly the diversity in these three axes there are five types that have been discerned. The first PPGIS type implies an information giving process based on scientific knowledge, such as *The Pilsen Project,* (http://www.evl.uic.edu/sopark/new/RA/#sub), merely based on scientific knowledge and informing the public. This case had no input coming from the public, especially during the implementation process of the study. As may also be seen in the project of *Portland metro’s dream*, as a final result of this study the public simply became aware of different scenarios via Internet. This information giving step can be achieved either by their direct interaction via Internet or by some other non-technical solutions such as workshops and meetings.

In the second type, none or direct interaction with software was very common where mostly scientific with some contributions of local knowledge was observed. Through Internet, there has been some success in terms of gathering a large quantity of participants. Basically, this type tries to hear the public's voice and to document their aspirations in order to supply some feedback. The project of *Community GIS and Gentrification Battles in San Francisco* can be given as a good example.

Following, in the third type, SK and LK have been observed. In fact once again SK was a primary knowledge source. This type employs the rich variety of Methods/Mechanism, particularly PLA, PRA and Internet. In terms of interaction with software, it usually appears none (i.e. *Participatory GIS project in a Newfoundland fishing community*). However, there exists some rare examples with direct and the high level interaction with facilitating (*i.e. Orange County Interactive Mapping; Virtual Slaithwaite*). The Materials and Equipment employed here is also varied such as technical, Internet, raw material and logistical type as well.

In the fourth type, the public becomes implicated partially in the action. Collaboration with the public has been observed in terms of producing and seeing local knowledge. The most typical characteristic of this type is that local knowledge becomes the primary data source (*Participatory GIS-based natural resource management in Lebanon*). However the interaction with software mostly emerges as none.

In the final type, a high level of interaction with software was observed accompanied by a facilitator. The data type seems mostly the local knowledge based. At the same time participative methodologies look like relatively varied in this level. In every stage of the process an elevated level of participative process was encountered (*Shaping Dane*).

4.4. Discussion

Regarding the typology, choosing any ideal type seems irrelevant in the case of PPGIS. The typology should be thought as a system of interconnected concepts for the PPGIS study which will be helpful in further studies. The typology created demonstrates that the first two levels of public involvement (information giving and feedback) don't involve any level of interaction with software. However, it won't be accurate to conclude any directly proportional relation between public involvement and interaction with software. As observed in the fourth type, a high level of public involvement may accompany a total lack of interaction with software. Thus, public involvement in PPGIS practices doesn't always suggest an interaction with technology. On the contrary, one of the important results emerges from these different types is, the very low level of interaction with software. Since the conceptual core of PPGIS involve with the communities using GIS and GIT, presently the results demonstrate that there exist some PPGIS applications which operate differently.

What have been observed from the research work is, there is no ideal PPGIS project, only exist ongoing attempts to encourage more vigorous PPGIS practices. An ideal PPGIS may be realized fully or not depending on circumstances. This is why each case has to be handled differently, since they all have different properties (geographical location, cultural effects, social and economical conditions, technological possibilities, etc).

In PPGIS, at a community development level, it will be profitable to discuss the problems in a learning process. During this learning process, understanding the problems, formulating some objectives and then helping the community to decide and to start certain actions towards these objectives will move the community from those problems.

Advances in technology may offer advantages to PPGIS. However it would be very artificial to rely on technological developments in an isolated way from other realities around us. It is essential to pay attention to different expectations or opinions. It is hard to neglect the privilege of specialized (scientific) knowledge. However, this specialized knowledge must be merged with local knowledge for maximum effect. Thus, the balance between these different knowledge sources turns into an important and sensitive issue for the future progress. Diversity in the perspectives of different people may shape the results.

What is needed for PPGIS is to work together with GIS technology and public participation in the decision making processes.

The attempt to offer a typology has provided some insights into PPGIS and its practices as well. This study has also helped to expand our understanding about the difficulties and the limits of developing such typology for future assessments. Even the aim was to construct a more comprehensive typology than the existing ones, a typology proposed here may only include some of the variables which play a major role in a PPGIS practice. Finally, we arrived simply three axes or criterions that may enable us to classify PPGIS. Variables chosen in our approach are not the whole variables but they represent the major ones. Another limitation with this typology study is that the analysis had to be limited to those available. A larger selection of cases may perhaps change the results. This is only a literature survey, not based on first-hand evaluation of each case. Thus the results coming from the literature might be controversial and perhaps improperly situated in the typology. For the researchers who may plan to place a PPGIS in a typology, it may be very useful to participate in some of the case studies. There exist some examples in the literature that propose helpful typologies applied in various research areas where this kind of method was favoured (Mintzberg 1980). Besides it's exhaustive and time-consuming characteristics, this method may help to obtain more systematic approach and more precise results for the future research works.

As different contexts having a complex character that are gathered under the title of "PPGIS", it is inevitable to observe the same type of complexity in PPGIS. This is one of the reasons why this research has not produced rules for practice or homogeneous categories for PPGIS study. However it can be mentioned about what these practices have or don't have in common for a certain number of cases analysed. In any research area without the guidance of past experience, the future can be an arduous and a confusing way to go. It is important to comprehend some realities that emerge from our analysis concerning previous case studies. Some exploratory results found here may become useful for future studies in PPGIS.

CHAPTER 5: KEY CONCLUSION AND RECOMMENDATIONS FOR FUTURE WORK

5.1. Conclusions

It is impossible to separate scientific truth from social parameters of its inception (Lynch & Woolgar 1990; Ross 1996). Social importance of science and technology has been recognized and increasing attention has been paid to matters involving science, technology and society (McGinn 1991). Likewise, Sheppard (1995) has already indicated how the technology of mapping and the science of cartography have always been interconnected to broader projects of political economy and geopolitics. Moreover some researchers have been emphasized the important social relationship between information technologies and society (Poore and Chrisman 2006; Chrisman 2005).

Many technologies lie at the core of GIS, it seems irrational to speak about PPGIS without the development and the adoption of new technologies especially the information technologies. Laituri (2003) includes technology as one of the components of PPGIS. Besides the adoption of the Internet Technologies, the growing progress in the software platforms for the development of Internet GIS (ArcIMS and Map Server) has led to wider use of Internet mapping (Hansen and Prosperi 2005). Peng (2003) points out this development very clearly in distributed GIS, started with personal desktop GIS to these distributed GIServices that includes the applications of wired GIS and wireless mobile GIS. The development of Internet GIS is an effective medium for more efficient and faster applications and communication. Applications like Google Maps, Google Earth or MS Virtual Earth have taken real public attention. Google Maps is a free web map server application and technology provided by Google. It offers street maps, a route planner, and an urban business locator for numerous countries around the world. A related product is Google Earth offers enhanced globe-viewing features. Microsoft Virtual Earth combines the MapPoint Web Service around bird's eye, satellite and aerial imagery, map styles and usability as well as enhanced local search. All these applications enable people to learn, discover and explore a specific location.

Today Internet geographic information services have become more important to the public. We are talking about the democratization of information by disseminating the maps. And the availability of geospatial data to opened up many opportunities the citizens. Finally to ask for the participation of the citizens through a global Internet access have become a huge aid in many applications. All the developments in computers, hardware, software, digital information and Internet have a huge impact on our today's world. In PPGIS, technology can be viewed as multifaceted, an opportunity for some and at the same time an impediment for some others. In PPGIS studies, technology plays an important role in the feasibility of the project if it is necessary during the whole process, i.e. for the applications like web-based PPGIS (*The Virtual Slaitwaite project, Virtual London*).
Information and communication technologies or spatial information technologies have the potential to bridge the gap between science and local knowledge in their use by local communities. Masses of spatial data are now available. Technology, science and local knowledge have been brought together encouraging sustainable development. In this context, PPGIS may be seen as a new recipe which has some promising and increasingly developing parameters.

Besides the developments in GIS and other technologies, participatory research that incorporates GIS applications has also grown tremendously. Thus, the trends come from social sciences and their engagement with GIS in decision making processes, technical developments in several domains first of all in IT and the critics about GIS played an important role on the concept called PPGIS. Evidently this phenomenon seems to have a huge potential which makes possible to develop better solutions and to take cooperative and enhanced decisions in our lives.

The impacts of a combination of many concepts have emerged after the discussions around GIS and the social issues (science, technology and society), which also put forward the concept of PPGIS. In other words, different concepts met in the crossroad of PPGIS. One of the central goals of PPGIS is placing GIS within the community context headed for solving community problems. Before PPGIS, the projects were rarely implemented in a community, social and cultural context. Since GIS has become more accessible to the public, it has increasingly been seen from the perspective of social and cultural studies and it has been promoted as a public technology more than before.

In the domain it seems that what is needed is to bridge the gap between theory and practice. However the practices carried out to date confirm that we are still far from the desired. In addition to this general picture, research results emphasize some particular facts regarding these studies. These facts can be summarized as follows:

- Informing public and asking about their opinions through healthy dialogue with the community is required so that these communities may develop better solutions With this approach PPGIS may be seen as a potential solution (i.e. case study of Minneapolis)

- There still exist some distrust issues to overcome (i.e. case study of San Francisco)

- Problems with the maps, using computers and the necessity of training skills in running GIS cause some major problems in the projects (i.e. case study of Philadelphia's neighbourhood, case study of Minneapolis, case study of Slaithwaite, case study of Malaysia etc.)

- Concerning the issue of participation, it does not always depend on the problems with the availability of technology or the support they need. Some projects had low participation (i.e. case study of Atlanta) due to difficulty of mobilizing the community.

- The requirements for human and financial resources are the vital issues in PPGIS projects, especially in terms of collecting the expensive data (i.e. case study of Australia, case study of South African fieldwork).

- The methods such as PRA seem very effective during participatory process which may improve communication between locals and outsiders (i.e. case study of Sri Lanka)

- Some failures were often observed which limit the final outcome, frequently caused by academic commitments or funding shortfalls (i.e. case study of Newfoundland)

- The equal participation is an issue which is controversial, since some community members have an advantage of having familiarity with data or information which may let them dominate the discussions during the process (i.e. case study of Southern Ghana)

- The interest in PPGIS coming from communities, town councils as well as the governments may have other potential.

- In numerous studies the final result couldn't be achieved, only the first step for future work was realized in most of them. At the same time the interested communities familiarized themselves more with their environment which is also an important issue in improvement of their environment and their lives as well.

- Geomatics covers many technologies and techniques (GIS, GPS, geodesy, remote sensing, surveying, including cognitive science and research in ontology) and uses/requires geospatial information. Thus, the importance of geospatial information and spatial analysis which is linked to geomatics as well as PPGIS domain has to be emphasized, since PPGIS support the use of these technologies and methods in a wider context, rather than just an expert use. Furthermore, PPGIS also depend on the availability of geospatial information. It is essential to repeat the crucial role of geospatial information and the applications of geomatics, particularly GIS, in PPGIS domain.

The conceptual framework developed in this research have once again emphasized that PPGIS is situated on the convergence of many concepts and disciplines. The results demonstrate the influence of these different contexts on PPGIS. These contexts have constituted the major characteristic of the domain. The typology proposed concerning conceptual outline takes into consideration both the theoretical and practical aspects of the

PPGIS domain. The study presents the current situation in PPGIS with numerous supporting examples. The concepts and interrelation between concepts gathered under PPGIS were demonstrated explicitly. The different origins of PPGIS and its development in time have been highlighted as well. Finally, better understanding of PPGIS through numerous PPGIS case studies was ensured. Some similarities and differences within these cases were categorized by placing them under different types. However, a tentative typology proposed here is limited in terms of elements chosen for the final typology and variety of cases analysed during this study. As may seen from figure 3, intersections between technologies, sciences and social inclusion where PPGIS takes place in the convergence of these entities illustrate very well the complexity of this domain. Because of the complexity of this domain, our efforts to propose a typology rather resulted with simple classification of PPGIS cases with three axes.

It is mostly a generalized description of different types originated from cases selected in the literature. Thus, study still remains to be improved in terms of its elements which need to be included as well as the variety of PPGIS cases ought to be considered. Some of the results mentioned as well as the recommendations for future work would be helpful in terms of supplying a framework for future analysis and to realize how PPGIS has needed to be analysed in future. With this study we offer future research and working lanes, one of the future lanes and the implementation of a definite area of test and validation can be this frame of classification.

5.2. Recommendations

Today, conceptual discussions are still ongoing about the use of GIS for spatial planning in combination with participatory approaches. Terms and concepts are used differently. There are variety of terms for similar or related techniques, such as Participatory GIS (PGIS), Public Participation GIS (PPGIS), Community-Integrated GIS (CIGIS) or Community Mapping. It is also suggested that the PGIS as a tool, PPGIS as a planning context and/or organizational framework, and community mapping can be seen as an example or a subset of participative GIS (PGIS) (Kienberger et al. 2005). These PGIS methods are widely used in developed societies for urban community neighbourhood identification, problem prioritization, and participatory planning. In developing countries these participatory applications are mainly centered on natural resource identification and management, hazard mapping and disaster risk management as well as simplified cadastral recording (McCall, 2004).

PPGIS needs a homogeneous methodology to facilitate the efforts given in the domain. These methodologies are still not available (Tulloch, 2003). It is possible to develop a kind of guide/manual in order to contribute into the practical analysis by proposing some methods. However this kind of systematic study needs some collaboration and may be developed progressively over time. It would be quite handy to develop such theoretical methodology for PPGIS practices to facilitate future work.

Gathering PPGIS case studies in an observatory aims to ease some of the difficulties in the domain. This was indicated as a secondary objective in our research to improve the knowledge in the PPGIS community. As mentioned before, to elicit the benefit from this kind of tool, collaboration seems a vital issue. The observatory is about to be completed, once it is done it will be possible to easily access the case studies and let the community become more aware about the diverse applications of PPGIS. It will also play a bridging role between practical and theoretical aspects of the concept. In this manner, we will better understand the concept and eliminate some existing ambiguities.

Another remarkable issue at present, beyond the terminological and conceptual ambiguities, is the value of recognizing today's advantages of virtual participation (Kingston, 2002). Various methods through digital technology and the Internet we may improve the public participation in most cases. Today, many PPGIS projects use the Internet technology in their process and ultimately access to spatial data. The current use of Internet may be seen in many studies, especially for urban planning and environmental applications (Craig et al 2002).

Once more, the technology is able to solve another challenging issue in PPGIS which is the participation issue, with some exceptions discussed before (i.e. case study of Atlanta). As mentioned above the development of the Internet, technology may enhance public participation by eliminating the barriers of place and time (Shiffer 2002). Additionally, wireless access to the Internet is rapidly growing. Maybe these technological solutions are not easy, quick solutions for everybody, but rather it seems that having a huge potential for overcoming lots of impediments in terms of participation.

Nowadays, community residents are using GIS in any ways to evaluate their neighbourhoods. By being able to understand the issues proposed, consider alternatives, evaluate consequences of decisions, monitor implementations, etc. neighbourhoods are in better positions. Also the widespread use of geographic knowledge provides a better condition for the adoption of new technologies and motivating change for the better as well (Dangermond 2002). One of the good examples of this widespread use of geographic knowledge is a free, downloadable Google Earth program which maps the earth using some satellite images, aerial photographs and GIS. In other words, it is a GIS which is available to anyone and facilitates the democratization of maps as well as GIS tools. It is for sure that it has a great future as mapping becomes easy for the public. Those who don't have any knowledge or specific background in cartography will have access to the spatial information and anywhere. The technology evolves some problematic issues like to access to the information, to the data, etc. however maybe not in a little while, but they will probably be solved in the future. Like the progress in technology many factors may allow facilities in decision making serving to democratic decisions and improvement in life quality. In this challenge GIS may become a common language. This kind of technology can make people more alert to their world they live in and give power to them by educating and informing which we can count as a vital mechanism in a democracy (Dangermond 2002).

The importance of the participation has been accentuated many times in the literature likewise observed during the research. It is a complex issue and possibly is one of the major elements that make the difference in PPGIS practice. Concerning the interaction of public in PPGIS, it seems appropriate to repeat an important conclusion based on a survey in Netherlands (Geertmann, 2002), which is also discussed by some researchers concerning the level of interaction. They pointed out that PPGIS should be more user-friendly, transparent, flexible and adaptable especially to the planning situation. Doing so, they are suggesting that the developers need to address the target groups in the PPGIS design process (Hansen and Prosperi, 2005), which sounds as an important concern needed to be considered carefully.

GIS made a huge impact in every day life and seems that it will be used by many and finally it is coupled with the society and participation element. This sophisticated technology has associated with numerous practices and disciplines which needed to be treated seriously. Accordingly it is suggested that, like social and political ones, many other disciplines playing role in this new form of GIS have to be studied closely.

Furthermore, as Ostrom (1986) says, “theory without experience is fantasy. Experience without theory is blind.” Thus, the theoretical studies in the domain need to be coalesced with experimentation. Despite the fact that it is not painless moving from theory to practice, it has to be tried to achieve in order to realize sustainable improvements.

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Annex

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3 **[NR-Min]** *The impacts of GIS use for neighbourhood revitalization in Minneapolis***,** Sarah Elwood, 2002, Community participation and Geographic Information Systems, eds. W. J. Craig, T. M. Harris, and D. Weiner, 101-112. London: Taylor and Francis

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5 **[V-Slw]** *Virtual Slaithwaite*, Richard Kingston, 2002, Community participation and Geographic Information Systems, eds. W. J. Craig, T. M. Harris, and D. Weiner, 101-112. London: Taylor and Francis

6 **[LIS-Dane]** *GIS-enhanced land-use planning (Land information system in Dane County)*, Stephen Ventura, Bernard J. Niemann, Jr., Todd L. Sutphin and Richard E. Chenoweth, 2002, Community participation and Geographic Information Systems, eds. W. J. Craig, T. M. Harris, and D. Weiner, 101-112. London: Taylor and Francis

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Systems, eds. W. J. Craig, T. M. Harris, and D. Weiner, 101-112. London: Taylor and Francis

8 **[RU-Aus]** *A community-based and collaborative GIS joint venture in rural Australia*, Daniel H.Walker, Anne M.Leitch, Raymond de Lai, Alison Cottrell, Andrew K.L. Johnson and David Pullar, 2002, Community participation and Geographic Information Systems, eds. W. J. Craig, T. M. Harris, and D. Weiner, 101-112. London: Taylor and Francis

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18 **[MAP-Orl]** *Orange County Interactive Mapping*- The City of Orlando's Geographic Information System, Mark Hoover.
http://www.cityoforlando.net/gis/interactive_mapping.htm

19 **[VIR-Lon]** *Virtual London* - CASA, Andrew Hudson-Smith, Michael Batty
http://www.casa.ucl.ac.uk/projects/projectDetail.asp?ID=55

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21 **[P-NewF]** *Participatory GIS in a Newfoundland fishing community*, Paul Macnab, 2002, Community participation and Geographic Information Systems, eds. W. J. Craig, T. M. Harris, and D. Weiner, 101-112. London: Taylor and Francis

22 **[PPGIS-Sin]** *Public participation GIS (PPGIS) for town council management in Singapore*, Sun Sheng Han, Zhen Peng, 2003, Environment and Planning B: Planning and Design 30(1): 89-111.

23 **[RM-Chn]** *Using GIS to Produce Community-Based Maps to Promote Collaborative Natural Resource Management in China*, Jack A. Mcconchie and John M. Mckinnon, 2002, A Hani case study, Luchun County, Yunnan. Asean biodiversity 2(1): 27-34.

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http://www.asu.edu/caed/proceedings99/SCHULTE/SCHULTE.HTM

25 **[NRM-Leb]** *Participatory GIS-based natural resource management in Lebanon: Experiences from a country of the South Arid Lands,* Rami Zurayk, 2003, Newsletter. No. 53, May/June 2003

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Also available at: www.iapad.org

Templates of Experiences

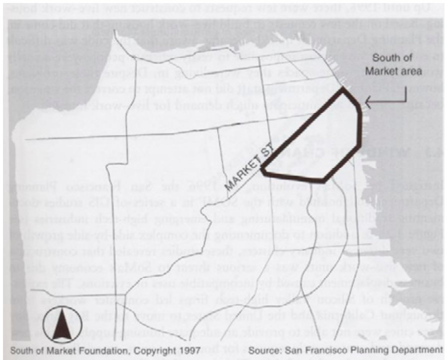
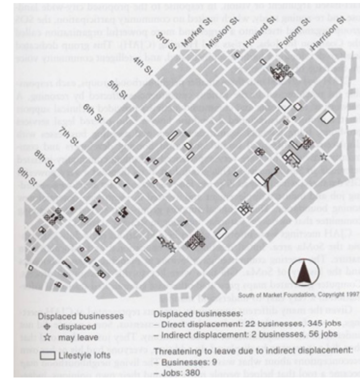


Figure: South of Market Area
Source: (Craig et al. 2002)

Figure: Companies displaced or threatening to leave due to lifestyle loft displacement
Source: (Craig et al. 2002)



Title: A Voice that Could Not Be Ignored: Community GIS and Gentrification Battles in San Francisco

Date: 1998-99
Country: USA
State and province: California
City: San Francisco
Latitude-longitude (tageo.com) : (37.775) – (-122.418)
Language: English
Subject: Inner City - Planning
Description: This case study is about how the South of Market community in San Francisco has developed a dynamic GIS model, or a "living neighbourhood map," and has used it towards modifying zoning controls and in developing several Internet-based applications designed to strengthen the local economy through daily transactions among local merchants and residents. A living neighbourhood map simulates a community's people, businesses, and buildings and continuously archives its growth. It is an interactive tool that empowers communities to control their own economic and physical development.
Rights: South of Market Foundation (Cheryl Parker and Amelita Pascual)
Background: In 1998, San Francisco residents, night club owners and workers protested the 'Soho-ization' of their south of market neighbourhood, known as 'SoMa'. The reason was the new developments being made next to or in place of diverse, mixed-use buildings which was a result of uninformed and rapid change. So the necessity of an industrial zone protection seemed as a best-compromise solution by planning the zones.
Conception: Top-down
Objectives: To design a plan that controls gentrification through enabling the community to speak about the issue.
State (start-finish): Finished
Sociopolicy concept: Parcel politics (politics of space at the smallest and most complex level which is grounded in the idea that a great urban place is composed of complex mix of spaces and places that can accommodate a wide variety of interdependent users.
Participative method: Public hearing, meetings (educational and informative), mapping
Ladder participation: Public feedback
Success elements: Communities voice was heard and documented. PPGIS has informed and helped the community to express their views and aspirations.
Problematic issues: Issues of distrust had to be overcome
Who participate? : Community, Business owners
GIS /model GIS availability: GIS was very helpful, GIS data were key to this educational process.
Why they participate: Because they are affected
Technical support: Technical support is being provided about maps
PPGIS geospatial technologies: Community GIS (acquired)

Title: Mapping Philadelphia's Neighbourhoods

Date: 1994-1995
Country: USA
State and province: Pennsylvania
City: Philadelphia
Latitude-Longitude(tageo.com) : 39.952 – (-75.164)
Language : English
Subject: Planning
Description: The study describes the progress of the efforts of the city to give neighbourhood planners access to its GIS resources and the impact of new technologies on that effort. This study also shows us that although the city may now be in a much better position to distribute its GIS data, there exist some difficulties of building effective PPGIS in urban neighbourhoods.
Rights: City of Philadelphia, University of Pennsylvania City and Regional Planning (Liza Casey and Tom Pederson)
Background: After the economical problems in the early 1990s, the city was rejuvenated. On the other side Philadelphia is a victim of the move away from an economy based on manufacturing. It has steadily lost jobs and people over the last 50 years and the city lost over 25 percent of its population between the years 1965-2000.concequently the neighbourhoods are filled with vacant buildings, crime and unemployment has been increased in the neighbourhood. In 1994 it has been recognized to planning neighbourhood and the applicability of GIS.
Conception: Top-down
Objectives: To introduce GIS to the community organizations in the neighbourhood as a tool for strategic planning
State (start-finish): Finished in1995
Participative method: GIS based methodologies, internet
Ladder participation: Public feedback
Success elements: Two distinct types of systems have been recognized for the dissemination of GIS technology, which are: public records GIS and neighborhood planning GIS.
Failure elements: Problems with the map and lack of necessary skills to run a GIS, problems with the transfer of data. Problems with the maps were standardisation. Each map attached different symbology.
Who participate? : The city and organizations and university of Pennsylvania
GIS/ model GIS availability: (ArcView) GIS-based information neighbourhood information system has been built with the University of Pennsylvania. And this system can be seen as an example of public-records GIS with neighbourhood information, which is an internet distribution of data through GIS concerning many applications but in this project it especially concerns zoning application. Internet map server GIS model is available.
Why they participate: For the benefits of interested but marginal neighbourhoods so that they can learn more about their environment but the projects still needs a considerable attention for an effective use.
Technical support: The project provided equipment, software, data, and training
PPGIS geospatial technologies: Public Records GIS (produced)

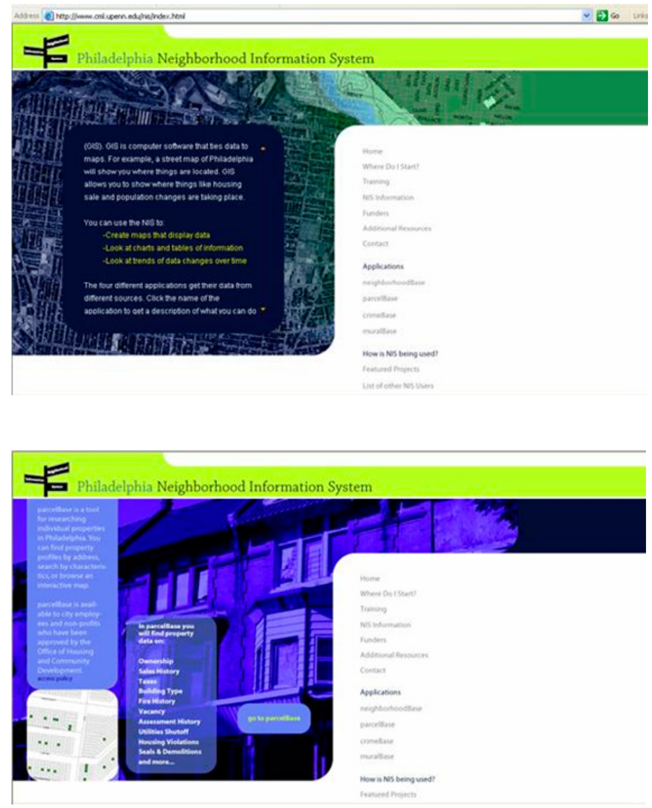


Figure: The neighbourhood information system
Source: (http://www.cml.upenn.edu/nis/)

Title: The Impacts of GIS use for neighbourhood revitalization in Minneapolis

Date: 1990
Country: USA
State and province: Minnesota
City: Minneapolis
Latitude-longitude (tageo.com): 44.980 – (-93.264)
Language: English
Subject: Inner city-Planning
Description: The use and impacts of GIS in neighbourhood improvement efforts.
Rights: Sarah Elwood
Background: The study concerns the Powderhorn Park which is a neighbourhood is south central Minneapolis. The neighbourhood faces some common set of inner-city problems, including loss of business and employment, high crime rate. The organizations and residents works together for the revitalization of neighbourhood by using range of different information technologies, including GIS, digital databases, the internet, etc.
Conception: Top-down
Objectives: To use GIS in neighbourhood improvement efforts
State (start-finish): Continuing
Sociopolicy concept:
Participative method: PPNA organization (elected board of neighbourhood residents), e-mail, internet (the website PPNA), local knowledge is used to gather housing information from residents.
Ladder participation: Participative-Consultation
Success elements: The organization (PPNA) was able to, for the first time, conduct comprehensive geographic analysis of housing conditions for all properties of neighbourhood. The study illustrated the important role that community dialogue plays in shaping the impacts of GIS technology on participation and power.
Failure elements: Training barriers, lack of training of staff members and resident volunteers. Limiting time, training and financial resources.
Who participate? : City of Minneapolis, Powderhorn park neighbourhood association, Residents of Powderhorn park and University of Minnesota
GIS/ model GIS availability: (Mapinfo) community-based (in house) GIS, map rooms
Why they participate: To obtain comprehensive housing information by accessing the information and gaining a sense of usefulness in improving their environment.
PPGIS geospatial technologies: Community-based (in house)GIS - (produced)

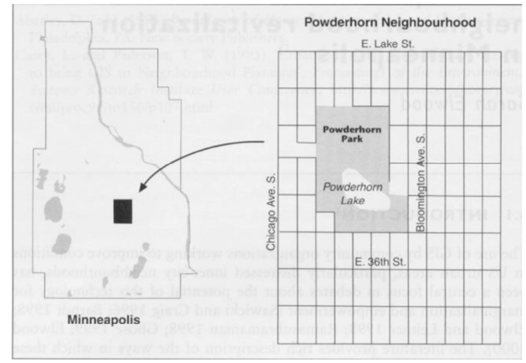


Figure: The Powderhorn Park neighbourhood, south of downtown Minneapolis
Source: (Craig et al. 2002)

Title: The Atlanta project (TAP): reflections on PPGIS practice

Date: 1991-1996(1st phase)

Country: USA

State and province: Georgia

City: Atlanta

Latitude-longitude (tageo.com): 33.749- (-84.388)

Language: English

Subject: Inner City-planning

Description: Community accessibility to GIS technology and the role of GIS technology within community decision-making, the role of GIS technology within the context of community-decision making and empowerment.

Rights: Georgia Tech, department of city planning and public policy, The City of Atlanta (David S. Sawicki and Patrick Burke**)**

Background: The program TAP has sought to give residents a voice and sense of power in determining the future of their communities, to achieve these objectives, a structure to support a neighbourhood-based model for community change has adopted. The TAP was processed in seven key policy areas; housing, economic development, public safety, health, education, children and families and arts and culture. GIS technology is being used to map the code violations which are recorded by participants. As information was entered from resident surveys into GIS, records were automatically given x-y coordinates based upon address which facilitates production of a map, and then the address-based information is correlated with the ownership and other relevant tax information in the database. TAP had many donations from dozens of foundations and Atlanta corporations. The team DAPA (the data and policy analysis group) played and important role in terms of sharing expertise and resources with community organizations.

Conception: Bottom-up

Objectives: Enable community to access to the GIS technology and participate in decision-making about the future of their environment.

State (start-finish):1st phase finished

Sociopolicy concept: The study supports the importance of political mobilization and use of existing political power for community change.

Participative method: Resident surveys

Ladder participation: Participative

Success elements: The application of GIS technology and the involvement of residents contributed to the validation of citizens' perceptions of the city's troubled state of code enforcement.

Failure elements: The number of residents involved represented in a small number in comparison with the whole population of the area.

Who participate? : Residents

GIS/ model GIS availability: Variety of GIS has been used

Why they participate: For the success of the project, because the citizen mobilization was the determining factor for this success.

Technical support: Hardware, software and 'collaboration room' that permitted the use of facilitation software is supplied.

PPGIS geospatial technologies: Desktop GIS

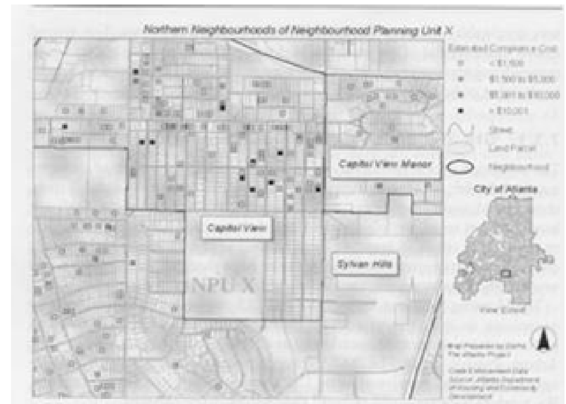


Figure: Residential code enforcement violations and estimated compliance cost
Source: (Craig et al. 2002)

Title: The Virtual Slaitwaite: The Slaithwaite Public Participation Geographical Information System

Date: 1998

Country: UK

State and province: West Yorkshire County

Latitude-longitude (tageo.com): (53.617) – (-1.883)

Language: English

Subject: Planning

Description: This web-based PPGIS allowed the community to interact with digital map area around West Yorkshire Village of Slaithwaite, UK. The residents, any one with internet access, for the local planning decisions, will be able to view a 'virtual' model of Slaithwaite and make their own suggestions about the future development of the village. In the resulting process of this case study, all user inputs were stored in order to use for future analysis and feedback into planning process and in this way community database is created.

Rights: The centre for computational geography, School of Geography, University of Leeds (Richard Kingston)

Background: The study involves the local community building a 3-D model of the area, into which local people stick flags of various colours. Written on each flag are their ideas for places they put them. The colours represent different problems such as health or crime. And the map was built by local schoolchildren at a 1:1000 scale. In parallel with this event, a web-based version of the map was developed.

Conception: Top-down

Objectives: To identify the views and opinions of local residents regarding the environment in which they lived and how they would like their village to develop in the future.

State (start-finish): Finished

Sociopolicy concept:

Participative method: Planning for Real (PfR) exercise both traditional and internet based

Ladder participation: Participative (well attended by a broad range of the community)

Success elements: The public response to the system found positive, the study provided a useful feedback about how people interact with on-line systems for the improvement of future systems. The problem of access to GIS technology, has been tried to solve by supplying some Windows NT machines with Netscape communicator.

Failure elements: The problems with the use of the computers particularly the mouse-controlled interface a few difficulties with understanding the map, the rareness of public access to computers for local people to use.

Who participate? : General public in UK (126 people used the system)

GIS/ model GIS availability: One public access terminal available in the public library for local people to use (Java map application called GeoTools)

Why they participate: Making suggestions and commentaries as a feedback into the planning process about their environment. The public have voiced their opinion.

Technical support: Provided

PPGIS geospatial technologies: Web-based GIS (produced)

Figure: Planning For Real (PfR) *Slaithwaite model*
Source : (http://www.geog.leeds.ac.uk/papers/99-8/)

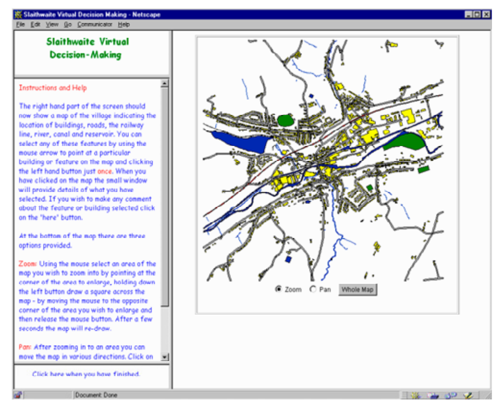


Figure: Internet based Planning For Real - Virtual Slaitwaite website
Source: (http://www.geog.leeds.ac.uk/papers/99-8/)

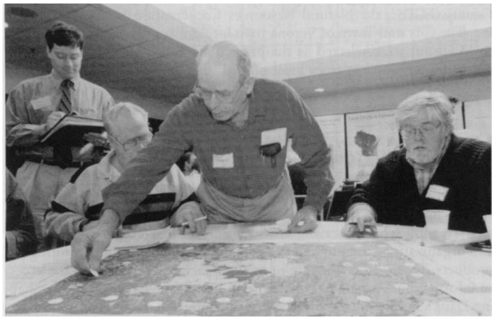
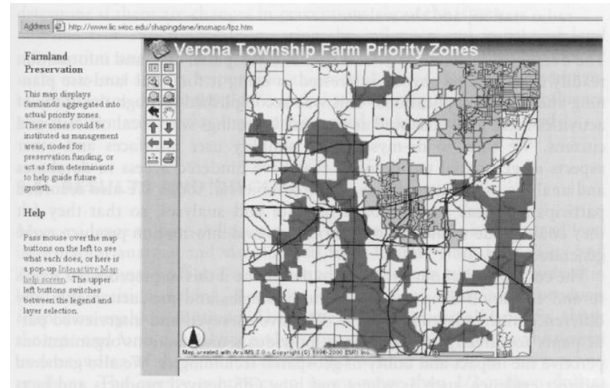


Figure: Citizens participating in land-use allocation exercise Source: (Craig et al. 2002)

Figure: Verona Township Farm Priority Zones Source: (Craig et al. 2002)



Title: GIS-enhanced land-use planning- Citizen-Based Land Use Planning in Dane County, Wisconsin, Shaping Dane

Date: 1998-2000
Country: USA
State and province: Wisconsin - Dane
City: Verona
Latitude-longitude (tageo.com): 43.251 – (-89.501)
Language: English
Subject: Planning
Description: This study shows the role of data, land information and community participation in land-use decision-making
Rights: Stephen Ventura, Bernard J. Niemann, Jr., Todd L. Sutphin and Richard E. Chenoweth (University of Wisconsin-Madison, Dane County, Town of Verona)
Background: Dane County intends to engage its citizens in land use planning processes by providing citizen input opportunities and providing broader access to relevant data and information in understandable forms. In addition, Dane County has been designated by Vice-President Al Gore as a Community Demonstration Project, in support of the development of a National Spatial Data Infrastructure as described by the Federal Geographic Data Committee Town and City of Verona, located southwest of Madison in central Dane County. Verona faces community development issues typical of the county and the nation: how to accommodate growth while preserving its historical agricultural character and small-town quality of life. Verona is a logical choice for the pilot project because citizens have actively worked for some time with community leaders and elected officials on growth issues.
Conception: Top-down
Objectives: The goal of the project is to involve citizens in a community-oriented process of evaluating land use choices. Understanding, visualizing and predicting the consequences of land use alternatives will lead to better decisions that can be embraced by the entire community.
State (start-finish): Finished
Sociopolicy concept: The process of land- use decisions is influenced by many factors including political, economic, legal, bureaucratic, personal and social pressures.
Participative method: Land use forums, Land-use allocation exercise, civic group meetings, website development to assist citizens and planners which includes WebGIS with the possibility of digital post-it notes that users can interact and share ideas via the internet.
Ladder participation: Participative
Success elements: All workshop participants found the land-use planning training very useful and eagerly participated.
Who participate? : Citizens
Local, county, and federal staff, as well as elected officials, has joined University of Wisconsin researchers in a cooperative effort
GIS /model GIS availability: (WebGIS based on Esri's ArcIMS)
Why they participate: To incorporate information technologies and have a say into the re-design process of their local land-use planning.
Technical support: Provided
PPGIS geospatial technologies: Internet , 'Hands-on' use of GIS

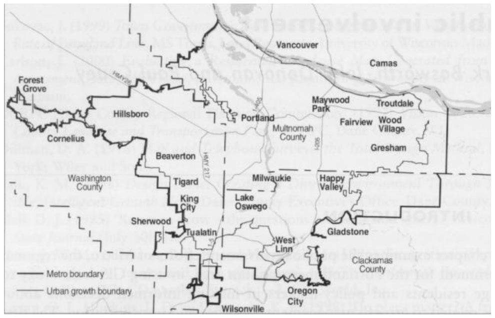


Figure: Portland Area
Source: (Craig et al. 2002)

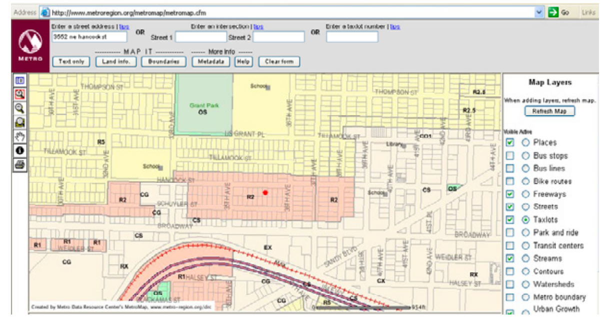


Figure: MetroMap interactive web-based application for accessing Metro's GIS data layers
Source: (http://www.metroregion.org/metromap/)

Title: Portland metro's dream for public involvement

Date: 1991(1995)

Country: USA

State and province: Oregon

City: Portland

Latitude-longitude (tageo.com): 45.524 – (-122.675)

Language: English

Subject: Planning

Description: This study examines the public involvement efforts of Metro, the regional government for the Portland metropolitan area, in using GIS technology to engage residents and policy-makers in making informed decisions issues related to growth management, land-use and transportation**.**

Rights: Mark Bosworth, John Donovan and Paul Couey

Background: Metro, the nation's only directly elected regional government, serves more than 1.3 million residents in the three counties and 24 cities of the Portland metropolitan region. Metro's top priority is managing the urban growth that the region is experiencing. The Growth Management Services Department is responsible for working with citizens and local governments for the region's future. Growth Management staff have implemented an intensive public involvement and rigorous planning effort for the next 50 years, called the 2040 Framework.

Conception: Top-down

Objectives: To propose a new platform for public involvement that would allow public participation in planning efforts in 'real time'. Internet-based technologies make it possible to create a new channel for pubic participation in planning.

Participative method: Ursa-matic; A multi-criteria excel program linked to a GIS to do comparative analysis of the potential areas for urbanization which could be loaded onto a computer so that residents could test various scenarios.

Natural resource protection workshops conducted.

A web-based view of the regional land information system database provided to the public via the internet to make some analysis.

Ladder participation: Information giving and participative (with 'show and tell interface' residents have been informed and involved)

Success elements: The more efficient communication model has been achieved

Who participate? : Residents (public) and Planners

GIS/model GIS availability: (Esri applications are used for the educational exhibit of Esri, such as; ArcGIS, ArcIMS, ArcScene) Internet map servers model, Interactive web-based application for GIS.

Why they participate: To become engaged with the issues about their environment and reflect their values and dream about their surroundings.

Technical support: Provided

PPGIS geospatial technologies: Metro map (web-based application), RLIS- regional land information system (parcel based GIS - produced)

Title: A community-based and collaborative GIS joint venture in rural Australia

Date: 1993-96(HMP), 1996-98(HRIC)

Country: Australia

State and province: Queensland

City: Herbert River

Latitude-longitude (tageo.com): -18.533-(146.283)

Language: English

Subject: Planning

Description: This study is about the evaluation of a community-based, collaborative joint venture in tropical Australia

Rights: Daniel H.Walker, Anne M.Leitch, Raymond de Lai, Alison Cottrell, Andrew K.L. Johnson and David Pullar - Commonwealth Scientific and Industrial Research Organisation (CSIRO) Tropical Agriculture, James Cook University, the University of Queensland

Background: The Herbert River catchment area has experiences strong economic growth in the agricultural and tourist sectors. To achieve ecological and economic sustainability within Herbert catchment, effective means are required to manage and reconcile industry imperatives with the requirements of other users of the catchement. Recognition of such issues has led government agencies in Queensland to implement integrated approaches to resource management to avoid the environmental and social damage sustained by land-use conflicts. After the completion of Herbert Mapping Project, the utility of the advanced analysis of the data in digital form became evident through using GIS which provides the best means for satisfying the requirements for data analysis and presentation. And finally HRIC was proposed which is a catchment-based GIS facility that supports management of natural resources in the Herbert River catchment by providing and allowing access to geographic information, GIS tools and expertise.

Conception: Top-down

Objectives: To facilitate a common geographic view of the catchment and enable synergetic planning which aims having better-improved decisions in planning and improved collaboration as well.

State (start-finish): Finished

Sociopolicy concept: Since the collaborators and representative groups play a key role in local politics and governance the projects is also socio-political.

Participative method: Semi-structured face-to-face interviews

Ladder participation: Public collaboration

Success elements: The project received widespread attention across Australia which can be a good example for future works and can be adapted in other settings.

Failure elements: It has become apparent that GIS had not been widely adopted in rural Australia. There are some problematic issues that need to be reconsidered such as the existing data which is too expensive to collect and maintain and the requirement of human and financial resources.

Who participate? : HRIC staff, partners, participants involved in the establishment of HRIC (representative bodies, general public, government, industry)

GIS/model GIS availability: In-house GIS model (Esri, ArcView has been used)

Why they participate: To improve collaboration in order to achieve the better informed decisions.

Technical support: Provided

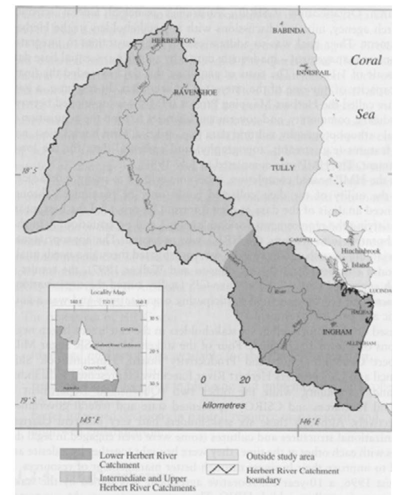


Figure: The Herbert River catchment in Northern Australia
Source: (Craig et al. 2002)

Title: Promoting Local community in forest management through a PPGIS application in Southern Ghana

Date: 1993 (forest department developed its own GIS)
1997 (PPGIS project)
Country: Ghana
State and province: Kumasi (the capital of Ashanti region)
City: Kofiase
Latitude-longitude (tageo.com): 4.854-(-2.084)
Language: English
Subject: Development- Forest management
Description: This project is at Kofiase in the Ashanti region of Ghana which was implemented to help build collaborative forest management institutions in the community. With the help of workshops (mapping sessions and discussions) the forest committee has been informed and involved in the participatory exercises. The meaningful maps and interviews are used to resolve the conflicts about the forest management.
Rights: Peter A. Kwaku Kyem
Background: The forest reserves are important sources of capital for Ghana's economic development and income for majority of rural dwellers. In fact annual forest fires and increasing reliance on the forests to meet domestic needs of natives have generated intense land-use conflicts. After coercive methods failed to prevent local inhabitants from destroying the forests, collaboration seemed the best option for the protection of country's rain forests.
Conception: Top-down
Objectives: Implement a PPGIS project to help build collaborative forest management institutions in the community.
State (start-finish): Ended
Sociopolicy concept:
Participative method: Mapping sessions, interviews
Ladder participation: Participative-consultation
Success elements: The role of GIS played in the discussions was satisfying and helpful.
Failure elements: There can be no guarantees for equal participation such as in the Kofiase projects, the foresters on the committee had an advantage of having a familiarity with data or information that enable them to dominate the discussions during the implementation process.
Negative official reaction, little official support.
The difficulties with the implementation of PPGIS in local and indigenous communities in a short term, the lack of infrastructure and skilled persons can cause some problems.
Who participate? : Members of the local forest committee (professional foresters, natives, civil teachers, civil servants, traders and representatives of various interest groups)
Why they participate: To resolve conflicts

Figure: The study area: forest districts in the Ashanti region of Ghana
Source: (Craig et al. 2002 and http://www.ncgia.ucsb.edu/varenius/ppgis/papers/kyem/kyem.html)

Figure: Members of Kofiase local CFMC reviewing alternative land use options from suitability maps produced with Idrisi

Title: A Participatory GIS for Community Forestry User Groups (FUG) in Nepal: Putting People Before the Technology

Date: 1999

Country: Nepal

State and province:

City : Dolakha District

Latitude-longitude(tageo.com) : 27.683 - 86.067

Language: English

Subject: Community Forestry

Description: Putting People Before the Technology PPGIS application in Nepal was developed, to determine its potential to assist village communities in the management of their communal forest resources in the mountains of Nepal.

Rights: Department of Agriculture & Forestry, Newton Rigg College, University of Central Lancashire (Gavin Jordan and Bhuban Shrestha)

Background: The study was conducted in the Yarsha Khola watershed, Dolakha District of Nepal. It is an area of the high mountains of Nepal, This a predominantly rural economy, with some extra income earned from working in the tourist industry in Kathmandu. The methodology employed is interdisciplinary in its approach, combining the use of social science participatory techniques with geomatics technology and participatory assessment procedures**.** As a conclusion of this study, In general it appears that PPGIS is an appropriate and advantageous tool for community forestry in Nepal, and should have much wider applications in participatory development work.

Conception: Bottom-up

Objectives: The primary objectives are to help promote the development of an economically and environmentally sound mountain ecosystem and to improve the living standards of mountain populations and to determine the value of using PPGIS in community forestry management.

State (start-finish): Finished

Sociopolicy concept: The maps developed from participatory work are highly political and hence PGIS can easily become part of a power struggle or village dispute**.**

Participative method: Participatory photo mapping session and Participatory inventory, semi structured interviews, group walks.

Ladder participation: Involvement

Success elements: It appeared that PPGIS is an appropriate and advantageous tool for community forestry in Nepal

Failure elements: The difficulties with technology

Who participate? : Local people

GIS/model GIS availability: Idrisi GIS (Idrisi GIS is a raster-based GIS system produced by Clark Labs, an off-shoot of Clark University. The current version of Idrisi is Kilimanjaro 14, available only for Windows-based systems)

Why they participate: To incorporate the local knowledge and decision making into the Participatory GIS.

PPGIS geospatial technologies: GPS (GPS Boundary Surveys)

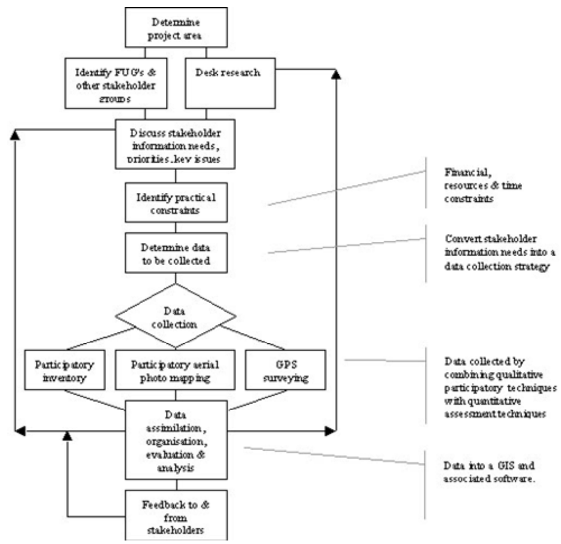


Figure: Systematic methodology for a community forestry PPGIS
Source: (Craig et al. 2002)

Figure: Participatory photo mapping exercise by women members
Source: (Craig et al. 2002)

Title: Implementing a community integrated GIS: Perspectives from South African Fieldwork

Date: 1999

Country: Republic of South Africa

State and province: Mpumalanga

City: Kwazulu-natal

Latitude-longitude (tageo.com):-29.817 , 31.533

Language: English

Subject: CiGIS- participatory land reform planning

Description: The research methodology combines the construction of a traditional GIS with the use of participatory methods. Traditional GIS data include hydrology and dams; transportation; hypsography; land cover and land use; nucleated settlements; land types and land quality; political, recreation, and cadastral boundaries; state and public lands; and forestry plantations. Socially differentiated local knowledge was compiled through participatory mental mapping exercises that involved placing tracing paper over GIS generated topographic map products.

Rights : Trevor Harris and Daniel Weiner

Background : The case study area of the Central Lowveld sub-region, is located mainly within the Lowveld Escarpment District of Mpumalanga Province, but also includes a small portion of Bushbackridge to the north. The latter is disputed territory in Northern Province and includes portions of the former Lebowa and Gazankulu homelands. Intensive and exotic industrial forest plantations and large-scale commercial fruit and vegetable farms dominate the western third of the case study area. The historical geography of forced removals, differential perspectives on land potential, the politics and power relations, identification of areas where land reform should take place and identification of perspectives on socially appropriate and inappropriate land use were investigated in the project.

Conception: Top-down

Objectives: To support the land and agrarian reform in South Africa

Sociopolicy concept: Sociopolitical in terms of landscape policy which is discussed with the community and the study is guided by an appreciation of regional political ecology.

Participative method: Community meeting, workshops, mental mapping, participatory land-use planning exercises

Ladder participation: Participation as legitimization or participation for publication in the context of academic world but not a popular participation

Success elements: Mpumalanga CiGIS did yield some interesting and important areas of agreement among the socially differentiated community participants. The study notices the interest in South Africa to link community participation with GIS.

Failure elements: The problems with acquisition of digital data: data were unavailable or unreliable and expensive to purchase and the problems with the inclusion of local knowledge within a GIS has to be reconsidered.

Who participate? : Local people

GIS/model GIS availability: Multimedia GIS systems- internet based GIS

Why they participate: In order to participate in a land-reform program

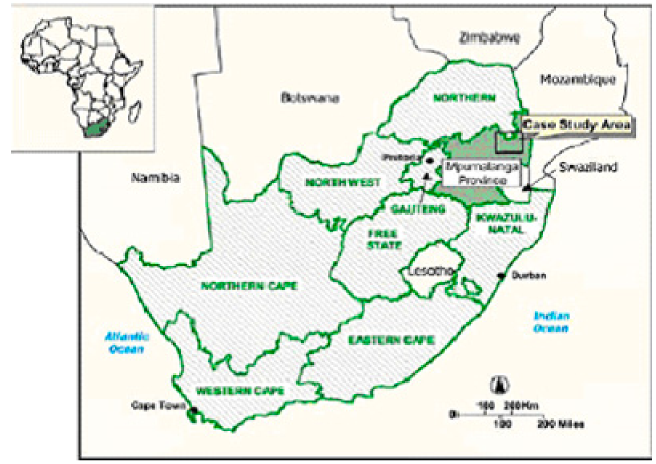


Figure: Mpumalanga South Africa Case Study
Source: (Craig et al. 2002)

Title: The North Hokianga Maori development project

Date: 1995

Country: New Zealand

State and province: Northland

Latitude-longitude (tageo.com): -41.283, 174.750

Language: English

Subject: Development

Description: The project focuses on three communities on the region. The study benefits the GIS facilities for the transmission, protection and maintenance of cultural information which is currently being lost.

Publisher: Melinda Laituri

Rights: University Auckland

Background: Local knowledge is currently recognized as critical to resource management issues but has not been adequately integrated into management strategies (Laituri and Harvey, 1995). This study which involves indigenous peoples contributes to works that tries to include indigenous knowledge within computerized expert knowledge systems for resource management.

Objectives: First of all, to identify potential areas for economic development in the North Hokianga region of Northland and further more to develop culturally relevant data layers such as the identification and assessment of resources and identification of significant cultural and sacred sites through participatory mapping exercise.

State (start-finish): Ended

Participative method: Participatory mapping exercise, meeting and interviews

Ladder participation: Participative

Success elements: An intense interest has been observed in the use of GIS with a healthy scepticism

Failure elements: Technological limitations, problems with access and the homogenization of knowledge structures

Who participate? : Local indigenous people

Why they participate: In order to encourage communication between indigenous knowledge and western-based knowledge through knowledge-sharing

PPGIS geographic information: Integrated - local knowledge and scientific knowledge. The existing out of date data (1979) was updated with data derived from different cultural groups, digital format type.

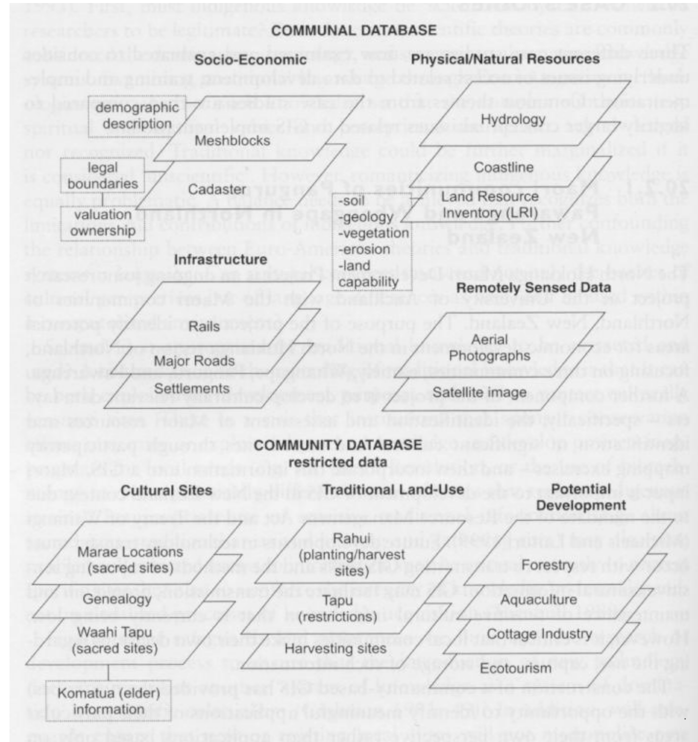


*Figure: **Two-Tiered database for t**he North Hokianga project*
Source: (Craig et al. 2002)

Title: The Cherokee Nation and tribal uses of GIS

Date: 1993
Country: USA
State and province: Oklahoma
City: Town of Tahlequah
Latitude-longitude (tageo.com): 35.915, -94.970
Language: English
Subject: Sustainable Development
Description: The Cherokee nation has a different kind of land base, which is not a reservation with single, perimeter-based boundary and known as 'checkboard' land base. This causes some problems when dealing with tribal land and law enforcement jurisdiction. Another issue is transportation planning which concerns difficulties with the transportation and tries to illustrate tribal roads, where proposed roads would be built as well as the roads needed to be repaired. There are some other applications in the Cherokee nation which are performed in different departments, such as natural resources and environmental services.
Rights: Crystal Bond
Background: Since 1990 the geographic data service center (GDSC) which was established by the Bureau of Indian Affairs (BIA) works for bringing geospatial technology to tribal people and teach them how to use it themselves. And the Cherokee nation of Oklahoma is one of the tribe who benefits these kinds of studies of GDSC.
Conception: Bottom-up
Objectives: Using GIS and local knowledge in order to determine the boundaries, and also to benefit from GIS in other areas such as to resolve the problems in the issues with transportation and tribal land management.
Sociopolicy concept: Legal jurisdiction
Participative method: GIS utilisation
Ladder participation: Information sharing, consultation
Success elements: It has been seen that GIS allows tribes many benefits such as an accurate, dependable method of inventory and developing their own transportation networks, tribal land datasets, environmental baseline data, and demographics and so on.
Who participate? : Cherokee people, tribal personnel
GIS/model GIS availability: (Esri, ArcViev,ArcInfo) In-house GIS model, local access
Why they participate: To educate themselves about the spatial data technologies and to resolve various types of problems about their lands.
PPGIS geospatial technologies: GPS (standardized), In-house GIS (produced)
PPGIS geographic information: Collected, compiled, enhanced and standardized GPS and satellite information (Bureau of Indian Affairs - BIA, digital (2000)). Fractionated Chreroke Tribal Land (Cartography - Geodata Center, 1990 and 1994 U.S. Bureau of Census, Tiger files)

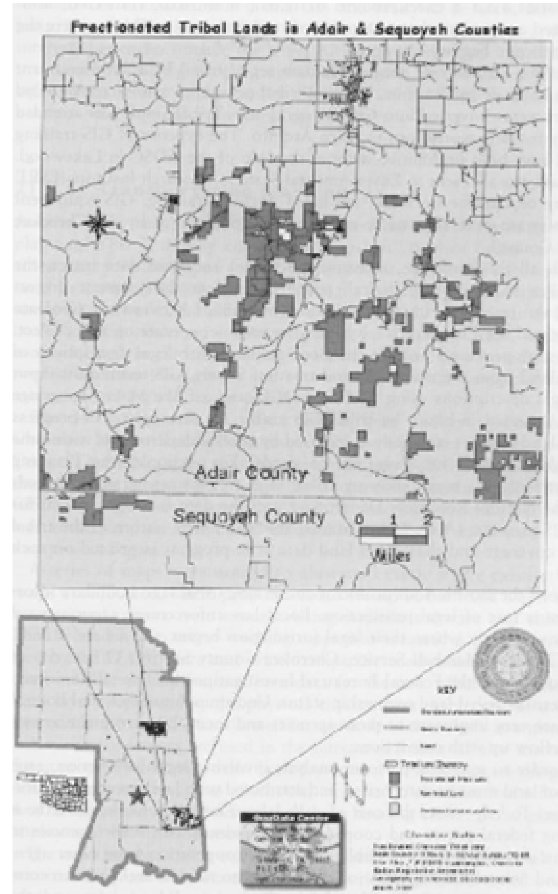


Figure: The Cherokee Nation and tribal uses of GIS
Source: (Craig et al. 2002)

Title: Participatory gender resource mapping: a case study in a rural community in Honduras

Date: 1995

Country: Honduras

State and province:

Latitude-longitude (tageo.com): 13.9234 , (-87.0117)

Language: English

Subject: (PGRM) Participatory Gender mapping: Combination of resource mapping and labor allocation analysis techniques

Description: The households that are considered representative of the various socio-economic conditions in the community were selected for the study. The selection was based on wealth, location and unique characteristics (e.g. female headed households).

PGRM was used to provide a framework for community members and outsiders to become aware of and sensitive to unequal gender and generational relations in a small rural community in Honduras. Basic data on each household were obtained through informal interviews. The resource maps and labor maps were drawn and the maps and the process of making these maps provided some results about the differences in activities according to their gender, wealth, etc.

Rights: Abigail Willmer, Jennifer Ketzis

Background: Participatory Gender Resource Mapping (PGRM), was used in a rural community in Honduras to supply information about the household/farm resources and labour allocation (by gender and age), PGRM was used to provide a framework for community members and outsiders to become aware of and sensitive to unequal gender and generational relations.

Conception: Top-down

Objectives: To provide some information about the resources and labour allocation in the community.

Participative method: informal interviews, resource mapping, labor mapping and allocation analysis

Ladder participation: Participative- Consultation

Success elements: Level of awareness rose about the resources and other issues.

Who participate? : Household members of the community

Why they participate: To explain issues of importance and show the parts of their farms and to mention their labour activities.

PPGIS geographic information: Resource maps and Labor maps (local knowledge by community members- 1998)

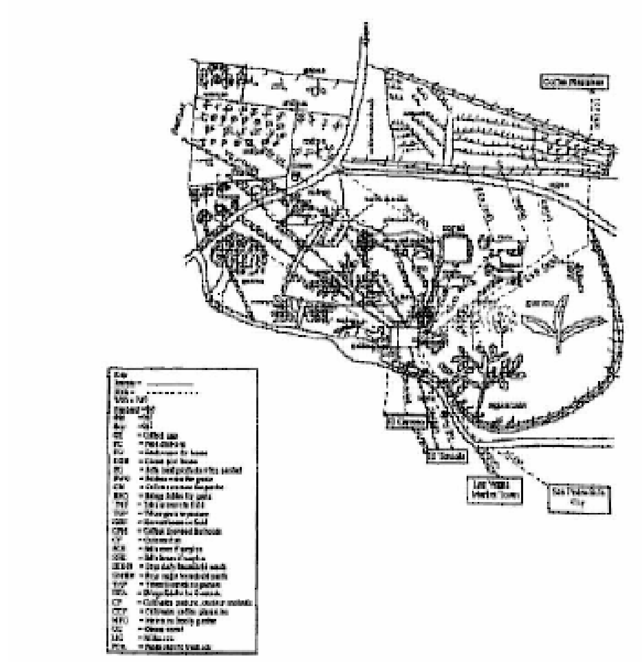


Figure: Household resource and labour map of a family
Source: (Willmer and Ketzis 1998)

Title: Integrating Local Knowledge and Spatial Information Technologies for Marine Species Management: A Case Study on the Turks and Caicos Island

Date: 2003

Country: Turks and Caicos

Latitude-longitude (tageo.com): 21.6166, (-71.6309)

Language: English

Subject: Resource management and sustainability

Description: The case study is a small-scale fishery in the Turks and Caicos Islands. The research takes a common sense, community-based management approach to the development of a multi-knowledge protocol for small-scale fisheries designed to reduce the knowledge gap that currently exists between fisheries researchers who tend to rely on scientific methodologies and knowledge, and local fisherman who use intuition, traditional practices and passed on knowledge. GIS is proposed and used as a medium to facilitate the integration of qualitative and quantitative data to eliminate the problems with data which is conflicting and incomplete.

Rights: Christopher Hugh Close (thesis), University of Waterloo

Background: The Turks and Caicos Islands are a British overseas dependent territory. The country is located 800 km southeast of Florida on the southern end of the Bahamas chain. The islands are comprised of eight inhabited islands and 41 cays divided into two general island groups, namely the Caicos Islands and the Turks Islands. Today, the fishing industries play important role to support its economy. The study in Turks and Caicos is about the use of spatial information technology as a medium upon which to integrate and visualise spatial distributions of both quantitative scientific data and qualitative local knowledge for the purposes of producing valid and locally relevant fisheries management plans.

Conception: Top-down

Objectives: To find a common ground that facilitates the combined use of local and scientific knowledge, in effect bridging information gaps (input of local knowledge into a GIS)

State (start-finish): Ended

Participative method: PRA, Verbal and map-based Interviews

Ladder participation: Consultation

Success elements: Successfully demonstrates the potential for local knowledge inclusion

Who participate? : Fishers

GIS/model GIS availability: (ArcViev)

Why they participate: They are asked for their information

PPGIS geospatial technologies: GPS, marine GIS (acquired-passive use) and RS

PPGIS geographic information: Integrated data (scientific and local knowledge by RS and Fishers, 2003)

Figure: Geographic location of Turks and Caicos Island
Source : (http://www.turksandcaicos.tc/turks/)

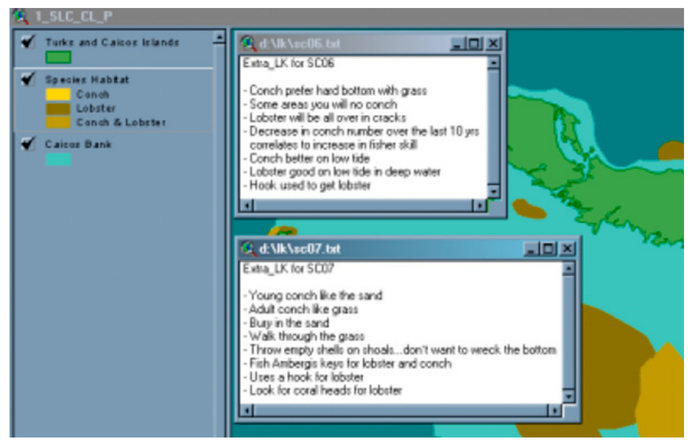


Figure: Local Knowledge text files illustrated through ArcView
Source: (Close, C.H 2003)

Title:Misconstrued land use in Vohibazaha: participatory planning in the periphery of Madagascar's Mantadia National Park

Date: 1993 (PRA took place)**,** 1997-2001

Country: Republic of Madagascar

State and province: Antananarivo

City: Vohibazaha

Latitude-longitude (tageo.com): -19.367- (46.733)

Language: English

Subject: Conservation

Description: At the end of the 1996–1997 farming season, several groups of farmers were expelled from land inside the Mantadia National Park in eastern central Madagascar. This study examines the roots of this fact, examining the history of traditional land-use practices as mediated by relations with national and international institutions. The study describes a community land-use mapping exercise undertaken in Vohibazaha in which community members constructed their own land-use map.

Rights: William J. McConnell

Background: Vohibazaha is a Betsimisaraka farming community of approximately 640 people, located in the steep hills between Madagascar's central plateau and the Indian Ocean. By the mid-1980s, international concern had focused on continuing destruction of the island's forests. Subsequently, Madagascar became one of the first countries to adopt a National Environmental Action Plan (NEAP). To protect the spectacular flora and fauna, in 1989 the agricultural frontier of more than a dozen communities was officially closed by the isolation of the Mantadia National Park. Later on, the Park and a neighboring Special Reserve were consolidated as the Andasibe–Mantadia Protected Area Complex (APAM), to be managed under a new Integrated Conservation and Development Project (ICDP).The management plan of APAM Project proposed the delineation of three zones, based on ecological and infrastructural criteria. Development activities were initiated with PRA exercises to help communities define and prioritize their needs.

Conception: Bottom-up

Objectives: Counter mapping (re-textualization) of land tenure in Vohibazaha which enabled outsiders to better appreciate the tenure niches that constitute the context and subtext of local land use.

State (start-finish): Ended

Participative method: PRA exercises which centers on group discussions to elicit information in such formats; sketch maps, land-use transects, historical trends lines, institutional Venn diagrams

Ladder participation: Consultation

Success elements: The well used spatial arrangement of land-use practices and participatory mapping exercises should be acknowledged.

Who participate? : Local residents

Why they participate: In order to describe their needs and priorities

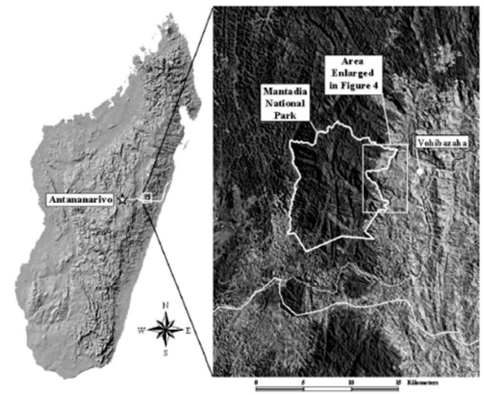


Figure: Vohibazaha and its neighbour, the Mantadia National Park, are situated on Madagascar's eastern escarpment, just half a day's drive from the capital, Antananarivo.
Source: (McConnell 2002)

Figure: A community leader explains land-use practices to Park conservation staff as they study the mosaic of aerial photographs.
Source: (McConnell 2002)

Title: GIS and RRA in Local Level Land Use Planning : A case study in Sri Lanka

Date: 1996

Country: Sri Lanka

State and province: Southern Sri Lanka- Hambantota

City: Weeraketya

Latitude-longitude (tageo.com): 6.117- (81.117)

Language: English

Subject: Land use planning

Description: This study concludes that GIS and RRA are complementary rather than alternative methods. They both have their role to play at different stages and different levels of land use planning.

Rights: M.Mari and P.Bitter

Dept. of Geography, University of Zurich-Irchel

Sri Lanka Land use Policy Planning Division

Background: The Sri Lanka Land Use Policy Planning Division (LUPPD) issued guidelines for the preparation of land use plans for Divisional Secretary Divisions, which are units of decentralized administration in Sri Lanka. Based on these guidelines, a model for land use planning has implemented.

The RRA activities were used in this study, which comprise the activities such as interview with caretakers, peasants as well as transect walks and group discussions. The results are various sketch maps that show the personal property with the present land use or plans for future land use and finally, a lot of information about he socio-economic and ecological situations in these communities has been acquired.

Conception: Bottom-up

Objectives: To prepare land use plans

State (start-finish): Ended

Sociopolicy concept: Political in terms of the existing questions that needed to be cleared about land use planning (who controls the land resources, who is in charge of land use planning? etc.)

Participative method: RRA sessions, sketch maps of village areas and group discussions, transect walks, interviews.

Ladder participation: Consultation, effective communication

Success elements: Lots of information about socio-economic and ecological has been acquired. The effectiveness of RRA and PRA has been proved to improve communication between locals and outsiders.

Failure elements: The implementation of land use plans did not considered.

Who participate? : Indigenous people (Land users, peasants, caretakers, owners)

GIS/model GIS availability: (Esri ArcInfo)

Why they participate: For the integration of local knowledge with the scientific knowledge, they described their perspectives and wishes for their land.

PPGIS geospatial technologies: GIS (produced)

PPGIS geographic information: Base maps (Sri Lanka, land use, land classification map, national atlas, agro-ecological map; **sources:** survey dept (1985), CRS (SD) (1995), irrigation dept, SD (1998), dept.of agriculture (1979); **scale:** 1:50000, 1:20000)

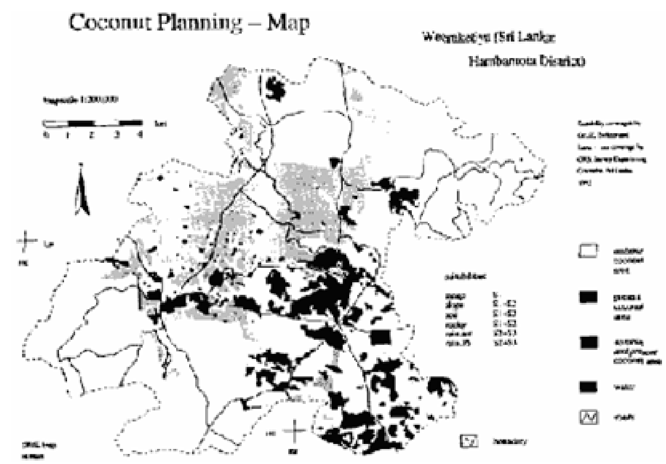


Figure: Crop planning map, planning map for coconut
Source: (Mari and Bitter 1996)

Title: Orange County Interactive Mapping

Country: USA

State and province: Florida

City: Orlando

Latitude-longitude (tageo.com): 28.538, (-81.379)

Language: English (web-site is available in Spanish also)

Subject: Interactive Mapping

Description: Orange County Interactive Mapping is an application which was developed by the city of Orlando. The Resource Management Mapping Service is a project developed by the College of Agricultural, Consumer and Environmental Sciences.

Rights: The city of Orlando (Mark Hoover)

Background: In this project, the GIS application allows the general public gain access to government data resources and interactive mapping by creating their own map and see where their address is anywhere in Orange County. This interactive mapping system provides options for viewing all of Orange County or zooming down to specific parcels. The search can start with an interactive county map or by using land record information with several search criteria options including street address. Different layers of information can be selected to appear on the map including; street names, contour lines/elevation, orthophotos (aerial photos), and city/county boundaries.

County Interactive Mapping offers the opportunity to define user specific areas on which comments can be stated into the map. The result can be mailed in a form of an attached PDF file to the Orange County Board of County Commissioners

Conception: Bottom-up

Objectives: To allow the general public to access to government data resources and interactive mapping.

State (start-finish): Continuing

Participative method: Online discussion

Ladder participation: Consultation

Success elements: Allow the general public to access to government data resources and interactive mapping

Who participate? : General public, citizens

GIS/model GIS availability : (Esri ArcIMS 4.0)

Why they participate: To supply feedback and to get information

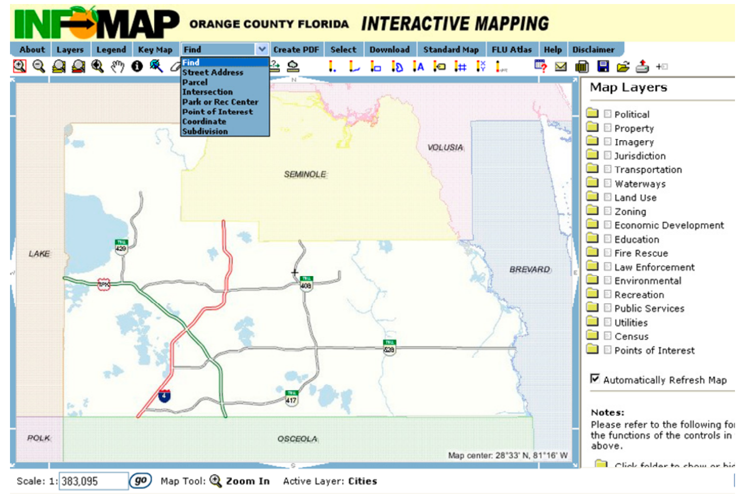


Figure: Interactive mapping

Source: (http://www.cityoforlando.net/gis/interactive_mapping.htm)

Title: Virtual London – CASA

Date: 1st phase finished in 2006

Country: UK

City: London

Latitude-longitude (tageo.com): 52.3756, (-0.7031)

Language: English

Subject: Environment, Urban Planning, Digital planning

Description: 3D model has been developed. The model is being produced using GIS, CAD, and a variety of new photorealistic imaging techniques and photogrammetric methods of data capture.

Rights: Greater London Authority (GLA), The Centre for Advanced Spatial Analysis (CASA) within University College London (UCL) (Dr Andrew Hudson-Smith, Michael Batty)

Background: The model will initially cover the Pool of London area, including City Hall, and will be accessible via the Internet. The project will explore use of the model to stimulate public participation in London government.

Virtual London will be distributed via a Multi-User Environment. Citizens will be able to roam around a Virtual Gallery as Avatars (digital representations of themselves) and explore the issues relating to London in a game like space.

Conception: Bottom-up

Objectives: The project is to create a three-dimensional model of London and to explore the use of the model to stimulate public participation in London government.

State (start-finish): Continuing

Sociopolicy concept: Socio-political in terms regarding the role of political power

Participative method: 3D modeling, web

Who participate? : Professionals (architects, developers, planners, etc), concerned citizens, virtual tourists.

GIS/model GIS availability: GIS data was provided through the use of ESRI-ARC Internet Map Server

Why they participate: For examining 'what if' scenarios that enable digital planning at the citizen scale, to facilitate educational use, virtual tourism and for the professional use as well.

PPGIS geospatial technologies: GIS- ArcView and 3D Analyst, Airborne, Photogrammetry

PPGIS geographic information: Lidar data (digital – DEM, airborne LIDAR system, 1970); Photogrammetry (data provided through the use of ESRI-Arc internet map server)

Source: (http://www.casa.ucl.ac.uk/andy/london.html)

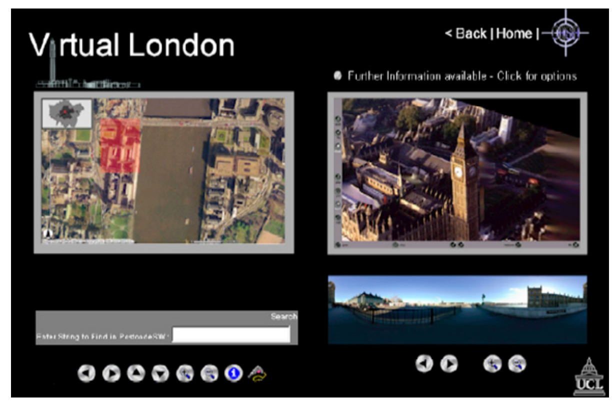


Figure: Prototype Interface to Virtual London
Source : (http://www.casa.ucl.ac.uk/andy/thesis.pdf)

Title: Woodland Online Decision System (WOODS) - Yorkshire Dales national park reforestation

Date: 1995

Country: UK

State and province: Yorkshire and Cumbria

City: Leyburn

Latitude-longitude (tageo.com): 54.300, (-1.817)

Language: English

Subject: Planning

Description : A regional level case study based on gathering the views of local people and visitors to the Yorkshire Dales National Park on where they would like to see native woodland regeneration. The system allows users to choose what aspects of the landscape they think are important (i.e. where trees could or could not be planted) and then run a GIS model to show where the best areas are for woodland planting. Each user's map is recorded by the system and used to create a composite decision map based on all responses. This shows the degree of consensus among people using the system about where to or where not to plant new woodlands in the national park. This system was developed in collaboration with the Yorkshire Dales National Park.

First you'll be asked the kinds of places where you think it's important to plant trees, then you'll see a map of the Dales with these areas highlighted and get the chance to change your mind. When you finished your map, you can send it as a feedback.

Rights: Centre for Computational Geography, University of Leeds (Steve Carver, Andy Evans, Richard Kingston & Ian Turton)

Background: The web site allows drawing a map of where you would like new woods planted in the Yorkshire Dales.

Conception: Bottom-up

Objectives: In generally the objective was to observe the use of the mapping software to allow the public to explore the decision problem, to experiment with possible alternative solutions; and to formulate their own decisions. Consequently the aim is to gather the views of local people and visitors to the Yorkshire Dales National Park on where they would like to see native woodland regeneration.

State (start-finish): Ended

Participative method: Public consultation through Internet and World Wide Web (WWW)

Ladder participation: Consultative

Communication structures:

Success elements: The project has evaluated the usefulness of these kinds of computer-based systems and public inputs to the democratic process.

Failure elements: The problems with access and participation. The concept participation has to be further developed in the much wider context.

Who participate? : Local communities, people living within the park, tourists, visitors to the area

GIS/model GIS availability: Web-based GIS consultation used in order to easily communicate with wide set of actors involved

Why they participate: To supply feedback, to describe their views and to define areas of conflict and identify consensus.

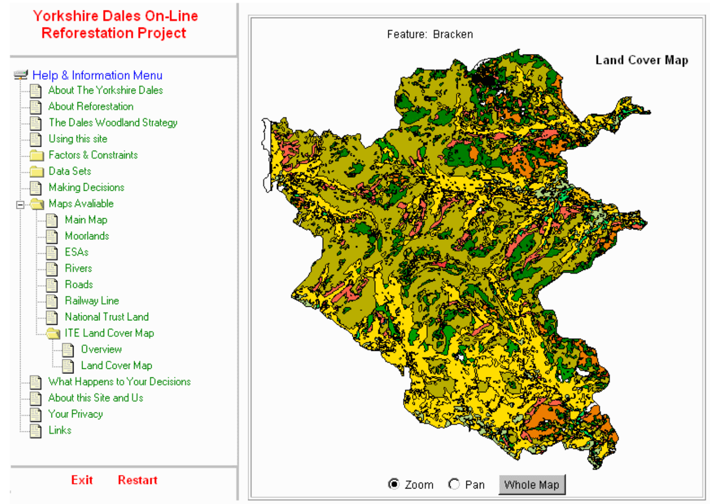


Figure: Yorkshire Dales National Park Reforestation web site

Title: Participatory GIS in a Newfoundland fishing community

Date: 1994-1997
Country: Canada
State and province: Newfoundland (Bonavista Bay)
Latitude-longitude (tageo.com): 49.000 - (-53.333)
Language : English
Subject: Environmental management-conservation
Description: Community fishers were able to generate maps that reflected their understanding of environment which included replacing government place names with local names, dept measurement from meters to fathoms and delineating areas for conservation and harvest. Generated maps were reviewed by the fishers and taken back for corrections as required.
Rights: Paul Macnab
Background: After 1980s the fishers started to observe declining catch rates and decreasing fish size. A considerable drop in biomass was detected in the offshore stocks. And Bonavista Bay was selected to best represent the natural and cultural heritage of northeast Newfoundland.
Conception: Bottom-up
Objectives: Develop a collaborative project intended to capture local fisheries knowledge through participatory mapping aided by GIS. This project evolved to link harvesters and government organization in central Bonavista Bay, a historically strong fishing area on the northeast coast of Newfoundland.
State (start-finish): Finished
Sociopolicy concept: Socio-political because of the conservation fact of the region
Participative method: Consultation, mapping sessions, meetings, sketch mapping
Ladder participation: Community members participate but do not control
Success elements: The mapping process helped government officials and harvesters move beyond concepts and theories to discuss real locations and pressing issues in the fishery. This atmosphere helped to build common understandings of a shared marine environment.
Failure elements: Despite the fact that the fishers had a lot of input into the project in terms of data collection, information sharing, and influence in the outputs, the resulting maps and ultimate decisions about conservation areas remain with the Canadian government. Also much of the funding dried up, and the partnership with other participants who provided support ended as the project neared completion. Funding shortfalls, academic commitments, reporting deadlines, tiny technical problems and several other factors limited the final outcomes.
Who participate? : Fishers, fishermen's committee
Why they participate: To provide valuable information about sensitive areas thus to help to guide scientific investigations.
Technical support: Provided to eastport fishermen's committee in an interactive and adaptive fashion.
PPGIS geospatial technologies: GIS (CARIS software, widely used in hydrographic)
GPS (visiting mapping locations and map the grounds with GPS)
PPGIS geographic information: Local knowledge, topographic and hydrographic maps (Fishers' map; i.e. depth, temperature and salinity and fishers' knowledge (1994); **Scale:** 1:20000 hydrographic filed shields

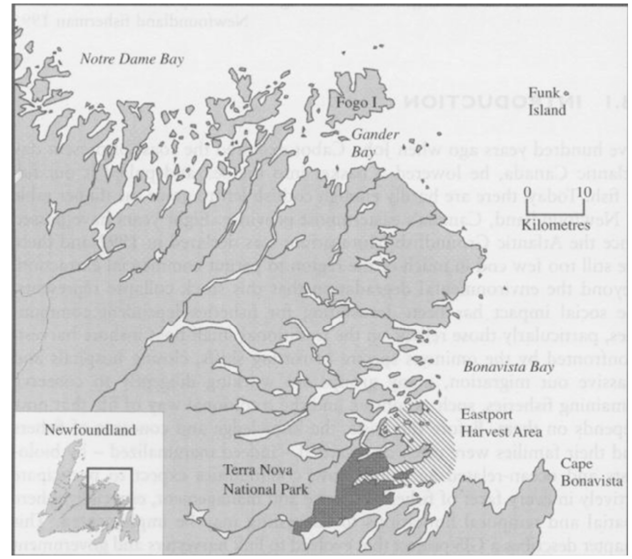


Figure: Bonavista Bay, Newfoundland
Source: (Craig et al. 2002)

Title: Public participation GIS (PPGIS) for town council management in Singapore

Date: 2000

Country: Singapore

State and province:

Latitude-longitude (tageo.com): 1.293 - (103.856)

Language: English

Subject: Housing-estate management

Description: The study examines the relevance of PPGIS to housing-estate management in Singapore. Formal interviews were conducted to collect data. A mock-up PPGIS was developed and evaluated. Informal interviews with property managers and secondary data also contributed to the discussions. The public used the PPGIS to feedback their comments and suggestions, the staff used it for collection, interpretation, and analysis of public input. In order to access the staff interfaces login and pass were required.

Rights: Department of Real Estate, School Design and Environment, National University of Singapore (Sun Sheng Han, Zhen Peng)

Background: In the literature on PPGIS, applications in housing-estate management have received no attention as the forms of urban residence are largely dominated by low-density landed residential properties. The study is situated particularly in Singapore's context of the management of public housing by town councils. The reasons are; town councils view public participation as playing an important part in achieving excellence in public housing management, and they encourage public participation. Also, there is a high level of awareness and use of information technology, as a result of the government's initiative of building Singapore into an "Intelligent Island". In 2000, several town councils embarked on a project known as EMAPS which provides a good base for exploring the potential of PPGIS, and they began to introduce GIS into their management practices.

Conception: Top-down

Objectives: To explore PPGIS application in a new area and a new cultural context - PPGIS for housing-estate management in Asia.

Participative method: Meetings, feedbacks with fax and email, user training workshops

Ladder participation: Consultative

Success elements: The feasibility of introducing PPGIS has been proved by the keen interest of town councils, residents and government initiatives.

Failure elements: The general public has no access to the database and functionalities of GIS in contrast to the town council staff and the property-managing agents.

Who participate? : Residents, town council staff, property managing agents

GIS/model GIS availability: (Esri- ArcView, ArcIMS) multilayered server-side internet GIS architecture was used for PPGIS

Why they participate: To make some suggestions

PPGIS geographic information: Local knowledge (mock-up PPGIS was developed and evaluated; formal interviews were conducted to collect data, 2000)

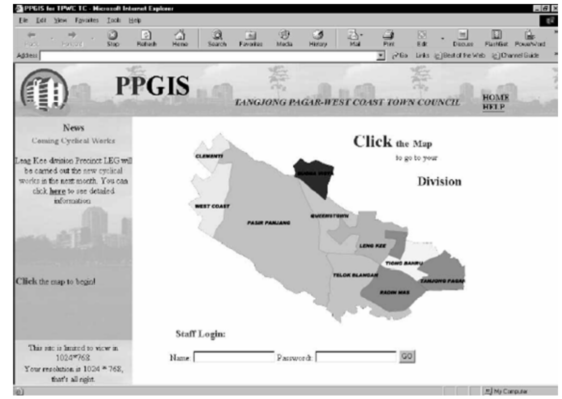


Figure: The home page of the public participation geographic information system (PPGIS)
Source: (Han S.S and Peng Z.2003)

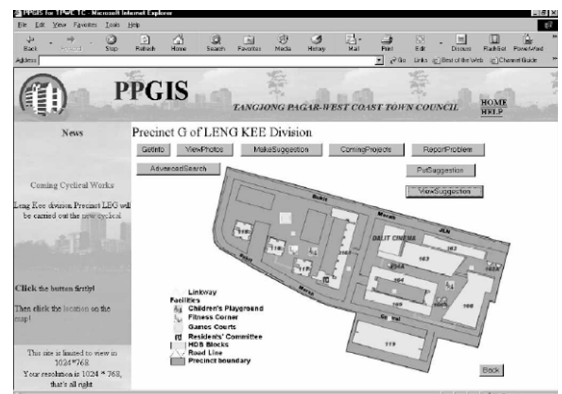


Figure: suggestions interface for the public
Source: (Han S.S and Peng Z.2003)

Title: Using GIS to Produce Community-Based Maps to Promote Collaborative Natural Resource Management in China

Date: 2002

Country: China

State and province: Yunnan- Luchun County

Language: English

Subject: Natural resource management- conservation

Description: The study describes a set of techniques (Participatory learning action – PLA and mobile interactive GIS - MIGIS) used to facilitate the negotiation and bottom-up solutions in the context of deforestation with Hani farmers of Luchun County, Yunnan in southwest China. It was proved that MIGIS is a powerful set of tool to assist and refine development activities and initiatives which are well-appreciated, accepted and adopted by local people. Consequently, it increased the chance of successful involvement.

Rights: Institute of Geography, School of Earth Sciences, Victoria University, Wellington, New Zealand (Jack A. Mcconchie and John M. Mckinnon)

Background: Luchun County is one of the 50 poorest counties in the whole of China. The erosion is a major problem in the study area. China's forest resources are small relative to its area and population. Population growth in traditional forest regions, and rising demand for forest products and services continue to put tremendous pressure on both biodiversity and forest resources. The forest quality has declined and the forest regions suffer the serious deforestation. To achieve this crisis the public involvement seems as a critical component in the environmental decision-making processes. It has been advocated that if local people engaged in the process, the development are more likely to be sustainable over the long term.

Conception: Bottom-up

Objectives: To take a GIS into an area in southwest China

Sociopolicy concept: The study is politically sensitive because of the nature of the study site (close to Vietnam).

Participative method: mobile interactive GIS(MIGIS) with PLA methods

Ladder participation: Consultation

Success elements: The study proved the power of set of tools used which helped to define and process the development plans. The other successful outcomes can be count as followed; all remaining forest was declared as a part of a village reserve, some of the villagers formed a watershed protection committee, the land was planted and finally the project made a first step for the future studies.

Who participate? : Farmers, Local villagers – university, government, organization collaboration

GIS/model GIS availability: mobile interactive GIS (MIGIS)

Why they participate: They have interviewed (being asked for the measurement for the survey of firewood usage and forest productivity)

PPGIS geographic information: Topographic and land use maps (A land use map: compiled in 1990, was updated with information collected during a fieldwork (1999); Land use was remapped during fieldwork through PLA exercised (1999); resource maps also were critical for PLA).; **scale:** 1:25000

Figure: Luchun County in southern Yunnan Province
Source: (J. A. Mcconchie and J. M. Mckinnon 2002)

Title: Utilizing GIS to facilitate public participation in access management issues: A Case Study in Florida

Date: 1999

Country: USA

State and province: Florida

City: Titusville

Latitude-longitude (tageo.com): 28.612 - (-80.808)

Language: English

Subject: Transportation Planning

Description: The City of Titusville and their consultants recently completed an access management study of two constrained corridors, state roads 50 and 405 in Titusville Florida. Currently, these two corridors are experiencing highway access management and development pressures due to population influx and developmental burdens over the past few years. It has been realized that these pressures need to be addressed in a comprehensive manner, in order to preserve corridor capacity, enhance corridor appearance, and promote public safety. GIS methodology and public participation were combined in order positive outcomes.

Rights: Kurt J. Schulte and Wilbur Smith Associates

Florida Department of Transportation and the City of Titusville, Florida

Conception: Bottom-up

Objectives: To conduct a joint planning study for the state roads 50 and 405 (SR50/SR405) corridors which would address transportation issues related to current and future development.

Participative method: Meetings, workshops.

Ladder participation: Well involved but limited with consultation

Success elements: Public response was positive and participation was increased due to the effective and efficient use of GIS to facilitate data sharing and information exchange

Who participate? : General public - business associations, neighbourhood groups and public collaboration

GIS/model GIS availability: (Esri- ArcView)

Why they participate: To view exhibits, discuss their concerns, to identify the important issues.

PPGIS geographic information: Paper maps, aerials, volumes of accident data, FEMA flood maps and digital data for State Road 50/405 study; **type:** aerials, tax maps, land use, zoning, flood zone, wetland boundaries, traffic zones (models) and soils data; **source:** digital data- Brevard County Property Appraiser's GIS division; digital (arcview) format, 1999.

Figure: Location map
Source: (Kurt J. Schulte 1999)

Figure: Bicycle and Pedestrian Plan(The process of collecting school and park locations were minimized and the real business of providing adequate connectivity to the local parks, schools, and existing bicycle and pedestrian systems could be focused on, all the creative energy was spent on the design not the production)
Source: (Kurt J. Schulte 1999)

Title: Participatory GIS-based natural resource management: Experiences from a country of the South

Date: 1995 - 2003

Country: Lebanon

Latitude-longitude (tageo.com): 33.6512, 33.6836

Language: English

Subject: Natural Resource Management

Description: The local knowledge has been used through sketch mapping. It is thus based on local perceptions of agroecological zones within the study area. Production of sketch maps for each study areas was one of the first steps in producing georeferenced maps of the study area that incorporate indigenous knowledge of agroecological zones.

Rights: Land and Water Resources in the Environment and Sustainable Development Unit, American University of Beirut, Lebanon (Rami Zurayk)

Background: Lebanon is ecologically as well as socially diverse. Agriculture, once a major activity, now contributes less that 10% to the gross national product. Moreover, the country was left crippled by 17 years of war, which ended in 1991, and currently bears the brunt of the volatile Middle Eastern politics. The public sector has been incapacitated and is still unable to fully take responsibility for the sustainability of agriculture.

Conception: Bottom-up

Objectives: To delineate the agroecological zones in three different study areas within three different regions of Lebanon (Aarsal, Ham and Maaraboun), according to the indigenous classification.

State (start-finish): Finished in 2003

Participative method: Hand-drawn maps on a paper are provided, sketches, diagrams rankings.

Ladder participation:

Success elements: It was recognised that PGIS facilitated research process by enhancing trust-building. When their value of knowledge is appreciated by researchers, their commitment is increased.

Failure elements: Some fuzzy approach has been noticed while defining soil types by local knowledge.

Who participate? : Local people- researchers, organization, government collaboration

GIS/model GIS availability: (Esri - ArcInfo)

PPGIS geospatial technologies: GIS, GPS (during ground-truthing phase)

PPGIS geographic information: Sketched map, satellite images; **type:** sketched resource map, satellite image with boundaries, 1970.

Figure: The sketch map of one of the study areas produced by local participants Source: (Zurayk 2003)

Figure: Satellite image with superimposed agroecological zone boundaries. Source: (Zurayk 2003)

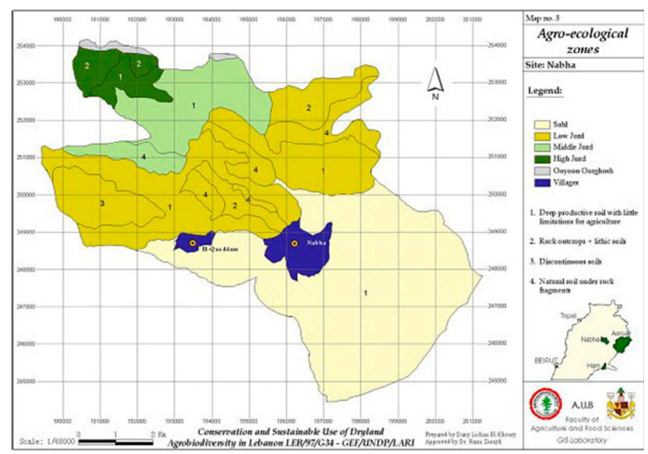


Figure: An agroecological map that combines geospatial data with local knowledge. Source: (Zurayk 2003)

Title: A Spatial Approach to Participatory Planning in Forestry Decision Making

Date: 2002

Country: Finland

Latitude-longitude (tageo.com): 60.3269, 25.1367

Language: English

Subject: Planning

Description: The study carried out in the area managed by the Finnish Forest and Park Service, illustrates how to pack huge amounts of unstructured public feedback as decision support. The result of the analysis was a score map ranking pixels in the study area according to the aggregated preferences and norms expressed by public. The methods used were enabled the collection of special local knowledge in contrast to expert knowledge as represented by foresters and planners.

Publisher: Leena A. Hytönen , Pekka Leskinen and Ron Store

Rights: Finnish Forest Research Institute, Kannus Research Station, Finland

Background: GIS and multicriteria preference analysis tools were used to incorporate quantitative and qualitative data about the area. Habermans' 'lifeworld' concept, that individuals own personal moral ideas and opinions about right and wrong actions, was used as the theoretical approach to making public participation meaningful and a basis for analysis. One of the ways that proposed to improve to distinguish preferences and norms is implementing an interactive process of collecting citizens' opinions through thematic interviews and focus group discussions.

Conception: Bottom-up

Objectives: To achieve ecological and social sustainability by public participation.

Participative method: Public meetings, feedback forms

Ladder participation: Participative-consultation

Failure elements: The limitation in this research was the difficulty distinguishing between preferences and norms.

Who participate? : General public -government, organization

GIS/model GIS availability: (Esri-ArcInfo)

Why they participate: To mention their concerns

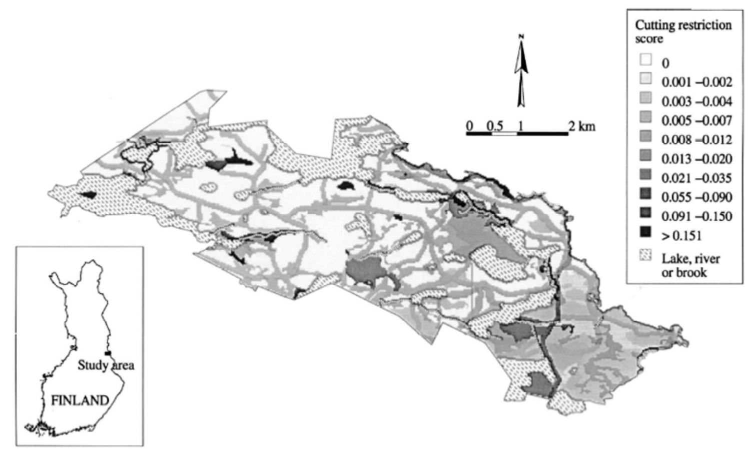


Figure: Combined score map of the theme ''Restricting of Cuttings'' in the case study showing the most valuable areas, in the public's opinion, to be set aside from commercial forestry.
Source: (Hytönen et al. 2002)

Title: Explorations of Participatory GIS in Three Andean Watersheds in Peru

Date: 2003

Country: Peru

State and province: Cajamarca, Puno

City: Asunción, San Pablo, Mañazo

Latitude-longitude (tageo.com): (-7.317) - (-78.533); (-7.117) - (-78.833); (-15.800) - (-70.333)

Language: English

Subject: community-based natural resource management

Description: This study's focus was on a community-based natural resource management in order to learn about how GIS data can be created to facilitate a participatory development process. It has given an empirical evidence of GIS performance in rural participatory resource management, particularly in developing countries limited in educational, administrative, communications and spatial data infrastructure.

Rights: Gaylord Nelson Institute for Environmental Studies University of Wisconsin-Madison (Craig Ficenec)

Background: Two of the three project watersheds, San Pablo and La Asunción lie in the upper Jequetepeque basin of northern Peru. The third and largest project site Mañazo lies in the southern highland department of Puno, near Lake Titicaca.

Conception: Bottom-up

Objectives: To empower grassroots organizations, NGOs, and municipal authorities with information that directly guides resource management decisions and attracts funding for locally prioritized development proposals.

Sociopolicy concept: This project illustrates that the ultimate impact of GIS applications is influenced no more by technical constraints than by the social and political context in which the technology is applied. Unfortunately, few such demands for GIS products were ultimately offered. The transition of political power in Peru through three presidential administrations during the course of this project severely limited the potential for rural investment.

Participative method: PRA methodologies, participatory resource mapping, sketch mapping, photo mapping, semi structured interviews and meetings

Ladder participation: Consultation

Success elements: The mapping exercises at the village level allowed stakeholders to express the local spatial knowledge explicitly while stimulating interest and fostering community dialogue for collective resource management.

Failure elements: The process and its preparation was time demanding, especially for first-time GIS users and was influenced by technical constraints and social and political context in which technology is applied.

Who participate?: Community members- University, NGO

Why they participate: To articulate development priorities, their necessities

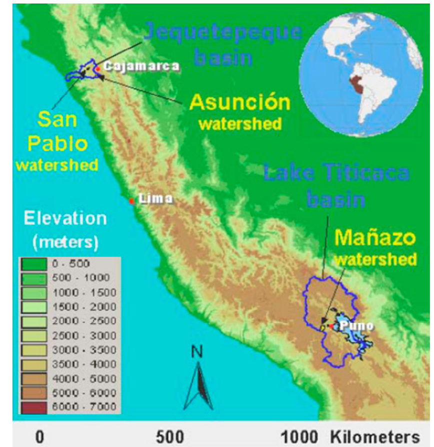


Figure: Project watershed sites
Source: (Ficenec, http://www.iapad.org/publications/ppgis/Ficenec_UCGIS_revised.pdf)

Figure: Photo mapping exercise in Capellania community in San Pablo
Source: (Ficenec, http://www.iapad.org/publications/ppgis/Ficenec_UCGIS_revised.pdf)

Title: Community Mapping in the Philippines: A Case Study on the Ancestral Domain Claim of the Higa-onons in Impasug-ong, Bukidnon

Date: 2001

Country: Philippines

State and province: Higa-Onon

City: Impasug-ong

Latitude-longitude (tageo.com): 8.308, 125.004

Language: English

Subject: Community Mapping

Rights: Randy Abeto, Zeff Calilung, Joan Pauline Talubo (PAFID),Benny Cumatang (AGMIHICU)

Background: The Higa-onon ancestral domain claim has a total area of 10,054.88 hectares, situated in the municipalities of Impasug-ong and Malitbog at Bukidnon, Mindanao. Early, the community has faced problems because of logging operations in the forests. The rich forests attracted lowlanders to invest and engage in logging businesses which brought not only competition to the community, but also destruction of their sacred home and disturbance to their quiet lives. The biggest challenge they have to face is the proposed establishment of Mt .Kimangkil as a protected area.

Conception: Bottom-up

Objectives: Through a construction of a 3D model, become familiar with the environment and to discuss the issues concerning their environment.

Participative method: Construction of 3D models, the perimeter survey.

They used raw materials at hand.

Scaled three-dimensional model, after the construction of the 3D model, zoning and land-use planning was done. On a plastic sheet overlaid on the 3D model, the community identified and traced the lines dividing the claim according to land use as well as adding other details that they considered significant, such as names of sacred places, landmarks and cultural sites. Names of mountain peaks, rivers and roads were taken from the topographic map of the area. All of these were consolidated into a land-use map for the community's reference.

Ladder participation: Participative

Success elements: Through these community mapping activities, government sectors heard the voice of the Higa-onons and doors of opportunities were opened for them. These activities even helped them deal with internal issues. The 3D model made them determine the past, present and future land-use of their land. They were able to discuss boundary conflicts both within and outside the community. Most of all, they familiarized themselves more with their home. They know the place by heart but seeing it in a small-scale model that is exactly the same made it more meaningful.

Who participate? : Indigenous people –NGO, government organizations

GIS/model GIS availability: 3D model

Why they participate: During the construction of 3D model and using their knowledge with their environment.

Figure: PAFID trained the community in making a scaled three-dimensional model of their claim. With just raw materials at hand, they were able to construct their 3D model

Source: Abeto et al. 2004

Title: A case study with Village Development Planning in Bach Ma National Park buffer zone, Vietnam

Date: 2004

Country: Vietnam

State and province: Thua Thien Hue

Latitude-longitude (tageo.com): 16.200, 107.867

Language: English

Subject: Participatory development planning

Description: The participatory studies took place in different villages Phuoc Tuong ,Trung Phuoc,Hoa Mau and Khe Xu villages.

Rights: Nguyen Thuy Trang

International Institute for Geo-Information Science and Earth Observation Enschede, the Netherlands

Background: The Loc Tri commune is located in the buffer zone of Bach Ma National Park. It's the only commune that has a part of it located within the park and this particular characteristic makes Loc Tri a focusing target in planning process for development activities. The main issue in Loc Tri commune is the poverty situation. There are many reasons for this poverty, and one of them is the misuse and lack of access to natural resources. Resulted from the current land management policies, land use planning process in the area is rather top-down and bureaucratic. The weak planning process does not involve farmers in the villages but is decided at the district level. Therefore, farmers in villages have little benefit and stand in the new land-use plan or they think that some areas are forgotten or inappropriate used. There is a need for developing a more grass-root planning approaches, which village development planning (VDP) appears to be fit to the requirement of local people and authorities.

Conception: Top-down

Objectives: To understand a practical process of the concept of participatory GIS through describing a study in application field of Village Development Planning and to identify its sequence and interaction between local community's participation and GIS technology.

State (start-finish): Finished

Sociopolicy concept: Political power plays a vital role in this project.

Participative method: PRA methods, meetings, sketch mapping, informal interviews

Ladder participation: Participative in terms of consultation, information giving, decision making and initiative action.

Success elements: Important as being an example for the future works

Failure elements: It has not completed the 'return' part of PGIS products to local communities.

In Hoa Mau village, the i-paq was not working due some technical problem and only GPS was working and hence mapping process during transect walk had to be done by manually recording the points' geo-reference into note sheet. Comparing to using mobile-GIS, this conventional way of ground truthing was much less productive in GIS data record and frustrated to participants.

The software problem were about GPS receiving, choosing geo-reference system, local datum and data recording/storing in safe place (memory card) or download data every day after coming back from the field.

In Hoa Mau village where sketch maps was not made, the mapping exercise based on satellite image took much longer time and participants were distracted by the satellite image too much.

Who participate? : Farmers, villagers

GIS/model GIS availability: (Esri-ArcMap, ArcGis) Mobile GIS

Why they participate: To share their ideas

PPGIS geospatial technologies: GIS, GPS (GPS-set+ I-paq in a mobile GIS system)

PPGIS geographic information: Photo, satellite images, maps, local knowledge; **type:** aerial photos, sketch data, road map; **source:** Landsat7-ETM, road map(informatics department, Bach Ma national park, interview GPS measurement; **Format:** shapefile format (road map), satellite images processed in ERDAS imagine 8.6; **scale:** 1:50000 (satellite image printed copies to field), 2003

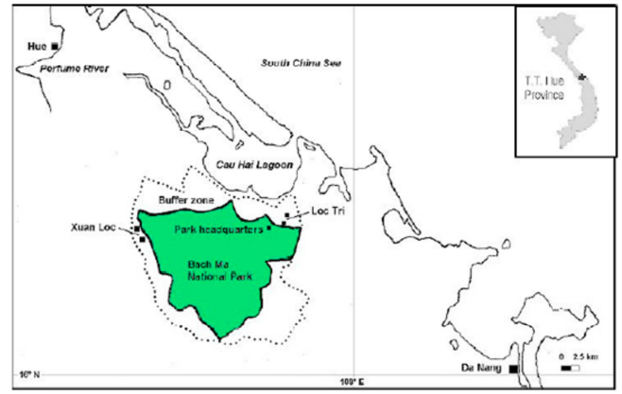


Figure: Location of Bach Ma National Park and Loc Tri commune
Source: (Trang 2004)

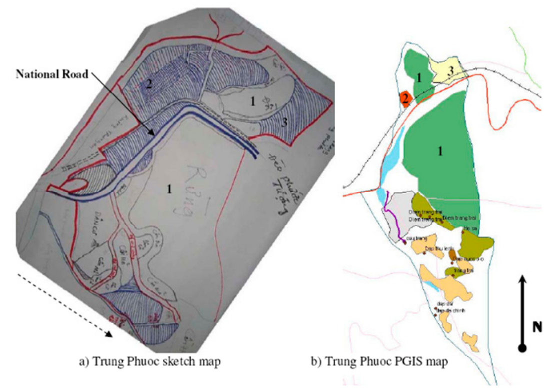


Figure: a) Sketch map of Trung Phuoc village- Local people decided themselves upon what symbols and in what colours they want to present certain subjects. Categories of mapped subjects were also decided by them, which later on were explained in the legend of sketch map
b) Trung Phuoc village, real shape in GIS
Source: (Trang 2004)

Title: Malaysia's Case Study Mapping Dayak's Customary Lands in Sarawak

Date: 2004

Country: Malaysia

State and province: Sarawak

City: Kampong Boyan

Latitude-longitude (tageo.com): 1.300, 110.267

Language: English

Subject: Community mapping

Description: The study performed for community –based mapping in Sarawak in order to help to preserve the local knowledge in the land. Another goal in the project is to apply the community map as a tool for negotiation and resolving disputes between the community with outside parties or within the community itself.

Rights: Mark Bujang - (BRIMAS)

Background: Sarawak is the largest of the 13 states in Malaysia. Sarawak's population is estimated to be at about 2.2 million people, the majority being the indigenous. However, 80% of the total Dayak population in Sarawak is rural dwellers, which consist of self-subsistent agriculturists, hunters and gatherers. Other populations include the Malaysia, Chinese and a small number of Indians. Gaining recognition and respect of natural customary rights (NCR) to land has always been in the forefront of the indigenous Dayaks' struggle in Sarawak. Presently, the State's legislation actually recognizes the NCR of the Dayaks to their customary land, but too often this has been ignored and violated upon by the State Government and the private enterprises for economic interests.

Conception: Bottom-up

Objectives: The main objective of community-based mapping in Sarawak is to delineate and document the native customary land boundary and thus helping preserving the community's traditional knowledge to their customary land.

State (start-finish): Ended

Sociopolicy concept: Some problematic issues occurred with the availability of some scaled topographic maps and aerial photographs because of the State Government restricting the distribution of these documents by law.

Participative method: Scaled hand-plotted maps were produced

Ladder participation: Consultation and information sharing

Failure elements: Problematic issues with GIS training which limits the participation and accessing secondary data.

Who participate? : Iindigenous Dayak community, NGOs and CBOs

Technical support: Provided by local NGOs (BRIMAS) and CROs

PPGIS geospatial technologies: BRIMAS' GIS (to produce community maps)
GPS (to collect field data)

Figure: After the field survey has been completed, community makes critical review of the topographic maps and the draft maps for the additional changes if it is necessaries.
Source: (Bujang 2004)

Survey Results

Preliminary Results of the Web Based Design Questionnaire

Structure of the database					
1. General Information of PPGIS experience					
	Very Important	Important	Somewhat Important	Not Important	**Response Total**
a) Experience name	28% (28)	**52% (52)**	15% (15)	5% (5)	**100**
b)Background of experience	**52% (51)**	41% (40)	7% (7)	0% (0)	**98**
c) Objectives of the experience	**66% (63)**	32% (31)	2% (2)	0% (0)	**96**
d) State (status of implementation: completed, ongoing...)	32% (30)	**43% (41)**	24% (23)	1% (1)	**95**
e) Date	24% (24)	**39% (38)**	35% (34)	2% (2)	**98**
f) Location	37% (36)	**41% (40)**	20% (20)	2% (2)	**98**
g) Main application or thematic of the experience	**62% (61)**	30% (30)	8% (8)	0% (0)	**99**
h)Participation's method	**62% (61)**	33% (32)	5% (5)	0% (0)	**98**
i) Ladder of citizen participation	**53% (52)**	34% (33)	12% (12)	1% (1)	**98**
j)Communication structures	37% (36)	**38% (37)**	26% (25)	0% (0)	**98**

k) Organisation(s) responsible for the experience	29% (29)	**44% (44)**	26% (26)	0% (0)	**99**
l) Contact person for the experience	41% (40)	**42% (41)**	15% (15)	1% (1)	**97**
m) Experience's sponsors / Funding agencies	21% (21)	**44% (44)**	28% (28)	6% (6)	**99**
n) Participants involved in the experience	39% (39)	**42% (42)**	17% (17)	1% (1)	**99**
o) Geospatial technologies used	**61% (61)**	30% (30)	9% (9)	0% (0)	**100**
p) Background of Geospatial technologies	29% (28)	**44% (43)**	24% (24)	3% (3)	**98**
q)) Nature of interaction with Geospatial technologies	40% (40)	**42% (42)**	17% (17)	0% (0)	**99**
r)) Geographical location of Geospatial technologies for the community	36% (35)	**46% (45)**	18% (18)	0% (0)	**98**
s) Geographical information used	**44% (44)**	41% (41)	13% (13)	1% (1)	**99**
t) Geographical	**43% (42)**	40% (39)	14% (14)	2% (2)	**97**

information sources					
u)) Results of the experience	**78% (76)**	19% (19)	3% (3)	0% (0)	**98**
v)Appendix (map, illustrations,etc.)	**46% (45)**	42% (41)	11% (11)	0% (0)	**97**
Total Respondents					103
Skipped this question					3
2. According to you, are there any other data which should be taken into account?					
				Response Percent	**Response Total**
Item 1				**94.3**%	**33**
Item 2				60%	**33**
Item 3				28.6%	**33**
Item 4				11.4%	**33**
Item 5				11.4%	**33**
Item 6				11.4%	**33**
Item 7				8.6%	**33**
Item 8				2.9%	**33**
Item 9				2.9%	**33**
Item 10				2.9%	**33**
Total Respondents				**35**	
Skipped this questions				71	
3. Your feedback is important !!! Do you have any suggestions or feed back about this first part of the questionnaire?					
Total Respondents				**23**	
Skipped this questions				**83**	

Structure of the Web Site – Part 1			
4. Would you like to have a discussion forum about PPGIS experiences, available inside the web based observatory for PPGIS experience?			
		Response Percent	**Response Total**
Yes		**60.2%**	**59**
No		2%	2
A direct link to PPGIS.net		37.8%	37
Total Respondents			**98**
Skipped this question			8
5. Would you like to be able to download the experience data files in a specific format (pdf for instance)?			
		Response Percent	**Response Total**
Yes		**95.9%**	**93**
No		4.1%	4
Total Respondents			**97**
Skipped this question			9
6. Are you interested in statistical information about PPGIS experiences, available from query tools?			
		Response Percent	**Response Total**
Yes		**85.7%**	**84**
No		14.3%	14
Total Respondents			**98**
Skipped this question			8
7. In your opinion, the access to the database information of PPGIS experiences should be :			
		Response Percent	**Response Total**
Restricted with user name and password		35.1%	34

Open to public		**64.9%**	**63**
Total Respondents			**97**
Skipped this question			9
8. In your opinion, the capacity to store a new PPGIS experience in the database should be:			
		Response Percent	**Response Total**
Restricted for users registered with user name and password		**61.9%**	**60**
Open to public		38.1%	37
Total Respondents			**97**
Skipped this question			9
9. Are you personally interested in feeding the database by providing new experiences or updating existing experiences ?			
		Response Percent	**Response Total**
Yes		**83.2%**	**79**
No		16.8%	16
Total Respondents			**95**
Skipped this question			11
9. Are you personally interested in feeding the database by providing new experiences or updating existing experiences ?			
		Response Percent	**Response Total**
Yes		**83.2%**	**79**
No		16.8%	16
Total Respondents			**95**
Skipped this question			11
10. Could you explain your previous answer? What would be your constraints / impediments for doing that ?			
Total Respondents			49
Skipped this question			57

11. Your feedback is important!!! Do you have any suggestions or feedback about this second part of the questionnaire?			
Total Respondents			**15**
Skipped this question			91
Structure of the Web Site – Part 2			
12. Among the following navigation tools of the cartographical user interface, please select those that seem to you useful to select and/or visualize PPGIS experiences			
		Response Percent	**Response Total**
Pan		86%	86%
Zoom +/-		**90.7%**	**90.7%**
Zoom to initial view		73.3%	73.3%
Export the view to a specific format		89.5%	89.5%
Cartographic layers control		88.4%	88.4%
Thematic maps (based on data stored into the database)		**90.7%**	**90.7%**
Total Respondents			**86**
Skipped this question			**20**
13. Please indicate below other useful navigation tools			
		Response Percent	**Response Total**
Tool 1		**100%**	**23**
Tool 2		60.9%	14
Tool 3		34.8%	8
Tool 4		8.7%	2
Tool 5		8.7%	2
Total Respondents			**23**

Skipped this question	**83**

14. Do you think that queries should be		
	Response Percent	**Response Total**
Related to the whole database content	**77.2%**	**61**
Limited to a specific number of predefined data	22.8%	18
Total Respondents		**79**
Skipped this question		**27**
15. If queries should be limited, which data/variable could be concerned?		
	Response Percent	**Response Total**
Item 1	**100%**	**9**
Item 2	55.6%	5
Item 3	22.2%	2
Item 4	11.1%	1
Item 5	0%	0
Total Respondents		**23**
Skipped this question		**83**
16. Do you think it is useful to be able to save the results of queries ?		
	Response Percent	**Response Total**
Yes	**75%**	**63**
No	23.8%	20
If yes, how do you want to save it (format, tools,...)	36.9%	31
Total Respondents		**84**
Skipped this question		**22**
17. Your feedback is important!!! Do you have any suggestions or feed back about this third part of the questionnaire?		
Total Respondents		**16**
Skipped this question		**90**

Your Personal Information			
18. How would you define your involvement in PPGIS ?			
		Response Percent	**Response Total**
Community mapping activist		2.3%	2
Community mapping practitioner		10.2%	9
Participatory GIS practitioner		14.8%	13
Researcher		**37.5%**	**33**
Development practitioner		10.2%	9
Development researcher		3.4%	3
GIS expert		18.2%	16
Other (please specify)		3.4%	3
Total Respondents			**88**
Skipped this question			**18**
19. Where are you located ?			
		Response Percent	**Response Total**
East Africa		9%	8
West Africa		5.6%	5
Central Africa		1.1%	1
Southern Africa		1.1%	1
Northern Africa		0%	0

Caribbean		0%	0
Latin America		4.5%	4
Central America		2.2%	2
North America		**27**%	**24**
South Asia		5.6%	5
Middle East		11.2%	10
Central Asia		1.1%	1
Pasific		0%	0
Europe		5.6%	5
Total Respondents			**89**
Skipped this question			**17**
20. Where do you operate ?			
		Response Percent	**Response Total**
East Africa		14.8%	13
West Africa		14.8%	13
Central Africa		9.1%	8
Southern Africa		9.1%	8
Northern Africa		5.7%	5
Caribbean		4.5%	4
Latin America		13.6%	12
Central America		3.4%	3
North America		21.6%	19
South Asia		12.5%	11
Middle East		20.5%	18
Central Asia		2.3%	2
Pasific		1.1%	1
Europe		**9.1%**	**8**
Total Respondents			**88**
Skipped this question			**18**
21. Your age range ?			

		Response Percent	Response Total
18-25		4.7%	4
26-39		**54.7%**	**47**
40-65		38.4%	33
Over 65		2.3%	2
Total Respondents			**86**
Skipped this question			**20**
22. Your gender ?			
		Response Percent	**Response Total**
Female		31%	27
Male		**69%**	**60**
Total Respondents			**87**
Skipped this question			**19**
23. Your highest level of education completed ?			
		Response Percent	**Response Total**
High school		1.1%	1
Bachelor degree (undergraduate)		13.6%	12
Masters degree (graduate)		**47.7%**	**42**
PhD		27.3%	24
Other (please specify)		10.2%	9
Total Respondents			**88**
Skipped this question			**18**
23.To finish, do you have any suggestions, comments etc... about the questionnaire??			
Total Respondents			**25**
Skipped this question			**81**