Community Participation and the use of Geo Information in Informal Settlement Upgrading Programs
A Case study of Recife

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February 2002.
Community Participation and the use of GI in Informal Settlement Upgrading Programs
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by

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Thesis submitted to the International Institute for Aerospace Survey and Earth Sciences in partial fulfillment of the requirements for the degree of Master of Science in Urban Land Administration

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Disclaimer

This document describes work undertaken as part of a programme of study at the International Institute for Aerospace Survey and Earth Sciences. All views and opinions expressed therein remain the sole responsibility of the author, and do not necessarily represent those of the institute.
I dedicate this work to my family,
in special to my parents
and the man of my life, my husband.
I love you all very much.
Abstract

The Low-income settlements face one of the hardest challenges in a city, the fight for basic needs such as water supply and electricity. There are efforts to create a participatory process between community and local governments with the intent of aiding the governments in understanding the reality these low-income settlements live in.

The need for the exchange and sharing of information leads to a search for new tools to assist this learning process.

This study had the objective of analyzing the participatory process and the possibility of implementation of new tools with the involvement of low-income settlements. As a result, a discussion was brought on whether GIS can be useful for the disadvantage groups and if such a tool can empower communities towards the decision-making process.

In the literature several studies experienced the use of different levels of GI technology by community residents, showing that the members of informal communities are able to work with maps and basic geographic information (e.g. aerial photographs, photo mosaics, thematic maps), which could help them in perceiving their problems.

For this research an empirical study was carried out in the city of Recife, Pernambuco-Brazil, where two settlements (Brasilia Teimosa and Tres Carneiros) were chosen so that interviews could be carried out with the residents as to observe and describe the participatory process with the municipality of Recife and the characteristics of the two settlements.

By analyzing the resident’s responses to the interviews some conclusions regarding the satisfaction of those people in relation to the process could be drawn and gaps in the process were identified. One of these is the difference between what is agreed upon in the meetings between municipality and the settlement’s representatives and what is actually implemented by the municipality.

In this process the use of GI technology can be of important value to improve the understanding of the problems and to bring the different points of view closer. Furthermore, this information can bring the spatial distribution of these problems into the process, which could in turn assist the decision-making process. One of these tools could be the GIS, which in the context of a participatory process, is referred as Public Participation GIS (PPGIS).

Nevertheless, existing difference in skills of the two stakeholders leads to the conclusion that the two groups would have to work with different levels of GI technology, in accordance with their own capabilities, so that the participation of community members in the process could be increased.

Finally, the research presents several conditions, which have to be fulfilled as to enable the process to take place and to contribute to its effectiveness.

Keywords: Low-income Settlements, Municipality, Participation, GI technology, GIS, PPGIS.
Acknowledgments

My gratefulness goes firstly to God that gave me strength and wisdom to go through these 18 months and helped me to carry out this research that made me realize how capable I am to overcome the hurdles life presents to all of us. Thank you for guiding me and being by my side always.

I thank my supervisors, Dr. Ing. W. H. de Man and Ms. Ayako Kagawa, who were very special to me during the research process, encouraging me through all the way and believing in my capacity to undertake this study, helping me to improve my skills and achieve my objectives. I thank the two of you for the respect and the kind way of dealing with professional and personal subjects.

I would like to thank my field supervisor, Dr. Flavio de Souza, for his attention and time and for the relevant comments and contribution, which were decisive to undertake the field activities, and for the success of the same ones. I thank him also for the worry with my security in the field and the protection given.

To Johan de Meijere and Karen Buchanan for the psychological support and the good job as students advisors, helping me always with the difficulties encountered in living in this foreign country.

I express my gratitude to who motivated me to choose ITC to undertake my MSc studies, a former student of this institute, Jose Jorge Seixas.

My deep appreciations to the staffs of URB and also of the Municipality of Recife, without whom I could not carry out the fieldwork activities in the very short time available. My special acknowledgements go to the Secretary of Urban Planning, Mrs. Tania Barcelar and her advisor, Jan Bitoun, to Kleber from the department of Geo Processing, and to Mauro Barros and Ana Carla from URB, who gave me special attention and contributed very much for the development of the field activities.

A special thank you to my friend Jose Laurindo Campos dos Santos who helped me in endless discussions, the english editing and also in being a very special friend.

To all my colleagues and friends who were there for me when I most needed them, in special to Renata Guizzardi, Ellen Steur, Lyssette Munoz Villers, Ericka Verissimo and Silvane Paixao.

I would like to express my gratitude to my in laws for all their support, comprehension and love during this 18 months period I had to stay away from my home and family.

To my father and my sister Paula for the technical support with the english editing and indication of relevant and up to date literature which helped me in the production of this study.

I thank greatly my family for being all the way with me, encouraging and supporting me through good and bad times during these 18 months. Thanks to my parents for the financial and psychological support and to my sisters for the love expressed and for believing in me. You are all in my heart.

A very special thanks to my beloved husband who had the courage to give up his own dreams and objectives to give me financial and psychological support and be here with me, helping to make this all possible.
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1. Introduction

Illegal settlements (*favelas*) are a typical scene of the contemporary city in Brazil and in other developing countries with a fast economic and population increase (Bantel, 2001). The appearance of these settlements was a consequence of the intense population growth, causing a very high demand for land and housing, which could not be supplied by the government.

In general, *favelas* face problems such as land rights and lack of basic services and they are usually situated in haphazard areas. However, as it is stated by De Soto (2000), ‘to varying degrees, they have become responsible for the provision of such basic infrastructure as roads, water supply, sewage systems, electricity, the construction of markets, the provision of transport services, and even the administration of justice and the maintenance of order’. These settlements are basically self-contained, which means they have their own rules and laws (Dwyer, 1975).

The residents of informal areas try to organize themselves in a way to address the most important problems. This attempt should lead to a common point of view, which can aid them in perceiving their own problems. One of the consequences of taking such an approach is that they will be able to negotiate with the local governments in an objective way. These community organizations are the so-called CBOs (Community Based Organizations).

The CBO members are the ones who usually enforce the local rules and make the final decisions regarding problems in the community. The residents democratically elect the members of the organization as to represent the community’s interest in negotiations with the government and to ‘administrate’ their settlement.

The governments are still trying to find the solution for informal settlements, as they cannot cope with the demand for land and housing, which is permanently (or continuously) increasing. Therefore, the local governments’ interest in formalizing the informal settlements has increased as ‘eradication policies began to be seen not as part of the solution but as contributing to the problem’ (Hardoy and Satterthwaite, 1989). From the day governments acknowledge that, upgrading programs started to be considered as a way of enhancing quality of life in informal settlements.

In order to carry out such activities, information about the settlements has to be gathered. Once this information is gathered, it can help the government in understanding the needs of these people and the actual status of their problems.

These are facts, which show that community-based information can be helpful for the government in the process of settlement upgrading.

To make the process of gathering information more reliable and effective, the participation of the community could be of good help.

The participatory process can help the local government in determining the problems and its status in accordance with what is experienced by the community and consequently set priorities based on the discussions with the people instead of doing the same in closed doors meetings in the absence of the people, which are the ones to benefit directly from that.

However, not only the local government will improve its process by determining the problems of the communities in a more realistic manner, the communities also will be organizing themselves to discuss their needs. Therefore, discussions about their situation as a community will give them the opportunity to be aware of the problems in their living environment and will give them a chance to
work together to improve the community. In this stage a common point of view is necessary and an agreement of the individuals priorities have to take place before the start of a participatory process, so that the problem of the community, as a whole, can be defined and afterwards discussed with the local government (Lisk, 1985).

If the agreement does not take place, that is, if a common point of view cannot be presented to the authorities, diverging interests will retard or even make the process impossible to be adopted.

1.1. Problem Statement

To implement a new tool into a process that has been carried out in the same way for many years can bring different impacts such as cultural, technical, social and even economical impacts.

The implementation of GIS can be complex and one of the most difficult barriers for this process to take place can be the acceptance of this tool, not only for the government but also for the community. As it is stated by de Man (2000), ‘Common in much of the literature on the effectiveness of geographical information technology (or any technology for that matter) is value and acceptance’. This shows how the effectiveness of such a tool can depend on the acceptance by the group making use of it.

This study focused on the participatory process between the two main stakeholders, the community and the local government, and the possible use of the GIS technology by them in this process.

The research looked at the impact of the implementation of a complex technology in the informal settlements, where contradictory facts such as low literacy level could restrict the participation of the community in the process.

As Wegener and Masser (1996) says, a GIS is to be used ‘in an open and participatory process of social experimentation and grassroots decision making’. Following this line of thoughts, one of the main goals of this research was to actually draw a conclusion on whether such technology can actually help these settlers in trying to define and solve their problems or if such an approach is only applicable for those of the local government, which have the special skills to work with this tool.

In the context of this research the GIS is especially referred to as PPGIS (Public Participation GIS), which is a term used to cover the range of topics raised by the intersection of community interests and GIS technology (Varenius, 2002).

Initiative 19 states, ‘there is a need to incorporate social implications of how people, space, and environment are represented in GIS and focus attention on the social contexts of GIS production.’ (Alspach, 2002, p.02).

In a PPGIS all voices are to be heard and the need to represent the feelings of community residents is a challenge to be achieved.

As it was mentioned by Varenius (2002, p.01) ‘GIS is alternatively seen as a powerful tool for empowering communities or as an invasive technology that advantages some people and organizations and while marginalizing others’.

1.2. Hypotheses

The hypotheses in this research were extracted from the literature consulted and tested during the research process.

The hypotheses were:

- The participatory approach is an important consideration when collecting and analysing data about Informal Settlements.
- Participation of informal settlers’ in the implementation of GIS can only be considered in one of the phases of the process, the collection of data.
1.3. **Research Questions**

1. What is the importance of a participatory approach for informal settlements upgrading processes?

2. To what extent do GIS and the participatory approach influence the process of decision-making?

3. Can a PPGIS be implemented and which are the barriers for implementation in Recife’s context?

1.4. **Objectives**

- To analyse the participatory process and the possible implementation of a PPGIS in such a context.

- To analyse to what extent the decision-makers use the information collected with the community’s participation and what is the role of GIS in this process.

1.5. **Research Design**

1.5.1. **Study Area**

The city of Recife is located in the state of Pernambuco, in the northeast of Brazil and it is one of the major cities in the country. Recife was chosen because of its history of informal settlements and the programs related with these areas. The municipality estimates that in the city there are more than 600 informal settlements, where more than 50% of the population lives (Assies, 1991; Moura, 1990; in: De Souza, 1999). From these settlements, two were chosen Brasilia Teimosa and Tres Carneiros, both located in the south of the city.

The settlements have different characteristics, starting from their topography and going on to their internal organization, as it is going to be explained in Chapter 3.

1.5.2. **Target Population**

The target population in this research involved all the informal settlers in the study area and the decision-makers of the upgrading process.

For the purpose of carrying out interviews, samples were taken from these populations, as time and financial constraints did not allow the whole population to be interviewed.

The respondents in the informal settlements were chosen by using the Stratified Random Sampling as the study population is seen as two groups of households. The first group being composed by men and the second group by women.

When speaking of informal settlements, women should always be included as respondent. One of the reasons is that in normal conditions there opinions are not considered as relevant as the men’s opinion, being it for cultural, religious or other reasons. Therefore, the women and men should be given equal chance of being selected, as to give both groups equal rights (Habitat, 1996).

In the case of the decision-makers, key respondents were chosen, as time constraints would not allow a very detailed interview considering the availability of this group for interviews and the duration of the fieldwork activities.

For the purpose of seeking consent for the interviewing activity, both populations were contacted before hand as to be given permission for such activity to take place and these contacts were made through key persons such as the CBO leader and a contact person from the local government.
1.5.3. **Data availability**

To answer the research questions data available and/or collected in the field should be:

- **Secondary Data Collection**
  
  - Aerial photographs of the informal settlement in the city of Recife, Brazil, to locate the study area, to be collected from past studies carried out in the same area.
  
  - Digital spatial data (boundary, hydrology, etc), which is available from the study, which is being carried out by implementing GIS.
  
  - Collection of information about the socio-economic status of the settlement (actual situation), from studies, which has being carried out in the area.

- **Primary Data Collection**
  
  In this phase of the research, interviews were carried out with the study population, in a semi-structured way as to collect information such as:

  - The problems the community is facing and how the participatory process is helping them in the perception and solution of these problems.
  
  - The feeling of the participatory process by the community.
  
  - Information on the existing political situation of the area.
  
  - Description of actual government’s decision-making process.
  
  - The role of GIS in this process.

1.5.4. **Expected output**

Analysing the implementation of GIS in a participatory process is a complex task. The use of this technology is closer to the reality of those working for government, having the special skills and the proper training.

In the case of informal settlers, how could this technology be implemented in such a way to involve these people not only in collection of important information about their environment, but also on the manipulation of the tool? It is very difficult to deal with new technologies, especially for those struggling to achieve their claims for a better living environment. These communities are usually composed of residents who are victims of the bad educational system present in the country.

All the differences, including the one mentioned above, could retard the implementation of technologies as GIS due to the priorities given to the limited budget involved in activities like the upgrading programs.

Therefore, the participation of these communities in the implementation of a GIS would probably be very much restricted to the collection of data.
1.5.5. **Flowchart**

The flowchart below shows the phases of this research.

Starting with the problem statement, the target population could be identified. As the whole population cannot be involved in the study for reasons mentioned before, a sample has to be taken and for that a sample method and size have to be determined.

With the sample, interviews were carried out in a semi-structured way and the analysis of the responses of the interviewees followed this phase.

At the end of the analysis, findings and conclusions were stated in the research report and recommendations were given at the last phase of the research.

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**Flowchart 1 Research Process**
2. State of the Art

2.1. Introduction

Informal settlements are a result of the rapid and unplanned growth of the urban population and they are motive of big concern for all governments in the developing countries. At least for the next 20 years, there will be new efforts concentrated at finding and implementing solutions for the problem and preventing the growth of these settlements and the appearance of new ones (World Bank, Cities Alliance, 2001). Many countries such as Brazil, Venezuela, Ghana and Philippines already recognize the slum upgrading programs as a successful approach, which contributes to the improvement of the living conditions of the urban poor (World Bank, Cities Alliance, 2001).

\[
\text{\textit{It is now common for 30 to 60 per cent of an entire city's population to live in the houses and neighbourhoods which have been developed illegally. In most cities 70 to 95 per cent of all new housing is built illegally' (Hardoy and Satterthwaite, 1989, p.12).}}
\]

The slum upgrading programs are a good start, but not sufficient to eradicate informal settlements from the cities. There is a need for change. Change in the policies, which are actually pushing the poor to the informal sector and worsening the gap between the formal and informal sides of the cities, forcing them to live in substandard conditions.

These aspects can lead to serious consequences which by themselves form a kind of chain that has to be broken so that these people can improve their quality of life and give the next generation a better environment to live in. For example, when a resident of these areas catches a disease due to the lack of sanitation in the area, this can and often does affect the productivity of that individual, sacrificing his or her monthly income. The effect in the income will also reflect in the quality of life of that person and of his or her family, which are already living in a very difficult environment and claiming for improvements.

To break this chain an improvement of the living environment of the urban poor has to take place, and therefore, enable them to be part of the formal side of the city and society.

In this process the role of the government is of great significance. Since an upgrading process has to be carried out it is important that the government participate, nowadays, not only as a provider of services, housing and land, but most important as an intermediate, so that others, such as the private sector, can also be part by contributing to the success of the slum upgrading processes (World Bank).

Another important aspect to be considered in these programs is the community participation. From past experiences, many organizations involved in this kind of programs learned that when the community is actively taking part in the process being it as labour force to help the process or contributing with the expenses to bring the basic services to their settlement, the probability of project success is increased. However, community participation does not stop there. The most important form of participation is the one where the community can actually take part in the whole process by being part of the decision-making process regarding their living environment.
2.2. The Informal Settlements

2.2.1. The influence on the formation of the settlements

Before starting to explain some of the reasons for the formation of these settlements or even to describe some of the problems they are faced with, a definition of informality seems to be necessary and convenient at this point. In this research the term informal settlements is related to those ‘settlements on government’s and/or private property to which the occupants, generally the urban poor, have no title or any semblance one or which they occupy without the knowledge or against the express wishes of the lawful owner. The term may also apply to areas whose residents knowingly or unknowingly break the planning regulations’ (Santiago, 1998).

Many reasons are attributed to the formation of illegal settlements in the cities of the developing countries. First, the rural-urban migration, which begun when the rural residents started to see better opportunities of improving there income in the cities, due to better job opportunities and where the social, political and economic activities were concentrated. This migration led to the growth of the urban population and also to the increase of demand for housing and land. As the government could not cope with such high demand, one of the alternatives was to implement programs that would motivate the people to return to the rural areas (Fernandes and Varley, 1998). Unfortunately, the government did not consider the desires of the people to improve their quality of life, which, in their point of view, could only be done with the new opportunities offered by the major cities that were growing economically, culturally and politically.

Second, the political framework and the laws created by it, as we can see from the point of view of Santiago (1998): ‘policies towards squatting were both inconsistent and ambivalent, alternating between permissiveness and harsh treatment’. From this author’s point of view, this means that policies towards informal settlements are in many cases radical, imposing eviction from the land or demolition of their homes as a solution to the problem, instead of considering the fact that, if government cannot cope with the demand, it should at least consider the settlements (in specific conditions) as part of the problem solution.

'Many experts now recognize that slum settlements are inevitable and in fact a sensible solution to the particular settlement problem of lowest-income people' (Van Huyck, 1971, p.13).

It is clear, that Santiago (1998) believes that certain conditions should be fulfilled, for example, the location of a settlement should not be a haphazard area, or that the settlement occupies an area where serious damage to the environment has been foreseen.

The other political aspect, which somehow influences the process of informal settlement, is the so called clientilism, which is a way by which politics takes advantage of the informal settlers, which are normally people in need, to offer them favours like provision of services, title deeds and even issuance of building amnesties for those constructions which were unauthorized. At the end, these favours should actually be exchanged for votes for the next elections (Yonder, 1987). This process of political pressure in one hand and the clientilism in the other shows how the needs of the poor are not given the proper attention by the government when trying to find a solution for these people’s problems. Instead, informal settlers are viewed as the ‘bad’ part of society, the one that should be eradicated in order for the section of society with the power to influence such process not to be affected by their existence. When the politicians offer some help, it is done not in favour of those who are in need, but actually in
their own favour, like it was said before about the clientilism. These promises are almost entirely forgotten once the elections are over and once again the needs of the poor population are neglected. Instead of making the effort to understand the process and wishes of the disadvantaged people the government insists in considering the ‘problems’ involving the rich section of society, which in most cases are not the most important ones. Very often these so-called ‘problems’ are wishes of the upper class related to the improvement of their living environment. Therefore not as significant if compared to the problems faced by the urban poor.

However, politicians need power and the support of that part of society that has the capability to influence processes, especially in Third World Countries. Even though the political aspect of this problem seems to be in dire need of improvements, there are always exceptions to the rules and in this case, these exceptions are the cities in which the government are working to improve life conditions of the urban poor, and this can be seen by, for example, the upgrading programs and regularization of informal settlements.

‘There is a need to rethink the process of political administration and conflict resolution implicit in urban planning, as well as the chosen means of enforcement’ (Fernandes and Rolnik, 1998).

2.2.2. Life in the settlements

In the informal settlements the composition of the population shows a homogenous pattern in relation to several aspects in which the low literacy level and the bad employment conditions take part.

In the past, the informal settlements were ‘condemned as chaotic and disorganized misery belts, populated by poverty-stricken migrants fresh from the countryside who were ripe for revolution’. Since the 1970s, these settlements are more organized and interested in solving their local problems and not trying to revolutionize the political arena (Dwyer, 1975).

One of the reasons for this to have happened could be the endless fight against governments and governors without considerable success. Since then, the local residents are trying to unite their efforts in a way to organize themselves and their settlement so that they could improve their living environment and became more independents. In this manner, the government begun to recognize the power and influence of some of these communities over other poor areas and even over the political sector, making them realize that their was a need of recognize those efforts and contribute to it.

These settlements are basically self-contained, which means they have their own rules and laws. Their residents are normally faced with a number of problems such as, land rights and lack of basic services provision.

Some communities organize themselves or at least are in the process of trying to do so, in such a way to help them address their problems. This attempt normally leads to a common point of view in the community, which should aid them in identifying their own problems and in finding a solution for them. These community organizations are the so-called CBOs (Community Based Organizations).

The CBOs are in general, a very strong institution inside the community and they were created with the intent of fighting for a solution to the problems involving the community. In this way one of the most important tasks of the organization is to negotiate with politicians to improve life in these settlements (Pugh, 2000).

The community organizations are composed of members, who are normally elected in a democratic way, which means all members of the community can express their wishes in relation to the candidate who has their vote.
The tasks of the CBOs vary from community to community. Normally the organization is involved in solving problems inside the community, for example settling land and boundary disputes based on the laws and rules that are created from the community itself, more likely from the community organization. However, these organizations can also have special responsibilities like the one suggested by Werna (2001) in which he says that ‘the neighbourhood organizations could act as development control agents and arbitrators in issues such as land use and environmental pollution’. However, the most important task of these organizations and maybe the hardest one is the search to bring betterment to their environment through negotiations with the government.

The informal settlements are always trying to think of solutions to their problems and this solution is very much related to security issues. This feeling of security can be felt when there is no possibility of eviction at any moment in time, or that their homes are not going to be demolished over night and not necessarily the security of having a title for the land and building they are live on. Sometimes this security is not felt as strong as the security of having services provision or a resolution of a boundary dispute (McAuslan, 1998). This means that for an informal settler to feel secure, the title is not the only element that can provide such feeling. Furthermore if a settlement sees that basic services, such as water supply or even electricity, is going to be provided to them, it usually means that the settlement is considered more stable than before, and that means that the provision of this kind of services happens generally when the area is considered by the government, either for regularization purposes or for a upgrading program. This fact brings about a sense of security to those people that are experiencing the transformation of a settlement where, in the past, eviction and demolition could happen at any time.

2.3. The Slums and The Upgrading Programs

Hundreds of millions of urban poor in the developing countries and transitional world have few options but to live in squalid, unsafe environments where they face multiple threats to their health and security. Slums and squatter settlements lack the most basic infrastructures and services (World Bank). The residents of these areas are often marginalized and excluded from the formal part of the city and society.

‘The laws and rules derived from legislative framework deem most aspects of the poor majority’s lives illegal’ (Hardoy and Satterthwaite, 1989, p.30).

Their substandard quality of life have not only direct impacts such as the ones mentioned above, but also indirect ones such as the social consequences of living in an environment such as squatter area or a city slum. These social consequences influence the conditions in their lives and the opportunities to improve it, since this seems to be a vicious cycle. First, the urban poor are forced to squatter or to live in very poor conditions because they cannot afford to live in the formal areas and neither can the government afford to provide all of them with land and houses. Second, the residents of informal areas are in the group of illiterates or of low education level, which restricts their opportunity of employment and as a consequence, their ability to improve their quality of life.
2.3.1. The recognition of Slum Upgrading Programs

In informal settlements or slums, people have been living in very poor and often miserable conditions for long periods. The claim for improvements in their living environment is also not a new aspiration, therefore, the poor instead of waiting for a solution from the governors of the cities, they decided to do things themselves. These people are often the ones responsible for bringing the basic services to their own settlements and to construct houses with the intent of sheltering those that are in the same situation as them.

The effort of the urban poor to try to solve their problems without waiting for a government’s solution was frequently ignored or underestimated as governors did not believe that such an approach could help to solve problems, such as housing deficit. This is well stated in Skinner, Taylor and Wegelin (1987), when they say that it had long been recorded that the urban poor had been involved not only in the building activities, but also financing and managing their house construction in the absence of appropriate state alternatives, even though it had not been common for the process to be seen as an important policy item.

Nowadays, this lack of recognition by the government has decreased and the activities carried out by the poor for improvement of their own situation is considered as part of the solution for the problem of slums by many city governments. This recognition came at the same time as the government realized that the deficit of housing was increasing and the government could not cope with it, as the supply of houses units was not compatible with the demand for housing by the urban poor.

The recognition that the old policy of provision of completed housing units was not a solution to improve the living environment of the urban poor and to bridge the housing deficit. This fact was a very important step towards the consideration of upgrading slum programs, as existing houses with substandard conditions could be improved instead of demolished (Skinner, Taylor and Wegelin, 1987).

This clearly shows that the government was starting to give some security to the poor, as there was now a possibility to consider some informal areas to be upgraded, instead of abolishing them. However, as it can be seen, this is only a part of the solution and the start of a process of recognizing the informal areas, as the upgrading process itself brings many changes to the area exposed to it and to the city in which this area is located. This is due to the demand for policy changes as to enable the process to take place. One example of that can be the regularization of the area. To undertake such an activity in an upgrading project there can be a need for relaxation of the building regulations (Skinner, Taylor and Wegelin, 1987), therefore not only the area involved in the project is affected, but the city as a whole is affected by this decision.
2.4. Community Participation

'No local government is likely to respond effectively to the diverse needs of poorer groups unless there are effective channels for citizens to influence government policies and priorities' (Hardoy and Satterthwaite, 1989, p.139).

Participation is a very important component of an upgrading process. First, it comes to consider the needs of the beneficiaries involved, meaning that the project could be more successful (Skinner, Taylor and Wegelin, 1987). This is an aspect that has to be considered, as many projects implemented are not always considered as important for the community. As it was stated by Hales (1995, p. 01), ‘choices don’t exist unless those who are involved in the decision process perceive them to exist’. Which means that the choices of solution should also come from the people benefiting and should have their support. Salmen (1987), also emphasizes that in an upgrading project the community needs and deserves to be heard, as the aim of such a project is to actually improve the living conditions of these very persons.

The government has to realize that the best decisions are the ones made together with the community and not assume to know the best solution to their problems, as very often it is the case.

From the statement made by Blauert (1990, p.36), where he says that ‘the answers arrived at by the state, and other outside institutions, make assumptions about what is beneficial for people, and way in which environment can be more effectively managed’, one can see how this external institutions need to change their way of making decisions regarding community issues. Often, the mistakes found in such decisions, can be attributed to the lack of involvement of the people benefiting from the projects. They are the ones experiencing the problems physically, meaning that their knowledge and experience should be taken into account and should have the potential to influence decision-making processes.

2.4.1. The participatory approach

There are different forms and levels of participation in practice. The meanings of popular participation can vary between the different countries and even within the same national entity (Lisk, 1985). Therefore a good definition of what is meant by popular participation or participatory process in this research is needed.

To begin with there are two different levels of participation considered in this research, internal participation, in other words, the participatory process which occurs within the settlements and the participation which occurs between settlements and municipality.

The popular participation process is actually the ability the people have, specially the disadvantaged groups of society, to influence the decision making process towards the improvement of their quality of life, through the meeting of their needs. Therefore, a very important aspect of a participatory process is to understand the needs of the people involved in the process and the situation they live in, so that projects and actions towards improvement of their lives can be implemented effectively and solve their problems.

The participatory approach is implemented as to improve the planning process. In projects affecting the urban poor, actions should be taken to eradicate poverty and improve their living environment. It is clear that the best way of making decisions directly affecting this section of society is to include them in the planning process. This can be done through participation. As mentioned by Rietbergen-McCracken and Narayan (1998, p.09), ‘Participation ranges from sharing information, consultation, and collaboration, to empowerment’. Without such an approach, the motivation of people for
participating can be affected, as to feel the benefits of a participatory process people have to feel they are part of it, influencing decisions and making choices together with the government. As Lisk (1985) states in one of the conclusions from his book there is a need for institutions within the planning system to make possible the participation of the most disadvantage groups of society in the decision making process, in a fully and effective way, so that popular participation realize its full potential in influencing development objectives towards basic needs satisfaction.

Another aspect of participation is that people are not only satisfied by meeting their material needs, but because they feel capable of organizing themselves as to claim for their needs. This is the result of the self-reliance brought by an effective participatory process and the experience of being empowered by the government to decide on subjects related to their needs. But very often this self-reliance is something to be worked in these communities as this people have been excluded from the decision making process relevant to their own well being for a long time. The reason was that the government didn’t recognize the important role they can play in this process. Therefore, external help is often needed to work together with the community defining their felt needs and formulating appropriate strategies and programs to meet those needs.

2.4.2. The benefits of a participatory process

A slum upgrading project requires many decisions to be made by authorities. These decisions are regarding different components of this project and relates to the quality of life of those residents. A participatory approach is seen as a very important approach as no one more than those community’s residents know about their needs and the issues inside the community. This statement is not only an assumption, but a lesson learnt from past experiences which were successful due to the implementation of upgrading projects with participation of the community or were not so successful and recognized that one of the determinants for the failure of the project was that the community was not heard and decisions were taken for them without consulting these beneficiaries.

Such lessons learnt in the past are so important for the recognition of the participatory approach that there are programs aiming to increase these experiences, so that more and other lessons can be learned with the projects, which are being carried out. One example is the Cities Alliance initiated by the World Bank and UNCHS (Habitat). Two of the basic assumptions made by the program, are that communities are equal decision-making partners in the process of upgrading and that they are the ones that know their community and its issues. They also state that community involvement increases the sustainability of the project and one of the reasons is that they will live the effects and often participate in the implementation.

Another interesting statement made by the project is that ‘there is no magic solution: each community must be addressed on its own merits’. This has an important meaning since each community has their own problems and the degree of their needs for each of these problems can vary from community to community. Therefore, many lessons can be learnt from experiences, but not everything can be applied in the same way as it was done in the past and very often changes to the implementation and also to the participatory approach have to be made as to adapt to the different situations people live in. The participatory approach can also bring benefits to the community itself, as it tends to bring the community together to define their problems and to give their priorities to the same ones. A good example of this is the case presented by Gibbon, Hamilton and Kaudia (1998), in Western Kenya. They were using the community participation approach to assess basic needs with the internally displaced using well being ranking. The interesting findings about the participatory approach were that, first, the neighbours which were in conflict before because of their tribal origins became aware of the common effects of the disturbances and their shared needs. Second, as discussions were inclusive
and open, so the individuals could not exaggerate their needs, instead they became informed of the needs of others, which could be greater than theirs. This shows how participation can be also important inside the community, because before discussing their needs with government and other authorities, the community residents have to understand their problems and set the priorities among themselves, leading them to a better understanding of their environment. In other words the community residents have to change their way of thinking from an individualistic point of view to a community point of view.

Mukherjee (1998) presents a good example of the need for the community to identify their problems in an early stage of project design with the case study of Bangladesh. He shows how the community was active in the first stages of the project by asking the community, which were their problems and how they saw their problems. He also asked them to think of ways to help them in overcoming their challenges, which would become the project’s activities, in this case. Afterwards, this design was exposed to the different stakeholders who were related to the problems found and there the difference in points of view was realized and tentatives of bringing them closer were made. This was an example that showed how community participation should be implemented and how planning and implementation should be carried out. This case began with the community’s perspective of their own situation and with this in hand the next step was to formulate alternatives for problem solution. Afterwards the stakeholders were consulted, but with the communities feelings in relation to their problems in hand, so that they could try to understand it and bring their point of view closer to the community’s reality and not the other way round. This could be one of the solutions to avoid misunderstanding the community’s needs and considering solutions provided by them to their own problems, which could help the different stakeholders in finding the right solutions to the problems present in informal settlements.

Another benefit that can be brought by stimulating a participatory approach is community empowerment. In many projects community participation was restricted to the implementation phase of an upgrading program (Phnuyal, 1998), which led community to feel as they were imposed to some decisions made by the governors. Instead, if authorities would actually make community part of the whole process, starting from the early phase of design, would motivate community participation and they would feel that their needs were understood and that their ideas and point of view influenced the process.

This empowerment can be felt in a variety of ways, for example, by motivation brought by involving people in the solution of their problems and by making them feel that the decision-making process can be influenced by their knowledge and experience. Another way of feeling empowerment is when such process makes the community realize its capability to perceive their own problems and therefore, be able to negotiate with authorities to improve their life conditions. This is the meaning of empowerment.

As it is stated by Gajanayake and Gajanayake (1993, p.6) ‘community empowerment ‘ is, in essence, the ability to stand independently, think progressively, plan and implement changes systematically, and accept the outcomes rationally’. Therefore, community needs to think about their problems and needs, alternatives solutions to these problems making the choice for the one that best fits the community’s needs and implement it.
2.5. GI and society

There are clear evidences, for example the need for the municipalities to acquire data regarding informal settlements, being it for upgrading or any other purpose, that there is need for community and government to communicate, so that they can bring their ideas more closer and understand each others point of view. This can be done by the participatory process, which was and is being experienced in some countries already.

In the participatory process there can be room for implementation of new technology as to improve understandability of expressions. With this statement, the author means that, for example, when one talks about a problem such as lack of water provision, there is a possibility that a technology such as GIS can represent the problem spatially in a way that both actors, government and community, can build a new view of the problem in a way never done before.

A GIS is this sense can help the decision making-process, improving the visualization of the problems and providing the people involved in the participatory process with the possibility of analysis and clear spatial view of the problems present in the area.

To make this possibility more realistic there is a need to improve the access of people, such as community residents, which are a kind of non-governmental organization in this case, so that the tool can be operated by the two groups involved in the process of participation, governmental institutions and non-governmental institutions (Obermeyer, 1998).

Of course the role of GIS in this process should not be summarized as a simple map-making tool, but one should make use of the great potential that GIS has to perform many kinds of analysis. One example that always comes to into mind when bringing this subject is the decision that has to be taken in relation to allocation of services in an informal settlement. This normally is done by a time-consuming fieldwork and could be done through spatial analysis in a GIS environment where time could be saved and a spatial view of the area is offered, so that allocation can be executed in an easier and more effective way.

This fact is clearly mentioned in Obermeyer (1998, p.65), when he states that to understand the relation between GIS and society there is also need of understanding that GIS is not ‘a tool designed to solve one aspect of a particular problem – that of translating spatially referenced empirical information into a spatial language to enable cartographic representation of patterns and relationships, and of analysing the nature of these relationships.’

‘The development of GIS, or any other technology, is a social process’ (Sheppard, 1995, p.06).
2.5.1. The public participation GIS (PPGIS)

2.5.1.1. The difficulties of implementation

There are certain contradictions related to the implementation of a Public Participation GIS (PPGIS). The idea that the new technology is there to help is a common sense, but there are also those who see the other side of this process.

The GIS is a technology that is many times seen as a tool to represent the world as a collection of objects. In the PPGIS, the idea of representing the relationships between human beings and the physical world is an element of importance. But, to do so, there are needs that such technology, in this case GIS, has to be used together with others so that these relationships can be made more clear when one has to make use of this tool.

In Harris and Weiner (1998, p.70), this necessity is shown at the moment that they say that ‘Non-Euclidean sketch maps, cognitive and mental maps, narrative and oral histories, pictorial images and moving images are generally excluded from current GIS knowledge bases’. At this point we could make the question: ‘how to represent such relationships in a GIS environment?’. The answer to this question is yet to be found and researches are being carried out, so that understandability of these relations between humans and the physical world can also gain from that. A good example of recent efforts trying to answer such question is the case study of KaNgwane village, South Africa presented in Pickles (1995), where a mental map was produced and it shows one of the ways, at least in this case, where local knowledge of the villagers could be represented in a GIS. Examples of some aspects, which were recorded, were the location of what they called ‘better soils’, location of borders and other relevant aspects of land use raised by them.

If one would like to analyse the usefulness that GIS has in a participatory process, but also to the individual organizations involved in this process, such difficulty has to be taken into account, and with an open mind, assess the environment in which the GIS is being implemented and the purposes driving the decision of doing so.

GIS is a technology that clearly depends on humans, being it to build it or to operate it. Analysing the description given by Harris and Weiner (1998, p.69) that ‘Geographical Information Systems are dependent upon human choices and constraints regarding the selection of coverages and attributes, scale, analytical procedures, and the decisions and outcomes arising from these analyses’, we can see how GIS is manipulated and therefore very close to the one building it. If this is a community, the point of view of all elements represented in that GIS will be viewed in there own way of seeing those particular things. In another way, if it was the municipality the owner and builder of the GIS, and a comparison would be possible, differences in the representation of the same area would be clear. This is justified by the fact that these two different organizations have two different views of the problems influenced but their own needs. An important objective that should be achieved with the implementation of a PPGIS should be to bring this two different views as close as possible and make use of this tools for negotiations between the two groups making more consistent with reality.

The differences in view of the groups involved in a PPGIS can be due to many aspects. In the case of a community, for example, the view can be influenced by their individual needs and also by their ignorance in relation to the technology. For example, in informal settlements, the need for service provision is always a reality. If the community is aware of the potential of GIS in representing their space and being a tool to assist them in achieving these needs, they can put much effort in representing these deficiency than the local government would, because their views of the necessity of that community is some way different as different priorities can be given to from the two groups.
In the same way that the community let there needs influence the process of implementing a PPGIS, the political facts influence the view of a local government involved in the participatory process. The priorities set in this process by the government, don’t necessarily come from the community’s participation and a common point of view, but are influenced by budget, elections, and all issues related to the political environment.

Understanding and representing the multiple realities and environment is a critical GIS and societal concern’ (Harris and Weiner, 1998, p.70).

2.5.1.2. The effects in the community

In Informal settlements of developing countries, the literacy level is usually very low. With this in mind, when we start thinking about implementing a GIS in these areas, many doubts will come to our mind in relation to how to do it and if it should be done. These misgivings must be considered as the need for a GIS and the reasons of implementation can vary from settlement to settlement. The first point, which is a very important one to consider, is the acceptance by the community. The offer to use a tool like GIS can be very attractive to many institutions and different groups of society, but in an informal settlement other aspects of life have to be taken into account. As explained in the first section of this paper, the informal communities are a different and sensitive group of society, as there are always fighting for the achievement of basic needs, while other part of society claim for the improvement of what is already considered a good quality of life. The introduction of a new technology may help the residents of these disadvantaged areas in negotiating with politicians and the public sector as a whole and this can be proved to them, but even though, many barriers can be encountered due to the very low level of education which make people not aware of modern technology as other worries occupy their lives.

The introduction of computer technology can make leaders uncomfortable, as their power in relation to the community can be risked by the fact that they are not aware of modern computer technologies and most likely don’t know how to operate them. So if such technology is to be introduced to these communities, how can the leaders exert their power with something not known by them? From another point of view the leaders can welcome other technicians whom are normally members of an organization such as NGOs or an academic institutions, which normally are the ones involved in such projects. These technicians would operate and sometimes, when is of interest for the community, train some of their members, so that they can be part of the process and with this make them more motivated. This is not likely to happen in all the communities as the different leaders might have different views of the process.

Existing case studies demonstrate that communities remain dependent on technical support for the implementation and maintenance of specific projects and the filtering of geographic information into GIS by technical experts’ (Harris and Weiner, 1998, p. 73).
2.5.2. The different levels of GI technology

The obstacles for the implementation of GIS explained in the earlier sections of this chapter suggests that other means of technology should be employed in the participatory process to promote a greater involvement of informal communities.

In this sense, one could think of different levels of technology to be implemented in the process to cope with the different skills of the different stakeholders involved.

To begin with, the use of analogical maps has been shown by many case studies and when of these was presented earlier in this chapter, where community members make use of analogical maps to produce their own thematic maps, which reflects the feelings and needs in relation to their living environment.

Another case, which can be presented here, was introduced by Alspach (2002) where he shows that aerial photographs and maps available to the public were used by groups of communities in participatory sessions to gather local knowledge. It is known that even with the use of a lower level of technology such as analogue maps, there is still need for technical support to introduce the technology in communities not familiar with it.

With the availability of thematic maps worked by the communities, the local government has more opportunity then to learn about that environment and to make use of one more tool to enhance the negotiations between the two groups (municipality and settlements). Furthermore, techniques to introduce this information to a GIS environment would be needed by municipal stuff making use of the tool.

A second alternative to increase the involvement of low-income communities in the implementation of a GIS could be to implement different levels of this same technology into the process. Theses different levels are the manual and automated GIS.

The manual GIS utilises light tables and cartographic drafting tools to create and analyse maps. As Alspach (2002, p.05) states ‘It requires a basic knowledge of maps and their properties, but skills in map analysis and creation can be learned relatively quickly’. The access to this kind of tool by informal community residents is more likely to take place then to a complex GIS environment.

The other level of GIS and a more complex one is the automated GIS. This level of GIS utilises a computer, software and hardware for data input and production of maps. Therefore, it demands more training than the manual GIS even when customisation takes place. This kind of level of GI technology is most likely to be accessed by private companies and public organs, which are the ones with the proper skills and knowledge.

‘GIS is far too complex a technology to allow effective use by the non-specialist with little or no previous training or experience in this field’ (Carver, 2001, p. 07).

One has to consider that the manual GIS is still a complicated technology for those illiterates and can be very complex to handle when it comes to operations such as overlaying operations which also can be time intensive depending on the amount of information.
2.6. Discussion

The point reached by the government regarding the consideration of informal settlements as solution to the housing deficit and as the place to where actions should be taken at, so that poverty can be reduced and the urban poor improve their living conditions, was a important step towards the recognition of upgrading programs.

Upgrading programs are a very important part of this solution. But together with such projects, participation should take place. In other words, the people benefiting from this projects should be involved as to express their needs and bring some understanding of the dynamics of their environment into this process.

Governments need to be flexible and let people participate in decisions and make choices together with them, so that improved decision-making processes can take place.

To improve such processes the application of other tools, as to make the analysis of available information more effective, can play an important role and this could be achieved by using new technologies, such as GIS.

In general, the idea that technicians and even some theorists have of GIS, is that it can be a powerful tool and it came to make the process of representation easier in many aspects, such as time saving, clearer spatial view of problems and like.

In the field of social sciences, this modern tool is not only dependent on technical aspects, as mentioned earlier in this paper, but dependent also in social facts. These social facts very much influence the processes which are to be represented in a GIS and also influence the GIS itself, as decisions of which data should be included, which analysis should be carried, and who produces and controls the information, is a clear example of how GIS is dependent on human choices (Harris and Weiner 1998).

There are different points of views as to how GIS could be used to represent social phenomena and all the elements which are part of it, for example, how to represent relationships, people’s feelings, and the dynamics of the whole process.

As this research is carried out in a context of informal settlements, the needs and worries of these people are the kind of representations, which the author have in mind when reflecting about the usefulness of GIS for a social group.

GIS was seen, till not long ago, as a top-down tool, which means that government, public and private organizations working with this tool were actually the ones who could benefit from it as well. There is a very clear reason for this, as the representations produced in their GIS was a result of their own view of the problems and the kind of analysis and responses to that, were all based on this same point of view.

All these concerns is spelled out in Pickles (forthcoming, p.58), as he says: ‘How can the knowledge, needs desires, and hopes of marginalized social groups be represented adequately as input to a decision-making process, and what are the possibilities and limitations of GIS as a way of encoding and using such representations?’.

Finally, there is a need to observe which is the actual role played by GIS in a process such as decision-making involving participation of communities. So far, it is not clear that GIS can be more than just a tool to help the process. The idea that GIS could influence the process of decision-making is yet to be proved, as there are clear social constraints impeding GIS to be view as a tool in which this whole process could be based on.
3. Study Area

3.1. The city

Recife is a city and seaport in northeastern Brazil, the capital of the state of Pernambuco, on the Atlantic Ocean, near the easternmost tip of South America. The city has a territorial extension of 217.8 Km² and a population of 1 421 993 inhabitants, resulting in a population density of 6 529.43 inhab/km².

The city, one of the largest and oldest in Brazil, is divided by waterways into separate districts. Major districts include São José, a commercial and financial district on a peninsula; Boa Vista, a business and residential district on the mainland; and Santo Antônio, a governmental district. Because of its many waterways, Recife is known as the Venice of Brazil. Its principal industries are importing and exporting, sugar refining, cotton milling, iron working, pineapple canning, tomato preserving, and the manufacturing of cement, asbestos, paper, roofing, and leather goods.

The municipality estimates that in the city there are more than 600 informal settlements, where more than 50% of the population lives (Assies, 1991; Moura, 1990; in: De Souza, 1999). In Recife, as in most urbanized cities in Third World countries, squatter movements have become a component of daily life and challenge to the state housing policies.

Different from the other agglomerations, the geographical segregation was not concretised in this city. Low-income settlements are spread in all neighbourhoods, and very frequently they are neighbours of the higher income areas (URB, 1999).
The popular settlements are part of the history of the occupation of the urban centre, which in the census of 1913 presented 43% of the residences as shacks or similar. Amongst these poor areas, the ones given special attention by this research are the so-called ZEIS (Special Zones of Social Interest) areas, which were instituted from the law of use and occupation of land in 1983.

The ZEIS are described as popular residential settlements, which emerged spontaneously from occupations in public and private areas, without basic infrastructure and without a regularized tenure situation (FASE/NE, 1997).

Today, approximately 200 of the 600 favelas are classified as ZEIS.

Until this time, 66 were instituted as ZEIS in the city of Recife. These areas are distributed in the six RPAs (political-administrative regions) and in almost all its 94 neighbourhoods.

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The delegates have the task of forwarding their necessities and claims so that they could be negotiated with the municipality in the PREZEIS forum or in the PPB (programa prefeitura nos bairros), which is the program of the municipality in the neighbourhoods.

### 3.1.1. ZEIS (Special Zones of Social Interest)

The basic concept of the ZEIS instrument is to include in the zoning of the city a category that permits, through a specific urbanization plan, to establish proper urban patterns for specific settlements (Rolnik, 2001).

The establishment of ZEIS means the recognition of the diversity of occupations existent in the cities and the possibility of constructing a legality corresponding to these settlements and therefore, the extension of the citizenship right for its residents (Rolnik, 2001).

The objectives for the establishment of the ZEIS are:

- To permit the inclusion of parcels of the population which were marginalized from the city, for not having possibilities of occupation of the urban land inside the legal rules;
- To permit the introduction of services and urban infrastructure in places where they didn’t reach before, improving the quality of life of the population;
- To regularize the market of urban land, so that decreasing the difference in quality of the different occupation patterns, the prices between them will also be reduced.
- To introduce mechanisms of direct participation of the residents in the process of defining the public investments in urbanization to consolidate the settlements.
- To increase the municipal revenue, because the regularized areas can then pay the taxes and fees – seen in this case with good eyes by the population, as the services are seen as an obligation and not anymore as a favour.
- To increase the supply for land for the low-income urban markets.
3.1.2. The PREZEIS

The popular movements have a high capacity of organization and social pressure in Recife. This organization enabled, in 1987, the elaboration of a project of law with a popular initiative which had the objective of guarantee the state intervention in favelas with the goal of urbanizing these areas and to promote the regularization of the same areas in favour of its respective occupants, the PREZEIS – Plan of regularization of the Special Zones of Social Interest (Costa, 2001).

The PREZEIS is a set of norms, which has the execution and monitoring assigned to the municipal level, having as objectives:

- To promote the improvement of the quality of life in the ZEIS areas, through the juridical regularization and the integration to the urban context;
- Define parameters which should be observed during the institution, urbanization and juridical regularization of the ZEIS;
- To institute channels of popular participation, such as the COMULs (Commissions of urbanization and legalization);

The law of PREZEIS recognizes the social right for a dwelling over the right for property, in other words, the PREZEIS defended the principle that the land exists to shelter and not to be a source of profits and speculation (FASE/NE, 1997). The approval of such a law had a very important meaning for the history of the popular movements, as it was one of the first experiences of project of laws being elaborated by the civil society in Brazil.

One of the principles in the PREZEIS is to respect the local characteristics of each community, enabling the occupations to stay in their original place, whenever the area presents conditions for urbanization and legalization.

In 1995 the PREZEIS forum, which is a space for political articulation and definitions in relation to the whole group of ZEIS and from this to the whole city, elaborated a new law proposal for PREZEIS, which replaced the law of 1987. This event had the purpose of updating and improving the function of the PREZEIS due to all the changes that occurred during its existence.

After this event, every area, when recognised as a ZEIS, could solicit the installation of a COMUL. In the new law of PREZEIS, the COMUL was then integrated by 5 (five) members. Two of these were representatives from the community, two representatives of the public sector and 1 representative of the entity advising the community (normally NGOs).

The COMULs could then be held every fortnight. The place of the meetings was, once at URB (Urbanization Enterprise of Recife) and the following in the community. The meetings in the areas (ZEIS) were posed so that they would stimulate the popular participation in the discussions and definitions of the COMULs.

For this to become true, the date, place and the agenda of the meeting has to be divulged beforehand and as much as possible so that everyone can attend including the residents and the local organizations.

The elections for the community representatives are held in a direct way, where by the residents vote for the one having their preference. Any resident over 16 years old can be a candidate.
3.2. The Settlements

In order to carry out the interviews for this research, two settlements were chosen. The choice of two settlements had the purpose of enabling a comparison between the two, which, for instance, have different characteristics such as topography, infrastructure and also different importance in the history of popular settlements in Recife.

3.2.1. Brasilia Teimosa

Brasilia Teimosa is recognized as one of the most important settlements in the history of neighbourhood movements in the city of Recife. The name comes from the struggle of the residents to stay in one of the most wanted sections of Recife’s territory.

The choice of Brasilia Teimosa (BT) was due to the importance and the achievements of this settlement in relation to infrastructure and legalization, since its foundation in 1957.

3.2.1.1. Geographical Description

Brasilia Teimosa is located in a privileged area of the city of Recife. This settlement is located between the Atlantic Ocean and the shores of Capibaribe and Tejipio Rivers, on the south side of Recife (see figure 2). It is located near Boa Viagem Beach, a high and middle-high income neighbourhood. The fact that the settlement is just besides a high and middle-high income neighbourhood (Boa Viagem) makes BT a place of interest to entrepreneurs.

BT is a flat and triangular peninsula situated at 2 m above the highest tide. The settlement was basically made up of successive landfills that have occasionally been flooded when the water level of the Tejipio/Capibaribe Rivers rises (Moura, 1987).
3.2.1.2. The Historical Background

Brasilia Teimosa is a ZEIS (Special Zone of Social Interest) in a public area owned by the federal government.

Brasilia Teimosa has survived countless attempts of forced removals over the years, and this is specially due to the fact that the settlement is in a most attractive central location, overlooking both Recife’s harbour and its beautiful central beach, Boa Viagem (Fernandes, 2001). From this fact comes the name Brasilia Teimosa (“Stubborn Brasilia”).

The most important period of settlement in this area was between 1957 and 1958, where a severe drought increased the rate of immigration flow to Recife and the rate of squatter settlements (*favelas*). At that time, Brasilia, the capital of Brazil, was under construction. The settlers of the area, previously called Areal Novo, where also building a new city, while being threatened by the police, town hall, would-be owners and some FFCP* fishermen. As a consequence of the facts mentioned before and considering themselves very courageous and stubborn, they named the new settlement ‘Brasilia Teimosa’.

In 1961 BT’s occupants decided to demand proper infrastructure to that area, which was dark and muddy at that time. After many attempts by the occupants to talk with authorities and the press, in 1964 the State Government of Pernambuco started to introduce some infrastructure services in the area. However, only in 1968, the first artesian well was drilled in the area.

In the meantime, BT’s occupants decided to elect a Residents’ Association in order to represent the whole community regarding their social problems. It was in 1966, the formal registration of the statutes.

The Residents’ association became stronger over the year in the sense that its bargaining power with the authorities increased. In fact, it always has very specific demands and the power of mobilization to back them up is very persuasive.

As for the origin of the heads of household, they come mostly from Recife. This fact, then, destroys the myth by which it is said the low-income settlements are populated by squatter coming from the interior of the state of Pernambuco.

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One of the inhabitants of Brasilia Teimosa recalls: ‘For six Months, we had to use clubs and knives…Police destroyed houses in the daytime, we rebuilt them at night…We organized a demonstration to talk to the mayor and explained that everyone had two lots at the most. One for building a shack, another for building a store…but I new people who had 30 lots…’(Moura, 1987).
3.2.1.3. **The economical Background**

The great majority of families are headed by men, and only 1.3 per cent is financially supported by women. Concerning family income, 3.4 per cent of the families have no income and 84.6 per cent live with minimal income that ranges from US$ 150 to US$ 200. And while 31.6 per cent of the male heads of household earn between US$50 and US$ 100, the same percentage of women who are also heads of household earn half of this amount. This fact shows a somewhat discriminatory society, where women do not have access to ‘good’ jobs or they are underpaid. In BT, commerce, fishery and activities linked with civil construction are the most important occupations. However, approximately half of the people engaged in these activities are not secured, meaning that they are not protected by any social security or labour legislation. Because of its historical association with fishery and its geographical position, BT is well known for its seafood supply. Many of the settlement’s roads have the name of fishes. Due to such diversity of seafood, the place has many bars and restaurants specialized in this kind of food and many people from the middle class of Recife’s society visit these places in the Atlantic coast. Another activity, very typical of informal settlements is also present in BT, the petty business. Some of the people already retired or even the ones not employed try to get or increase their incomes by opening a business in the same building or the one next to their houses.

3.2.1.4. **The Infrastructure**

Brasilia Teimosa has been gradually upgraded by both official and informal processes, and, although it would benefit from more systematic public investment, for an informal settlement it is very well serviced and largely physically integrated with the neighbouring areas and with official road system (Fernandes, 2001). For an informal settlement, the houses in BT are in a regular condition. Many of them are made from brick, however, there are also the ones made from wood and clay. In general the houses are in relative good conditions, especially if compared to the ones in other informal settlement. As for water services, most of the families (90.1 per cent) have drinking water. Concerning electricity, the majority of the households have electricity, although some of the consumption is illegal. On the whole, even where the tenure legalisation process has not been completed, there is a generalised perception of security of tenure, meaning basically that residents feel safe against the threat of eviction by the government and have some access to credit and services (Fernandes, 2001). This security can also be a consequence of all the infrastructure and services present in this community, as the residents know that the municipality would not upgrade a settlement if the idea of eviction or demolition were still in their minds. Brasilia Teimosa was in the process of tenure legalisation since the 1980s, but still the settlement hasn’t received any title that has a value. They have received a title that at that time would represent the ownership of the land they possessed, however as soon as the residents tried to register the title in the Land Registration Office, they discovered that those titles had no value and that they were back in the same situation, illegality.
3.2.1.5. General Information

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
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<tbody>
<tr>
<td>Surface</td>
<td>49,51 ha</td>
</tr>
<tr>
<td>Population</td>
<td></td>
</tr>
<tr>
<td>1974</td>
<td>18,459 inhab.</td>
</tr>
<tr>
<td>1979</td>
<td>25,000 inhab.</td>
</tr>
<tr>
<td>2000</td>
<td>30,000 inhab.</td>
</tr>
<tr>
<td>Population Density</td>
<td></td>
</tr>
<tr>
<td>1974</td>
<td>393 inhab/ha</td>
</tr>
<tr>
<td>1979</td>
<td>200 to 500 inhab/ha</td>
</tr>
<tr>
<td>1999</td>
<td>600 inhab/ha</td>
</tr>
<tr>
<td>Number of residences</td>
<td>1974  3,488</td>
</tr>
<tr>
<td>Access</td>
<td></td>
</tr>
<tr>
<td>Boa Viagem Avenue</td>
<td></td>
</tr>
<tr>
<td>Antonio de Goes Avenue</td>
<td></td>
</tr>
<tr>
<td>Zoning Regulation</td>
<td>Political-administrative region: 06</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 3 health posts</td>
</tr>
<tr>
<td></td>
<td>• 3 transportation (bus) lines</td>
</tr>
<tr>
<td></td>
<td>• 7 public schools</td>
</tr>
<tr>
<td></td>
<td>• 3 private schools</td>
</tr>
<tr>
<td></td>
<td>• 2 community schools</td>
</tr>
<tr>
<td></td>
<td>• Churches (catholic, evangelic, others)</td>
</tr>
</tbody>
</table>

Table 1 General Information of Brasilia Teimosa

3.2.2. Tres Carneiros

Tres Carneiros is a settlement where not much study about the area has being carried out. The choice for the settlement was made based on different factors. The first because a comparison with Brasilia Teimosa needed to be made and for this an area with different characteristics had to be chosen. The first of this is the topography as Tres Carneiros is situated in a very hilly area, with steep slopes, where access is only possible through ladders constructed many times by the residents. The second characteristic diverging from BT is that Tres Carneiros (TC) has a more recent historical background making the conquests of this settlement limited, especially if compared to BT.

3.2.2.1. Geographical Description

Tres Carneiros is located in a hilly area. The area is actually situated between two Municipalities, Jaboatao dos Guararapes and Recife, although for the purpose of these study only the area in Recife’s Municipality was surveyed. The topography of the settlement makes it a very haphazard area, influencing very much on the problems present there and also on the tenure regularization. The settlement becomes very vulnerable during the rainy period as the hill sides are prone to landslides making the area very dangerous to live in.
3.2.2.2. Historical Background

The historical process of Tres Carneiros was gradual and dates from the 1966. The land used to be vacant and had the appearance of a jungle. For this reason, the area was very vulnerable to criminality. Information collected with old residents of the area shows that the occupation process had a very important phase in the beginning of 1980s.

The people who came to this settlement were mostly from the interior of the state and also from the capital, as at that time there was a serious flood in Recife and many people were affected by it, loosing their homes or the few assets they had.

3.2.2.3. The economical background

Because of its topography, geographical position and also its illegal situation, TC does not benefit from the presence of important business like Brasilia Teimosa.

The most common activities in the settlement are the petty business and the small bars ran by the residents of the area. However, one can also see some construction material companies also owned by the residents of the area.

3.2.2.4. The infrastructure

In Tres Carneiros there are few roads as the topography does not allow new roads to be built. Some of these roads are paved, but they are relatively narrow, so that it is very difficult to cars and other vehicles to transpass. As a consequence, many ladders had to be built from all points of the settlement either by residents or the urbanization enterprise of Recife, so that the population in the area can move internally.

There is some transportation (buses and vans) going in to the area. However buses have to stop in a certain point and turn back with much difficulty, as from that point on it is impossible to continue.

In relation to the landslides, there is a major project going on called parceria (partnership), where by the community and municipality together build protection on the hillsides to avoid the landslides to happen. Nevertheless, the community leaders are not very comfortable with the development of the process, as the effectiveness of the constructions is in doubt and this is mainly because of the material and techniques involved in the process. One of the leaders reported an incident where by one of these constructions fell off, showing how poor the construction could be and also the danger brought from it.

In relation to water and sewage, not all the households have this kind of service and if they have, many times it was brought by their own efforts.

Regarding the land regularization, because the area is actually situated between two municipalities, as mentioned before, negotiations are going on between the owner, as the land is also privately owned, and Recife’s municipality.
3.2.2.5. General Information

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface</td>
<td>115,66 ha</td>
</tr>
<tr>
<td>Population</td>
<td>Approximately 20,000 inhabitants</td>
</tr>
<tr>
<td>Population Density</td>
<td>172 inhab/ha.</td>
</tr>
<tr>
<td>Access</td>
<td>Boa Viagem Avenue, Antonio de Goes Avenue</td>
</tr>
<tr>
<td>Zoning Regulation (Law 16.676/96)</td>
<td>Political-administrative region: 06, Especial Zone of Social Interest: 25</td>
</tr>
<tr>
<td>Geographical Description</td>
<td>Hilly area</td>
</tr>
</tbody>
</table>

Table 2 General Information of Tres Carneiros

Overall, not many studies have being carried out in Tres Carneiros. Therefore, the information available and collected from the fieldwork is restricted.
4. Methodology

This chapter presents the methodology used in this research. It describes the methods used in each of the phases of the study and the limitations encountered during the research period.

4.1. Fieldwork Approaches

4.1.1. The municipality approach

In the municipality two different interviews were applied one regarding the decision-making process and the role GIS plays in this process, and the second interview with respect to the use of GIS inside and by the municipality (refer to appendix).

4.1.1.1. The decision-making process

The first step taken in the fieldwork was to visit the Urbanization Company of Recife (URB), which is an institution under the Secretariat of Urban Planning, and make the appointments with the staff working with the ZEIS areas.

The following step was to interview one of the departments where the technicians involved in the meetings with the communities (COMULs) work, so that a description of the decision-making process, from their point of view, could be given.

The interview with the technicians involved with the two specific settlements of this research was not possible due to their availability at that time.

The interviews were carried out always in Portuguese, in a semi-structured way, but always ended with additional comments whenever the technicians felt free to do so. As a result, very often, the comments made gave very interesting information, which could not be acquired in the interview itself.

The other staffs to be interviewed were always pointed by the former interviewees and this process seemed to work very well (in this case) as at the end the staff interviewed gave the information needed for this research although the time was always a matter of concern.

The first department interviewed was the DGZ (Divisao de Gestao de ZEIS), which is the one directly related with the people working inside the settlement. A technician, the coordinator of the whole process, was interviewed and explained the whole process, not only giving descriptive material, but actually confronting this material with the real situation in the field. As explained before, no technician working in the settlement could be contacted in this department.

The next person who responded to the interview was the director of the DIUR (Diretoria de Integração urbanistica), which is the directorate under which the DGZ is located.

The following step was to interview the staff at the Secretariat of Urban Planning at the Municipality of Recife.

With the purpose of contacting only key respondents due to time availability, the first interviewee was the Secretary of Urban Planning as she was the one most indicated for the task.

The first Key respondent pointed by her was the technical advisor of the secretariat who is also a geography teacher at UFPE (Federal university of Pernambuco). He is well known by his work in projects involving informal communities in Recife and has been studying the city for many years.
The process of indication of the following interviewees by the former ones, used in URB, was also applied successfully here.

The next person contacted was a consultant who has been working with the municipality for several years. He gave an overview of the PREZEIS process and the actual and possible uses of GIS in the municipality of Recife.

4.1.1.2. The use of GIS

The subsequent phase of the fieldwork was to interview the staff in the department of geo-processing under the Secretariat of Urban Planning and also the DUZ (divisao de urbanizacao de ZEIS) under the DPEU (divisao de projetos e equipamentos urbanos) in URB. This two departments or divisions are the ones supposedly working with GIS in the municipality.

The first two staffs interviewed were a technician and an architect at the DUZ. The first was involved in some of the projects aiming to build a GIS for the municipality in specific projects. The second was involved in a project for which the output was his Msc thesis. The final stage of the thesis was to build a GIS related with one of the ZEIS areas called Torroes.

With the two interviews, a clear picture of what role GIS plays in URB, especially regarding the ZEIS areas, could be captured.

During the interviews, an advice to visit the DRF (departamento de regulamentacao fundiaria), where the topographic survey of the ZEIS areas is carried out, was given. One of the reasons for the visit was that as the legalization of the informal areas is a very important subject and the higher goal of the whole PREZEIS, to observe if any technology, such as GIS has been implemented to help the process would be of interest for this research.

The next step was then to visit the municipality, specifically the department dealing with geo-processing.

Two people were interviewed there. One student and the other was the technician, head of the department. The interviews were undertaken in a semi-structured way, but always followed by a long informal conversation, as it was the best way to make them feel more comfortable to talk about the weakness of the process of building and using GIS.

In the interview, the student gave an overview of the projects they worked and are working with, whilst the technician gave an overview of the same projects, but in more details. The details always included reasons why it was and still is difficult to work with GIS in the municipality and also why past projects were not successful.

He explained about the infrastructure available at present, but also a future project the municipality would like to carry out in relation to the use of geo-processing.

At the end of the visit to the municipality, some opinions were given in relation to which settlements should be visited and the advice was always followed by justifications based on the criteria set by the research beforehand.

In Figure 1, a simple overview of the structure of the municipality of Recife is presented. In this structure, the entities involved in the interviews are highlighted as to facilitate the understandability of the institutional organization.
4.1.2. The settlements approach

4.1.2.1. The selection of the case study area

Before choosing the case study area, the question of how many informal areas to study had to be answered. Finally, two areas were chosen, so that a comparison would be feasible and the difference in behaviour, in the two different settlements could be pointed out.

The case study area was chosen based on several criteria. The first of these was the ownership of the areas. One of the settlements, Brasilia Teimosa (BT), as it was stated in chapter 3, is owned by the federal government and the second settlement, Tres Carneiros (TC), has a mixed ownership, private and public, as the area is partly located in Recife and partly in the neighbour municipality, Jaboatao dos Guararapes.

The second criterion was the occupation time as the author of the research was also interested in seeing the differences in behaviour in relation to the time by which the settlement exists and therefore been able to achieve many of its goals. The first settlement was occupied in 1957 whilst the second was occupied in the 1966, showing a difference of almost 10 years of occupation.

The third criterion, which was especially important for the purpose of comparing the infrastructure in the areas, was the topography. The first settlement is located in a very flat peninsula, between the Atlantic Ocean and the shores of Capibaribe and Tejipio Rivers. The area is a privileged area, near to one of the most important middle-high and high-income neighbourhoods of the city. The second settlement is situated in a very hilly area where people have to go around by the stairs constructed as no roads could be constructed in the area and therefore, it is not an area of much interest to the entrepreneurs or the higher society as it is the case of Brasilia Teimosa.

The fourth criterion was the power of the community in relation to the achievements and also in relation to the influence the settlement has with politicians and public sector as a whole. The first settlement, BT, is very well known for its conquests and for the influence in local politics, whilst the second is more likely to have BT as an example to be followed due to the fact that the settlement does not have much power to influence politicians or public sector as a whole.

Table 3 presents a summary of the criteria explained above.
Communities Participation and the Use of Geo Information in Informal Settlement Upgrading Programs

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Brasilia Teimosa</th>
<th>Tres Carneiros</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ownership</td>
<td>Federal Government (Public)</td>
<td>Private/Public</td>
</tr>
<tr>
<td>Occupation time</td>
<td>Since 1957</td>
<td>Since 1966</td>
</tr>
<tr>
<td>Topography</td>
<td>Flat area</td>
<td>Hilly area</td>
</tr>
<tr>
<td>Power of the community</td>
<td>Very active</td>
<td>Inhibited</td>
</tr>
</tbody>
</table>

Table 3 Research Criteria Applied

4.1.2.2. The selection of the case study population

Recife has a problem with maps of the informal areas of the city. Even though the municipality works and considers some of these areas as places to be upgraded, these areas were not mapped before, therefore some of them do not have maps or if they have they are not in accordance with reality, as they are not updated. For this reason, the selection of the interviewees was made according to the following criteria:

- Consideration of important places in the settlements (centre, fish market, etc)
- The situation in the different parts of the settlement (infrastructure present, access to transport, distance to seaside, the existence of construction activities, etc)
- The situation of the houses where the interviewees live in.
- And, whenever, possible the gender issue.

Brasilia Teimosa

With the criteria in mind, the first step in the fieldwork was to make a visit and to recognize the first settlement, BT. The best way of doing it was by walking around and observing people in the different places and the different activities taking place in the area.

During the visit one could see that the settlement has a very important area where the commerce takes place and this area is accessed by one of the main roads of the settlement. The second important area was the fish market, where one of the most important sources of income in the settlement takes place. The other observations made were related to the roads in which constructions were taking place, but not finished. They either were going on or were abandoned. Therefore, the status of these roads were important for the responses of the interviewees as the situation could influence their feelings in relation to the company carrying out the activity or in relation to the municipality.

Finally, while the visit was made, the streets where the interviews took place were selected. The interviewees within these streets were selected according to the condition of their houses, whenever the roads presented different house characteristics, and always with the worry of having a fair gender distribution in the responses.

At the end of the fieldwork, 15 interviews were carried out in this settlement.

There were barriers that didn’t allow increasing the number of interviews. The first of these was the duration of the fieldwork activities, one month. It seemed to be a short time for the type of research. The second barrier was the availability of diverse people in this area, as they seem to work in full time jobs or in independent jobs, which takes the same time. Therefore, after spending some time in the settlement, the same people who already were interviewed were the ones that could be met. The third barrier is a very well known from past works in informal areas, the availability of the people present in
The people, although present at the time, have tasks to be completed during the day or they even work at home and could not stop their activities to reply to the questions. The interview with the most important leader, as pointed by the population, could only be carried by phone, as she was not available at the time the fieldwork was undertaken.

**Tres Carneiros**

Tres Carneiros was the second settlement visited and therefore, time constraints had more severe consequences. One of the reasons for that was the unsuccessful tentative of increasing the number of interviews in the first settlement. An important fact to be mentioned about this settlement is that, different from the first settlement, BT, in the second settlement people are not as free to walk around and observe life in the area. Therefore the leaders’ consent was of immense importance and had to be given beforehand. In addition to that, the municipality offered some support, a technician and a driver, so that the place could be accessed without any kind of problems, as the staff is known by the community due to the work they carry out in the informal areas.

To undertake the interviews in the area, one of the leaders had to be present at all times, as to give security to the group and to guarantee that the interviews could be completed. This fact did not influence the responses of interviewees, as the leaders were very careful in not being too near the people, but at a place where they could see the group although not hear the conversation. In TC six interviews were carried out and the people were strategically chosen, as time didn’t allow a better method to be applied at that time.

The first interviewee was the owner of a bar, which is a common source of income in informal settlements and present in TC. The second and third interviewees were a man and a woman, who are one of the oldest residents of the area. The three remaining interviewees were ordinary residents, but living in areas with different characteristics. One of them lives in one of the hillsides, where a ladder was the only access to the house. The other two persons lived in the main street of the settlement near to the bus stop.

In TC, the interview with the leaders were carried out in a different manner as the time did not allowed all of them to be interviewed although all of them were available at the moment the group visited the area. Not to miss the opportunity to hear all of them, a discussion session was suggested and finally undertaken in one of the leaders house.

The experience was even more interesting than would be the separate interviews of the individual leaders, as many findings in relation to hierarchy and the whole decision making process inside the settlement could be drawn.

Another very important aspect was the validity of the information received. If any information was given and one of the leaders did not agree, the discussion allowed them to argue and arrive at a common answer.
4.1.3. The NGO approach

The third stage of this research was to interview the staff of one of the important NGOs working with low-income settlements in Recife, FASE.

The purpose of the visit was to examine the study they are undertaking with ZEIS areas and the information related to the two areas involved in this research.

The first visit was made to the headquarters of the NGO and the second was in one of the groups from FASE working together with UFPE.

The first interviewee was the coordinator of FASE. He gave an overview of the researches FASE has been doing on the PREZEIS process, followed by his view on how GIS could play a role in this process and how the NGO is working together with other institutions to build a GIS for the ZEIS areas.

The second and third interviewees were the coordinator of the group in UFPE and the student engaged in the work in which the GIS for the ZEIS areas is suppose to be the final product.

In this visit, maps and the database containing information about the settlements was presented and at the end of the visit all the material that could be published was made available for this study.

4.2. The Interviews

The interviews, for each of the three institutions involved in this study, contained questions describing their role in the participatory process and also questions to measure their satisfaction in relation to the contribution of the other institutions to the same process (refer to appendix for more details on the questions).

The interviews also tried to observe how each of these institutions accepted the contribution of the other ones, by asking questions about the decision making process in which the participatory process is only a part of it.

In the case of the municipality, these questions were asked in a directly way, however in the informal settlements the question was posed indirectly, so that it wouldn’t appear as to be already a judgment.

The interviews carried out with residents of the informal settlements also tried to produce a picture of the internal organization of each of the settlements and the relation of the residents with the community organization and with the municipality.

The interviews with the leaders of the same settlements had the purpose of checking the information given by the residents and also to look for contradictions in responses given by the two groups, so that a final portrait of the settlements could be made.

The relation of these settlements with NGOs could not be directly concluded from the questions asked to the residents and leaders, but the subject was often brought into the conversations, which would always take place after the interviews.

In the municipality, the subject of the role of GIS in this organization and its implementation in the participatory process in the ZEIS areas was presented in the interviews with the decision-makers and staff working with this technology.

The interviews with the NGO had the purpose of hearing from an institution, which worked with the communities but acts as a mediator, at least in this case study, so that this institution could describe the process and the roles of the other two institutions, but not necessarily taking one of the two sides.

At the end, with the view of the institutions, a comparison could be made and it acted as a crosschecking, so that final conclusions regarding the participatory process could be drawn up on more reliable information.
4.3. **Information Analysis**

The following phase of this research is the analysis of all the information collected in the fieldwork. Flowchart 1, gives an overview of the post-fieldwork activities and more specifically the analysis phase, which is one of the subjects of this chapter.

The first step made after having completed the fieldwork was to interpret the information available. The information could then be coded and prepared for the next phase of research, the analysis.

In the fieldwork activities three institutions were involved, Municipality, Settlements and the NGO. The two first institutions are the main stakeholders in this case study. Therefore, the first analysis undertaken considered the two main stakeholders and the NGO individually. This phase is followed by the analysis of the relationships between the three institutions and the influences it can bring to the decision-making process.

This phase is also importance for the analysis of the implementation of GIS in this process, since all three institutions are involved in the COMULs and with the PREZEIS as a whole.

The final phase of this research involves the conclusions and recommendations based on the findings drawn from the analysis of the information explained above.

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**Flowchart 2 Analysis of fieldwork information**

This phase of the research involved the analysis of all the responses for each of the questions in the semi-structured interviews carried out.
4.3.1. The settlements

The responses for each of the questions were analysed in the sense to find similarities between them so that categories could be created and the similar answers could be grouped in one category, whenever this was possible. Subsequently, information could be coded and then ready for further analysis. However, some of the responses contained a very subjective section, which was the justification for the answers. The justification could sometimes be categorized, but whenever this was not possible, it was analysed with the purpose of observing the behaviour of the people involved in the research and the validity of their answer to the questions.

The final output of this analysis is then a detailed description of the scenario for each of the two settlements, so that a final conclusion with regards to the implementation of GIS in the participatory process and their role in the process itself can be drawn in the final phase of this study.

4.3.2. The municipality

These interviews were not categorized and coded, as in this case, only key respondents were involved in the interviews.

The interviews were analysed for each of their answer and as mentioned before, some of the answers were crosschecked with other institutions so that the study could arrive in a final picture of the situation in Recife.

The conversations held after the interviews could, in some cases, be recorded so that the main points could be written down afterwards and complete the information lacking from the interviews.

One of the reasons for the lack of information given in the interview was that the respondents were feeling uncomfortable and only with time, most often during the conversations, the situation became more comfortable. Some of the respondents expressed their feelings in relation to how uncomfortable it was to be asked questions and having to give straight answers for them.

Therefore, many of the answers given, especially for the first questions of the interviews, could have a better response during the conversations.

This analysis would give a description of the scenario with regards to the municipality, so that a final conclusion with respect to the implementation of GIS in the participatory process and the role of this institution in the process itself can be drawn.

4.3.3. The NGO

The interviews with the NGO staff involved only key respondents. As in the case of the municipality, these interviews were not categorized or coded.

In this case, as the role of the NGO is of a mediator, their description and their view of the participatory process was an important element to be added to this study. It enabled a crosscheck for the answers given from the settlement in relation to the role of the municipality and vice versa. Consequently, the relation between these two institutions can be described based not only in their own view but with a third one, in this case the NGO, which makes the information more reliable.

The interviews with the NGO also included questions about the work they are carrying out in these communities and their aspiration of building a GIS for the ZEIS areas.
5. Research Findings

This chapter will report all the findings of this study regarding the participatory scenario in Recife between municipality and settlements and the current situation of the use of GIS.

Some of the ideas posed in this chapter can be contradicting some of those stated in chapter 2 (State of the Art) and this can be explained by the fact that before the fieldwork activities, the ideas of the process in Recife were very primitive for the researcher and the ‘ground truth’ helped to improve those concepts and to build the final picture regarding the issues treated here.

5.1. The Municipality

One of the first findings of this research was related to the current use of GIS by the Municipality of Recife.

In the current moment, there is no use of GIS by this institution and several reasons led to this situation.

The first of those is the lack of trained professionals to execute the job. In the department visited during the fieldwork activities, there was only one person in charge of the department who was capable of actually handle such activity. The other staffs were technicians and students who were learning about the process even though they were approximately six people working at the time.

From these students and technicians the knowledge related to GIS was not present or in the process of doing so. Even the staff member in charge was current taking part in a master’s course so that he could learn more about the process.

The second of the reasons and directly related to the first one is the lack of budget allocated to the department and specifically to the activities involving GIS. Therefore, infrastructure such as computers, softwares, technical workshops and related material cannot be brought into the department and also no improvements in the existing ones can be made.

In the interview with the staff related to the subject (technicians and decision-makers) there was a different answer to the question with regards to the influence GIS could make in the decision-making process.

The decision-makers were clear about the insecurity of bringing a technology out of their knowledge into the process and base some of their decision in the same technology. Actually there are two barriers to transpass when dealing with the subject. On the one hand, the believe in the old practices, although the decision-makers recognize that there is a need for improvements, thus the fear of bringing a new technology into a process which has few professionals with capability to work and handle, is a issue to be considered by them at this point. On the other hand, there is a need for improvement as it was stated before; nonetheless, the reliability of the information available is yet to be tested.

Therefore, the knowledge about the subject has to be present not only for the technicians involved but for the decision-makers so that they can understand and judge the potential of this tool in the process.

The participatory process achieved a very important stage in Recife, where by the population is actually heard and their priorities and point of view are discussed and can influence the ones set by the municipality.

All of this is stated in the new PREZEIS law (1995) so that the act of doing so is not seeing as a favour anymore, but just an obligation.
Nevertheless, in practice there is still a gap between what is agreed up on and the ‘ground truth’ as we could confirm during the fieldwork. Urbanization plans are produced and negotiations carried out with the community, but implementation still depends very much on the bureaucracy and political will. From this one could conclude that the influence of the community in the decision-making process seeks improvement as to bridge the existent gap.

Regardless of all the existing community participation, there is a need of involving the community in the implementation of activities related with the agreements in the COMULs, whenever this is possible. In reality, the municipality is still handling some information such as parcel boundaries by their own. This was confirmed during the interview with the technician from the Department of Land Regularization in URB, where the respondent stated that the work carried out by them only seeks for the resident’s help if they run out of alternatives to do it by themselves. From this statement, it can be concluded that even though the work has being done, in some of the cases the information collected. This fact is especially applied to informal settlements, where there is an internal organization and agreements not known by outsiders, could be erroneous, misleading technicians towards assumptions, which have to be made. This fact can actually contribute insecurity with regard to the implementation of a GIS, which is an expensive process and need reliable information so that its effectiveness can contribute to the process.

5.2. **The settlements**

The behaviour of informal settlers in relation to the existing institutions inside the settlements is different.

In this section the findings in relation to the internal structure of each of the two settlements is going to be presented and the flow of information between the leaders and the residents is also going to be exposed so that the difference in the process can be explained and visualised.

5.2.1. **Brasilia Teimosa**

Brasilia Teimosa, as one could see in chapter 3, is a historical settlement and due to this fact has a strong political power in Recife.

The residents interview shows that from the 15 interviews carried out in the different places inside the settlement, the majority of the residents do not attend very often, if at all, the assemblies which they are invited to.

One of the reasons also concluded from the interviews, was that the residents are very confident with the work carried out by the representative of the COMUL, who is also one of the leaders in the area. However, another justification for that was that some of the residents said they were not heard by the leader or the CBO members, consequently they consider their attendance to these meetings irrelevant. Nevertheless, most of the respondents were satisfied with the representative’s work and achievements. The reason for that in some of the cases was that they trusted entirely the work of the leadership and they do not feel the necessity in discussing their needs anymore. This could also be a consequence of the actual situation of the settlement, as comparing to the others BT is a well-serviced area.

In one of the interviews, Maria da Silva said: ‘I don’t attend the meetings, but I like the leaders because she helps the very poor people in the area’.

The work of the representative of the COMUL is not only related to the activities regarding the participatory process held in that meeting. This leader carries out many programs to help the people in more need in this area.
Some of the programs are the milk program, the bread program, the vegetables program and some
others dependent on the current situation. For instance, during the fieldwork activities a high tide
achieved a very fragile area of the settlement, destroying many shacks. The leader immediately
contacted many potential donors so that the roofless people could receive help such as food and
matrices.
This fact shows how an active leadership can contribute for the improvement of the quality of life of
the residents of the settlement and how the good work conquests the trust of the settlers.
In the settlement there were many associations such as, women’s association, elderly association,
resident’s association and the COMUL.
The negative aspect of the existence of so many associations inside a settlement is that when they are
not united, the forces are split and the settlement is not focusing on the same goal. Therefore, the
residents whom attend the different meetings are discussing and prioritising problems that are going to
be worked by separate leaders instead of working together so that the settlement would have only one
set of priorities and unified forces to claim for them.
Although, inside the COMUL, the priorities of the settlement are already being discussed with the
municipality, which is already an important achievement for the informal settlements, the priorities of
the settlement has to be a common view and understanding of the whole settlement so that the
participatory process can be effective and reflect the needs of at least the majority of the residents.
In flowchart 3 the flow of information inside Brasilia Teimosa is shown. The local structure of the
decision making process is then explained.
The first step is the official invitation to the local residents to participate in one of the local assemblies
to take place, with the objective of discussing the problems present in the community and to set the
priorities for that assembly.
After the priorities setting in the distinct meetings, each of the leaders try to work with their individual
goals, set in the assemblies, but not actually between themselves.
Therefore, in the case of Brasilia Teimosa, it seems that there is no communication between the
different local assemblies and the COMUL, but only between the resident’s assembly and the
COMUL, where the leader is coincidently, the representative of the community in the COMUL.
Therefore, in the COMUL only the priorities set in that assembly are the ones actually
brought into it.
Another interesting aspect, mentioned in 5 of the interviews, was that, somehow the people benefiting
from the help of the resident’s assembly and the programs carried out by them, is chosen. They are
part of a group previously selected.
One of the interviewees, Penha Roberta da Silva said, ‘the leader here is very nice, she fights for the
most poor people and always gets help, but this depends more or less on the face ’, meaning that it
depends on the person asking for it.
This fact also constituted some of the justifications of the respondents when they were asked the
reason for not attending the meetings anymore.
During the conversations with the interviewees, which would always follow the interviews itself, one could notice how the status of the work the municipality was carrying out at that moment, in the settlement, could influence the responses.

One of the cases was the interview with Laura Ferreira da Silva. She said that overall the relation of the municipality with the community organization was good, but the work carried out was not efficient. At the moment of the interview, the municipality was working on a hole just in front of the respondent’s house and that fact was affecting all the justification she gave for the negative view she had on the effectiveness of municipal work.

Another similar case was observed in the interview with Vanda Vandeli, where she had a very negative view of the relation between the settlement and the municipality and also between herself and the members of the community organization. At the end of the interview when she was asked for any further comments, she stated that she was very unhappy with the attitude of the municipality of demolishing her bar, which was one of the sources of income she had. She stated that they didn’t consider to help her and that the CBO members didn’t do anything against it, although she was aware that the business she was undertaking was illegal.

5.2.2. Tres Carneiros

The case of Tres Carneiros is different from the previous settlement as the settlement has a more recent occupation and a more inhibited community organization, especially with regard to the current leader of the resident’s association.

In flowchart 4 one can see the local structure of the decision making process in TC.
First the local residents are invited to participate in one of the local assemblies carried out to discuss the problems present in the community and set the priorities in that specific assembly. After all the priorities settings in the distinct meetings, the leaders set up another meeting, but now between themselves. The meeting has the purpose of agreeing up on the different priorities, set beforehand in the different assemblies. The outcome of this meeting is then the final set of priorities for the community as a whole.
These are the priorities that are going to be the input for the COMUL and therefore discussed with the sectors there represented.

As we can see from the explanation of flowchart 4, this settlement shows a more united point of view and decision-making process. The priorities here are more likely to represent the community as a whole, as all residents may participate in the process. The leaders discuss the results of their individual meetings before bringing the results to the COMUL.

One of the reasons leading to this can be that the representative of the COMUL in TC is not a representative of any other association, therefore the need of hearing from the others is stronger than in the case of Brasilia Teimosa.

Nevertheless, the leaders also claim for improvements in the settlement individually, by making commissions together with residents and going directly to the municipality to negotiate with the staff in charge of that specific problem. This practice is somehow diminishing after the implementation of the COMULs as the municipality already has defined the place and date to meet the community representatives and negotiate the urbanization and legalization of the same one.
Another justification for the meeting of the different leaders could be that, as the community organization is not as powerful as the one in BT, they have to unit their efforts and understanding of their needs so that the negotiations with the municipal staff can take place in the most effective way possible. In the 6 interviews carried out in different points of the settlement, the majority of the respondents said that they are free to attend the different meetings and that the discussion with the leaders are effective and brings results, which in this case are the set of priorities. Overall, the leaders responses to the interviews showed that the decision-making process with regards to what is set inside the COMULs is being influenced by the decision taken together with the community. However, the decisions and claims from the community in relation to other channels of participation, apart from the COMUL, has not influenced the decision-making process and these issues are still being decided by the municipality staff, in closed door meetings.

In general, the leaders stated that the participation takes place and in some of the cases it has being brought to practice. On the other hand, in other issues, such as the example cited by them of the construction of walls to protect the settlement from landslides in the rain season, there is not a common point of view, and the techniques and material implemented are not discussed with the community beforehand, but just implemented by the municipality.

As it could be heard from the leaders, the view of the problems from both institutions is still different and one of the benefits brought by the COMUL was that these views could actually be discussed and finally agreed up on.

A very important aspect reported by the leaders was that, some of the agreements of the COMULs are not being implemented in practice, and this is the weakness of the process at the moment. Very often the municipality produces the urbanization plan, but these plans are still going to drawers and no implementation takes place. By the time the implementation is finally done, the plans have to be updated, making the process longer then it should be. This fact could be confirmed by some of the municipality staff in charge of the plans and one reason given was the lack of budget designated to those activities.

5.3. The participatory process

Flowchart 5 explains the relationships between the two main actors of this research, municipality and informal settlement.

The process begins in a way that municipality and settlement works separately. Each one, analysing the existing information and consequently defining the problems existent in that settlement, but normally with diverging points of view.

The difference in this point of views begins in the different approaches taken to make this analysis. The resources and technical expertise available in the municipality is not applicable for the people in the community, thus the output of the analysis can give a different picture and reality to both. Another fact contributing to these diverging views is the living experience of those in the settlement, being directly affected by the problems present in that environment.

After the municipality states the problems, there is also an analysis of information, which is lacking and its needed for the solution of that problem. For example, in the case of regularization of a settlement, the municipality may know how many properties are involved in that project but will probably need to collect ownership information of all properties, characteristics of the property and of the owner if not existent.

The next step is the collection of this information. In general, this is the phase where the municipality interacts with the settlers.
If we take the same example of the regularization of a settlement, there is, most often, a high probability that the municipal technicians need to interview the people in that settlement to find out who owns what. Such an activity demands the participation of the community. This is due to the fact that many of these settlements are organized in their own way, meaning that the residents are aware of the ownership and other information, but people from outside may not be. The reason is that these areas are not part of the ‘formal’ city; therefore, no records containing such information are available. With all the information collected, the information already available can be complemented or updated. The problem statement, which is the next phase, can then be based in more reliable information and the municipality’s view of the problems can also be improved, depending on the participation of the community in the process.

With updated information in hands the municipality sets the priorities to that area. In the framework of the settlement the analysis of the information is done in the local assemblies, which in some cases can be more than one and with distinct leaders. The result of these meetings is the priorities set by the whole settlement, between leaders and residents. Both municipality and settlement representatives meet in the COMUL, where there are representatives of the public sector and the representative elected by the community. In the COMUL the priorities will be negotiated and an agreement between the two sides takes place, which composes the output of this meeting.

The decision making process follows this phase. Here is where the final decision regarding the future of that settlement takes place and the factors, which could influence these decisions, are brought together. One of the factors that could have a high weight is the budget. Therefore, not everything agreed up on in the COMULs is implemented and if it is, when can be a question to be asked. Finally, the problem solutions are implemented in this last phase. The agreements that are not put in practice are considered but have to wait for the bureaucracy to let it happened.
Flowchart 5: Relationship in the participatory process

- Municipality of Recife
  - Analysis of existing information
  - View of Community’s problem
  - Selection of needed information
  - Information captured
  - Analysis of updated information
  - Problem Statement
  - Priorities setting

- Informal Settlement
  - Assemblies
    - Analysis of existing information
    - Problem Statement
    - Local Priorities Set
  - COMULs
    - Priorities Agreement
    - Decision Making Process
    - Implementation of Solution
5.4. The conditions for a GIS environment

Taking into account the conditions encountered in the field with regards to the settlements, the municipality and the relationship between these two stakeholders (participatory process), explained earlier in this chapter, a suggestion could be made at this stage in relation to the implementation of a GIS.

Considering the different internal organization of the two settlements here involved and the objective of the implementation of GIS, which is to enhance the participatory process already taking place in Recife, one could foresee that the different internal organization would lead the two settlements to be a better scenario based on different arguments.

The first of these settlements, BT, presenting a more centralized approach in relation to its internal organization and the second, TC, showing an internal organization more feasible for internal participation, can lead to the assumption that the second would be a better scenario for the implementation of GIS as to achieve its objective. That is due to the fact that if GIS is to be implemented to enhance the participatory process, the level of participation taking place internally in the settlements is of great importance and a point to be considered carefully.

In the case of TC, as participation is already taking place internally and the leaders are much more interested in involving members of the community in the process, the probability that the implementation of a GIS could improve the involvement of the community in this same process is greater than in BT.

If one takes BT as an example, it was shown that the settlement relies on their leader’s capacity to bring betterments to the area. The same can happen with the implementation of a GIS, it would be very much depended on the leader’s willingness to work with such a tool. This aspect can introduce obstacles to the process, especially if a community’s leader risks his/her leadership by not being able to use the tool (refer to chapter 2) and having to employ and trust other people to do so. This concern is also present in the statement made by Weiner et al. (2002, p. 13) where he says that ‘Disempowerment has been observed through the reconfiguration of established community groups and the threatening of existing elites in response to the introduction of new technologies’.

Nevertheless, as the tool is most likely to be used by the municipality and only accessed by the community, the view of the municipality is decisive at this point. In this way, a settlement with a much stronger leadership and a population that mostly relies on this leader to take decisions would be an easier community to be working together with municipality for the proposed purpose of working with GIS in the participatory process. The reason for that is that to arrive at a common point of view in relation to a whole community can be a complex process and when a settlement has a strong and capable leadership this obstacle can be overcome, but again this would depend very much on the leadership’s interest to represent the settlement.

Another reason, which could lead to the assumption that BT would be a good settlement in which GIS could be introduced, is the location of the settlement. Situated by the coast and very near to a high-income neighbourhood, BT offers a variety of restaurants and other entrepreneurial activities (chapter 3), which attracts the middle and high sections of society. Therefore the people of the area are much more exposed to these other sections of society and the activities involving those, giving them a sense of these entrepreneurial activities, going on in the settlement and outside of it, and also the modernization occurring in the higher sections of society. This fact could be a permanent influence to the settlement and thus the need to search for new tools that could support them in negotiations to achieve their goals could emerge from this closer contact.
These two reasons explained above, would also make BT a good scenario for the implementation of GIS. Nevertheless, the choice of the settlement and the better scenario for the implementation of GIS would be very much dependent on the conditions under which the municipality would chose to work.
6. The implementation process

6.1. The use of GIS

The use of new technologies such as GIS is still a challenge in Recife, especially with regards to the involvement of informal settlements in the process.

As it was mentioned before, the informal settlements in this city are characterised by having residents with very low education level. Some of these people never even used a computer throughout their lives or even do not know what it is and what it can do for their benefit.

In Recife there are many technicians learning how to use GIS softwares, but that is just it. The knowledge of the subject and the understandability of each step of the process are frequently not present. However, this research does not involve this type of GIS, but the one that makes people think about each of the procedures and each of the analysis carried out.

At this point one could then ask the question: ‘How could informal settlers be part of this process?’.

This is a very difficult question to answer as no empirical study was carried out in this research to answer it. Nevertheless, the answer to that can be based on several reasons, which are present in the daily life of these settlements.

One of these was already mentioned before in this section, the very low educational level. It is very difficult to imagine informal settlers with a very limited knowledge, especially with regards to new technologies, making use of a GIS in the sense of actually making use of the tool and maintaining it.

The second reason is the interest of the municipality in letting these people be part of this process. One thing is to have them involved in the participatory process and having them making use of the final products of a future GIS (in the case it would be implemented). Another different aspect is to let them into the process and give them voice to also make the choices (refer to section 2.5, chapter 2).

The third of these reasons is the willingness of the informal settlers to take part in the process and also let a GIS influence their decisions.

During fieldwork research with the municipal staff, several of them mentioned the difficulty of implementing new tools in the process because of the acceptance of this tool by the people involved in the discussions.

If then, a GIS is to be implemented to enhance the participatory process, the acceptance and trust of the people is a very important condition for the process to take place. Nonetheless, this behaviour could be a consequence of how these people are involved in the process. If the municipality only allows them to use the final products and accept that those products reflects a common point of view with regards to all problems present in the settlements, it could be a problem towards the validation of these results. However, if in some stages, discussions could take place between the municipal staff and informal settlers, and some of the knowledge present in the informal settlers point of view brought into it, the feeling of security and manipulation by the settlers could be worked in this way.

In this respect, even though there was a limited influence from the community in the process, they were part of it. However, this is a theoretical argument and each case can behave in different ways, making each case an individual case.

Therefore empirical experiments should always take place and adapt to each of these situations.
6.1.1. The implementation of the tool

6.1.1.1. A view of the process

To implement a GIS in the municipality of Recife with the purpose of enhancing the participatory process already existent in the city, several steps have to be taken.

The first step of this process could be the most important one and crucial for the acceptance of GIS into the participatory process. This would be to bring the knowledge of the subject to the decision makers whenever this is not present.

Nowadays, the Municipality of Recife has few people involved in the decision making process who understands about the tool even though their knowledge is very often in a superficial stage where theoretically the potential of GIS is understood but practically there is a need for technical support so that the decision with regards to the composition of the GIS could take place and the question of how to implement the tool can be answered.

The second of these is the allocation of budget to make the implementation of the GIS possible. Nowadays, the availability of money to execute the implementation of this tool is not sufficient. This could be noticed during the visit to the department that handles geo information and observing the equipment existent at his moment and also by the interviewing municipal staff that stated that there was no availability of money to improve the situation. This fact would restrict very much the possibility of building a GIS environment with effectiveness, as all know that this is a very expensive process.

In the case of Recife, the situation is difficult as the equipment available are not capable of handling large amounts of data and not appropriate to be used with the purpose of handling a GIS. Therefore, new equipment is needed and for this reason the allocation of budget would probably have to be renegotiated with the purpose of enabling the implementation to take place.

The third step should be related to the training of those staff members in charge of the department in which the GIS is going to be allocated. In the case of the Municipality of Recife, the department is located under the Secretariat of Urban Planning at present. However, the Secretariat already expressed their wish of building a centre exclusively to deal with geo processing and which would integrate the geo data coming from all the different secretariats and organs, which composes the Municipality (information from interview with the Secretary of Urban Planning).

Nonetheless, as it was mentioned in chapter 5, during the fieldwork it was observed that there was not enough staff with the knowledge about the subject and in charge of the department. Therefore, there is a need for allocation of people to be trained to handle the tool or even the need to employ new professionals with the capacity of building such a complex environment. These are then the people who are going to give the needed support to the decision makers.

The fourth step in this process should be then to assign the role that GIS is going to play in the participatory process and to have brainstorming sessions with staff and ordinary people (in the case of the representatives of the community) involved to define in which way would GIS help the process. Here it is meant that all the subjects related to the use of GIS would be discussed.

To start with, to answer the question of which of the elements would be included in the GIS. Here, the community could participate, preferably with members trained beforehand by municipal staff so that they could understand the process and express their wishes together with other representatives of the municipality. The involvement of the residents would be of great importance as they are the ones feeling the physical impacts of problems and therefore their opinion in relation to which elements are important in their settlement should be taken into account. Here a list of the component of the GIS is negotiated and the source of the information needed to be determined.
In this case and because of how the participatory process works (refer to chapter 5), important elements of informal settlements, when present, should be included. Some of these could be parcels, water network, sewage network, individual pits, electricity network, public spaces (schools, crèches, health centres), commercial centres, main reference points (in the case of Brasilia Teimosa their was a fish market), ownership data, socio-economic data and like.

Some of this data, such as parcels, ownership data and socio-economic data should not be a problem as in Recife, when the informal settlement becomes a ZEIS, some activities such as topographic survey of the area, socio-economic and household survey are already programmed to be undertaken.

After defining the composition of the GIS, the fifth step would be to define the tasks for each of the institutions taking part in the process. These tasks are with regard to the use and access to the tool, management and updating.

6.1.1.2. The participation of informal communities

The implementation of a GIS involves a discussion on different aspects involving the two stakeholders of this research.

New technologies are out of reality of low-income settlements and the introduction of those is only thought of in the high levels of society.

PPGIS should be a tool to actually offer people one more source of information and to help them see their problem in different ways, so that their conclusions could be made upon different perspectives of their own life.

As it was stated by Jordan (1998, p.05) ‘PPGIS is designed to provide information to all these diverse stakeholders, at an appropriate level. This is an additional attribute of GIS; it allows the information to be effectively stored, analysed and prepared for dissemination in a means appropriate for each stakeholded group’.

But, how to deal with all the difficulties present in such environment?

This study suggests that there is a great need for research in this field and that some observations with regards to the behaviour of people introduced to these new technologies should be made.

In theory, one could find obvious the conclusion that an illiterate could not perform analysis in a GIS environment or even understand its outcomes. Nonetheless, There were past works with communities where maps were introduced to the residents and the study showed that at the end, these residents could understand the maps and work with them. In this way, how could one be sure of the impact that a GIS would cause in an informal settler’s life and if, somehow, these people could learn to work with the tool.

In this study, this conclusion cannot be drawn as no empirical research was made to observe such behaviour and the impact of this implementation.

Nevertheless, even though some people could be willing to experiment that or the municipality could be interested in making this a part of the implementation process, would the informal settlers be willing to take part on this?

As can be noticed, there are many questions in need of answers and many of those could be given, but none proven at this time and with the evidences available at this moment.

However, the acceptance of the informal settlers would depend very much on whether the people could be trained to understand and work with the tool. Not necessarily all of the residents, but at least a groups of representatives should be involved as to give the community security in relation to the process and to demonstrate that the tool is not one more, which comes to assist the municipality in their arguments. In other words, one more top-down process to take place.
In this case, it would be necessary to involve the community in earlier phases of the process, such as the building phase where the municipality is still making the decisions with regards to the composition of the GIS. This would bring the two groups closer and stimulate the interest of community representatives towards the whole process. The non-participation of the community in the analysis phase and even the maintenance phase would not be a problem as long as the community is actually not capable of being part of it because of technical constraint and that they are aware of it. In this way, the community could see the municipality as an assistant so that the access to the tool could be possible for them. Furthermore, it is difficult to foresee any more participation then mentioned here. First, due to the lack of results coming from empirical studies and second because of the difficult reality which by itself contrasts with the possibility of one not concluding his/her second grade, but handling an automated GIS instead.

6.1.2. The different role of the two case study areas

As it was explained earlier in chapter 4 (refer to section 4.1.2), the research involved two case study areas. These areas presented different characteristics and were chosen so that a comparative analysis of the two settlements in relation to the participatory process (refer to chapter 5) and the use of GIS could be made. The different characteristics of the settlement could lead to a different role played by them in relation to the implementation and use of GIS. 

The difference in physical characteristics, ownership and occupation time, might not lead to any different attitude or behaviour in relation to the whole process. However, the very important characteristic and the one that could actually foresee a different role is the power of the community, which means the political power that each of this communities has.

In the case of Brasilia Teimosa, the political power is seen as very strong and influential. In contrary, Tres Carneiros is a very inhibited settlement (refer to chapter 3). This fact would suggest that the negotiations and the use of GIS by the two communities would differ.

The first diverging role could take place in the negotiations phase. The power of communities to influence the political scenario in Recife could be one of the causes for the diversion. If one settlement can persuade municipal staff in relation to which data should be involved and from whom that is coming from, it would make representations of the areas in the GIS environment different. Therefore, the elements added in the GIS, being it spatial (e.g. parcels) or attribute data (e.g. socio-economic data), could be different for the different settlements. The fact that only representations are different may not bring an immediate impact. However, the wish of the community for a different representation than the one proposed by municipal staff could show, not directly but at least indirectly, that their point of view are differing and their individual priorities are not in line.

The second diverging role and a very important aspect that the influential power of communities can bring is the right of access to the tool and the use of the tool for community works (e.g. mapping occurrences of diseases). The likelihood that a strong and well-structured community can achieve more rights of access is bigger than for the less powerful ones. In this case the implementation of the GIS would be worsening the segregation problem, but now this would take place amongst the poor communities. Therefore, the objective of implementing a tool to help the process and bring the disadvantaged groups closer to the other levels of society, (the last being the object of upgrading programs) would not be fulfilled and changes would be introduced in the process but to give privileges to the stronger communities.
Therefore, the implementation of the GIS would introduce a new problem amongst poor communities and risk the effectiveness and acceptability of the participatory process as a whole due the changes explained above.

With the purpose of undertaking empirical research, the two case studies presented in this study would be very interesting cases to be undertaken. The reason for that is that the power of the two communities differs considerately and therefore the exposure of the two areas to the implementation process would be worthy of note. However, there are still some aspects to be worked with so that the two case studies could achieve the same level of organization with regards to the participatory process.

In the case of Brasilia Teimos, there is still a problem with regards to the centralisation of power, which leads to a restricted participation by the whole community. This could lead to a serious segregation process inside the settlement in the case of the implementation of a new tool, as there is already a clear division between the highest levels of the population (the ones who makes the decisions), and the ordinary residents (the ones who accepts or ignores the decisions).

In the case of Tres Carneiros, the role of the resident’s association in relation to the negotiations with the Municipality should be enhanced. For this to take place the resident’s association leader has to become more active inside the settlement and conquest the trust of the people living there as at present this leader shows a weak leadership. The consequence for that was the doubt of people with regards to his capability of leading this settlement.

Furthermore, the restricted involvement of communities in the other phases of the process, for reasons explained earlier in the sections above, would diminish the role of the two communities in the process in the same way as both are composed of the residents with similar characteristics with regards to literacy level.

6.1.3. The Levels of technology

6.1.3.1. External Assistance

NGOs are present in a great number of works and projects involving informal settlements and the public sector.

In this research, the NGOs are the supporters and facilitators of the informal communities in the participatory process. They are present in the COMULs and their task is to assist the informal settlements in perceiving their problems and finding solutions to the same ones.

In the case of the implementation of new tools into this process, some difficulties were foreseen and a solution for that could be the support from NGOs.

If it would be difficult from the communities’ point of view to discuss with municipality and receive their technical support at the same time, the other choice could be to have the technical support from the institutions that were already present in the communities, undertaking projects and helping them with the challenge of improving their lives.

The NGOs, as neutral institutions, could develop the trust of the community in relation to the implementation of GIS as long as they can take part in this process as they already are part of the participatory process and their role is very much recognized by the municipality. Therefore, it could be also a task for the NGOs to help the municipality in training the representatives of the community so that they could be more involved in the process by overcoming their possible incapacity to do so at present.

With the presence of these organizations, the role of the community in the process could expand considerately. The first reason is that the technical restrictions would be lessened, either by having NGO staffs as representatives of the community or by training members of the community and assisting them in the process. The second of these reasons would be that with a capable partner, the
possibility of access to the tool increases as by this time the municipality would know that a partnership from communities and NGO could turn up as a important partner and also assistant them in the process.

It is recognized that the dependence of informal communities in relation to technical support is still needed (refer to chapter 2) and it will be needed in the near future, but the NGOs could be powerful partners when it comes to enabling this communities to access new and complex technologies.

**6.1.3.2. The different levels of a GIS**

In this study references were made to GIS, but no further explanation with regards to which level of this technology is needed as to arrive at a possible solution to the problem of access by the different stakeholders here involved.

If a project or process involves different stakeholders and these are represented in groups with different levels of knowledge, there is a need to enable and facilitate the communication between these stakeholders. This is especially true when the scenario is a participatory process involving informal settlements.

In this case study, communities and municipality have got different levels of knowledge, even though none of them have the required level to handle a GIS at present.

In such a case there is a possibility of having the two groups working with the same information, but embedded in different levels of technology.

An example of this was presented by Alspach (2002) taking the experience of a project in Ecuador, the DFC (*Dessarollo Forestal Campesino*) as an empirical study.

He shows that the communities as illiterates have a need to work with a different level of GIS, the manual GIS. However, in this project, there was still a need for technical support and the group involved was willing and prepared to train and clarify the individuals in relation to any doubt they would have with regards to the tools used.

Nevertheless, this level of technology presents many restrictions, for example, to handle an overlay operation with maps in a manual GIS means that the number of maps involved are limited and that the greater the number of maps the greater the time to execute it. Nonetheless, the possibility of involving community residents in the process is much greater then utilizing solely an automated GIS.

With regards to the other stakeholders, in this case the project staff, an automated GIS was used instead of the manual, as the staff members had the required skills to make use of it.

The advantage of making use of such powerful technology is that the analysis capabilities are outstanding.

After that, the information represented in the manual GIS could be translated to the automated GIS and further analysis with this information could be performed.

The idea was that, at the end, all stakeholders could make use of the information gathered and the final products of the analysis.

Nonetheless, even in this case, there could be restrictions in relation to the understandability of the outputs and the choice of the media to present these results are as important as the use of different levels of technology. Therefore, the choice should assure a two-ways process, meaning that the project gets the information from the community but also the community should have access to the final products. In this way, the process would be made more efficient.
6.1.3.3. Other technologies

There is a clear picture of the difficulty that informal communities would have to work with a GIS. Even though a manual GIS could be used, there are phases in the process such as the analysis and the interpretation of outputs, which would restrict their involvement in the process, or at least it would be left to the municipal staff’s willingness to adapt the process so that the involvement of the community could be increased.

In this case one could think of applying other GI technology with an easier level of understandability. The first option could be a database. Nevertheless, databases would be a very complex tool to be interpreted by informal settlers. As Alspach (2002, p.04) states ‘Literacy is often an issue when information is collected within a project. Thus, interpretation and use of tabular data is restricted to those that can read and conceptualise information presented in a matrix. A GIS can graphically represent these data through shapes, lines and symbols therefore transcending language and literacy boundaries’. This could lead to the consideration of another level of GIS once again.

A second option could be to introduce a set of basic GI technology such as hard copy maps, aerial photographs and photo mosaics to the community and let them work with these tools, whereas the municipal staff could make use of an automated GIS.

In the example referred to in the section above, the experience of exposing the community to maps and photos was showed. The result was that, even with the need of clarifying some aspects related to the interpretation of those and with the necessity of getting used to work with the tools, the community could understand and recognize their environment. Therefore, there are cases that different people, with different skills should work with the tools they are capable of handling and with that getting the best they can of their individual work.

With community members interpreting maps and photos would help the municipality to understand their environment and the processes taking place there, and to learn to interpret their priorities and point of view.

The fact that different tools are being applied to the two groups does not mean that a work has not being carried out together and in this case could avoid the feeling of frustration by the community members who, for instance, may not be able to handle even a manual GIS.

An interesting aspect which immediately comes to mind when making use of this mechanism is the translation of the interpretation done in analogue maps by community members to the digital maps in the automated GIS used by municipal members, which is in itself an important phase in the process. The use of this information should assist the GIS technicians in learning about the informal settlers’ culture, social-economic characteristics and the dynamics of their environment and thus bringing the two groups closer.

This fact shows that the implementation of different levels of GI technologies could be a potential solution to increase the participation and involvement of low-income communities and to assist the two groups in perceiving the problems present in informal settlements.

An important benefit, which can be brought by the tools into the process, is the spatial distribution of problems in relation to each individual settlement. It could assist the decision makers and community in finding and prioritising solutions by enhancing the visualisation of the problems in the same communities.
Flowchart 6 presents the different levels of GI technology involved and the steps undertaken to achieve the outputs.

![Flowchart 6](image)

The process would begin with the introduction of the manual GI technology mentioned earlier to the community. This phase would most probably involve training of residents to capacitate all or the ones, which are not capable of working with the information yet and for those familiar with the information some time to situate themselves into the process.

The next phase would be the use of the material by the community, which would generate thematic maps expressing their way of seeing their environment.

In a next phase this maps should be translated into an automated GIS environment by the municipal staff. During this phase the personnel involved will learn to see the environment interpreted there. Depending on the information present, the challenge of how to input this data into a GIS environment will be present and the need of creating new methods to do it may arise during the process.

After the information has been digitised, the analysis of the same information takes place and results are created.

As it was mentioned earlier, there is a need of translating this information to a media where the community can understand this results and work with them to enhance their problem statement as well as the municipality, which could make use of more complex manners.

By applying this process, one can see how the community can benefit from the whole process by exercising their minds in relation to their settlement. The exercise starts from the need of interpreting the maps and photos, which at first can be done individually, but there will be a need of arriving at a consensus so that the thematic map would express the feelings and needs of the whole settlement and can then be translated to the GIS. All of this process will lead the community to exercise the participation internally.

Furthermore, the access to the results of the analysis can also bring a new way of seeing their problems as explained before.
6.1.3.4. Conditions for the implementation process

Before describing and giving an overview of the implementation process and the use of GI technology in the participatory process in Recife, the conditions for the process to take place should then be presented. These conditions are there so that they should be fulfilled before (conditions 1, 2) and during (remaining conditions) the implementation process. These are:

1. The willingness of the municipality to bring informal communities into the process;
2. The willingness of informal communities to be part of the process and accept it;
3. The acceptance of the analogue information (thematic maps) produced by community by the municipality;
4. Digitalisation of analogue information (from community) and integration with digital information (from municipality/automated GIS);
5. Determination of essential products/outputs of community’s interest within their capability of understanding.

These conditions are a very important prerequisite for the effectiveness of the implementation of the different levels of GI technology in the participatory process.

Furthermore, flowchart 7 presents an overview of the role of GIS in the participatory process and the use of GI technology by Municipality and Informal Settlements in Recife. After the analysis of the participatory process in Recife (refer to chapter 5), a framework of the process was presented in the previous chapter (refer to flowchart 5) and the stages of the process explained. Therefore, flowchart 7 has the objective to present a framework in which the role of GIS in this process is described.

The findings with regards to GIS suggest that the technology would mostly be managed by the Municipality. In other words, the community would have a restricted influence in the use of the technology.

From the point of view of this study, one of the reasons for that is the total lack of knowledge from the community residents due to the low level of education and the lack of access of these same ones to new technologies and/or even computers.

The flowchart begins by showing the first phase of the process by which the municipality would be introducing manual GI technology to the informal settlement and in the case the representatives of these communities are not familiar with the tool, the municipality would also offer them technical support. With the maps and photos, the communities are the ones to produce thematic maps and this would be adding to the existing information available at the settlement and also at the municipality, bringing more knowledge of the informal settlements into the process and into the next phase, the discussion.

The next stage then would be a discussion phase where the existing information in the Municipality and in the Informal Settlement would have to be compiled and then entered into the GIS. This would be the second phase of the implementation process.

In this phase, discussions between the two stakeholders should be held as to analyse the use of the different information present and reach an agreement with regards to what information should be part of the GIS and from who this information should come from. This would include the thematic maps produced by the community in the case that the tool would be applied.
Nevertheless, it is clear that the municipal staffs are the ones with the knowledge about the subject and will probably lead this phase of the process.

A third phase should be the structure of the compiled information. In this phase, the information should be structured in a proper manner (e.g. tables, digital maps) as to enable the next phase of the process to take place.

The next phase would then be the analysis of the compiled information and the production of results related with that settlement. In this phase, it is foreseen that the participation of the community would be very restricted according to the present situation in Recife unless NGOs partners are involved.

With these results in hand, the municipality and communities will be able to make use of one more tool (in this case the GIS) to achieve the problem statement. Nonetheless, there would be different levels of the technology being accessed by the different groups according to their different capability of handling it.

Even with the availability of such a tool, the problem statement arrived at by the community should still be based on their own mechanism of analysing the existing information available but also based on the results presented by the municipality staff. This process can therefore lead them to arrive at a different problem statement in relation to the one arrived at by the Municipality. With this in mind, the two institutions would have their individual priorities set.

These two different views of the problem are going to be the input in the COMUL where both views are going to be negotiated and an agreement with regards to the individual priorities has to be set as to implement solutions in that community. In this phase the use of GI can assist the community representatives in taking their decisions but now with the choice of visualizing the different problems present in their environment.

Again, it would be up to municipal staff to produce information in a proper media (e.g. thematic maps, photo mosaics) so that community could easily interpret whatever is represented there and this information could be of use for them.

With the use of this information, the view of the municipality and community, and their priorities could change as GIS, if used in an effective way, can show the spatial pattern of problems and help the stakeholders in visualizing the problems in a way never done before, as explained earlier in chapter 2.
Flowchart 7 The implementation of GI technology into the participatory process
7. Conclusions and Recommendations

This chapter has the objective of answering the hypothesis, research questions and research objectives presented earlier in Chapter 1 and also present the further conclusions arrived during the research period. With this purpose, the conclusions are divided in two different sections, Participatory Process and Implementation of GI technology, which were the two subjects of this study. Furthermore, based on the findings and the final conclusions, recommendations were made as to help the municipality and the informal settlement to enhance the present situation of the participatory process in Recife.

7.1. Conclusions

7.1.1. Participatory Process

The participatory process in Recife has achieved an important level of community involvement. Nevertheless, there is always the need of bringing the two different views of the stakeholders (in this case the communities and municipality) increasingly closer as the process can always be improved. The seek for improvements is present not only in the settlements, but municipal staff themselves feel the need of making use of tools to enrich the argumentation by the two groups. Therefore, regardless of the level the participation has achieved at this moment and the benefits it brought to the process, there is still need for enhancement of this process.

- The recognition of ZEIS areas and the implementation of COMULs in those areas reflect the recognition of informal area and their role of providing housing for the residents by the municipality of Recife.

- The participatory approach in informal settlement upgrading programs in Recife shows that the involvement of community members in the process brings a greater understanding of their living environment to municipal staff involved in the process and therefore contributes for the implementation of improvements meeting the real community’s needs. This, in a way, improves past processes by which actions were implemented but not necessarily needed by the community and therefore not meeting their real needs.

This statement answers the first research question in the sense that it describes the importance of the involvement of community members in the participatory process, assisting the municipality in learning about each informal settlement in the meetings and by visiting the site monthly. This involvement contributed to the enhancement of the past mechanism by which decisions were taken in closed doors meetings and based mostly in the municipality’s capability of interpreting the needs of the poor without interacting with this level of the population. It could be seen that the process clearly brought the two views closer and more satisfaction by informal communities by seen their needs being met.

- The effectiveness of the participatory process is very much dependent on the participation inside the settlements. The organization of each settlement is a very important aspect towards the achievement of a common point of view.
The motivation of the people inside the settlements towards participation and the role of the representatives in promoting it is a very important element in the participatory process. Leaders, which are left with the task of representing the settlement by themselves, can risk the negotiations with municipality and the improvement of their environment.

− The participatory process between informal communities and municipality has achieved an important level of participation in Recife and also in guaranteeing that the community’s priorities are to be negotiated together with municipality’s priorities.

The fact that settlements and municipality are involved in prescheduled negotiations, which are held twice every month, and they have equal right of voice, leads the two institutions to a greater possibility of agreement and closer point of view.

− There are still gaps to be bridged so that the process can be made more effective. A very important one is the need to set limits to the period between agreement and implementation of solutions and related to the same subject, the need to agree not only what is going to be fixed and implemented but the way this implementation takes place.

At present agreement are taking place and this is a very important level achieved. However, the gaps with regards to the implementation needs to be bridged to motivate people continually to be part of the process and to engage them in the implementation phase as well as in the phases they are involved at present.

− The municipal staffs are better skilled and capacitated to undertake the implementation phase and a restricted participation of the community can be accepted due to this reason. Nevertheless, whenever a problem can count on the residents’ experience to be solved this should be taken into consideration and no presupposition of municipality’s superiority should take place as residents also have good experience in relation to their living environment and potential solutions for their problems.

− Based on the earlier conclusions and with the purpose of answering the second research question with regards to the participatory process, this study arrived at the conclusion that the participatory process has involved community residents in several phases of the process, as stated earlier. However, for other reasons such as budget, involvement and needs of other communities to be met and political will, there is still much restriction on the participation of these members in the final decision making.

7.1.2. Implementation of GI technology

− As to answer the third research question, the first conclusion in this section is that for the implementation of GIS to take place, different groups involved can make use of different levels of GI technology. In this case the informal settlers would be making use of basic GI such as analogue maps, photo and photo mosaics and the municipality can make use of the automated GIS.

The reason for this is that the different skills and capability present in the distinct groups demands a different level of technology. Nevertheless, if this mechanism promotes more involvement of the community into the process (refer to chapter 6), the fact that the groups are not working with the same level of technology should not mischaracterize the process of a PPGIS even though this would take place with a different level of participation.

− The involvement of informal community members in the implementation of a GIS in Recife can be brought not only during the phase of data collection, but also helping the municipality in the analysis phase, by making use of different level of GI technology, and also in the interpretation of the
results as long as the complexity and the level of understandability are compatible with their capability of interpreting such results.

Having in mind the first statement of this section and answering the second hypothesis of this research this statement presents a suggestion for increasing the involvement of disadvantage groups in the process of implementation of GIS technology.

− The collection and analysis of data in the context of a participatory approach can assist the municipality to work with more reliable information as now they are counting on the community’s knowledge to analyse their environment and make use of information many times only known by the inhabitants of the informal areas. In this way the municipality could learn more about each settlement and thus contribute to the effectiveness of the process by making use of community’s available information instead speculating whenever they are not familiar with the subject.

This conclusion answers the first hypothesis and it states, in other words, that finally the skills of expertise in different fields from the municipality and the knowledge of the informal settlers in relation to their living environment can be combined and bring the best of this combination to the process.

− The municipality often needs and has the capacity to work with more complex results and outputs and this would lead to the use of information of difficult access by the community members, if any could take place.

This statement reflects the consequences of the difference in skills presented by municipal staff and community representatives. In this respect, it is expected that some of the outcomes produced in the GIS environment should be only assisting the municipality. However, this does not mean that a PPGIS has not being applied. It only shows that in real life, two groups have different capabilities of working with a tool and one of them can make more use of the tool, but still the participatory process as a whole (community and municipality) can benefit from it.

− GI technology can help settlers in visualizing their living environment in a different manner. To work with maps and photos would lead them to exercise their minds in relation to the problems encountered in their environment and help them in perceiving them and therefore be able to arrive at better solutions.

In this situation, settlers would come out of a process where by problem statements are based on information collected by them and in their way of seeing their settlement. With the introduction of GI and the access to some of the results produced by the GIS the settlers would be able to have a spatial component while perceiving their problems, which can help them in visualizing their space in a different way, never applied before.

− Technical support is and will be need in the near future by community residents. They are still dependent on technical support to be part of the processes such as the one suggested here. This support could come from NGOs, but also from the municipal technicians, whenever both sides are willing to give and receive according to their needs.

In this process community residents are still dependent on municipality’s willingness to let them be part of the process. For example, for a community to have access to the results from the GIS analysis, the municipality should introduce these to them in an understandable way (refer to chapter 6). It is clear that there is a need for technical support and there are choices for that. The first of these is the municipal technicians and the second, the NGOs. The choice between both would be very much
dependent on which is the group most capable of undertaking the work, accepted by community members and in the latter case this would be the NGOs members, there is the question of whether the municipality will be willing to let them be part of the process. As NGOs are already assisting the community in the participatory process, if they have the capability of handling the GIS they could also act as facilitators in this process and thus help to improve community’s participation.

The access to the PPGIS and its results by the two different case studies would differ in accordance to their individual ‘power’ to influence the political scenario. The ‘strongest’ would be able to make more use of the tool according to the settlement’s needs.

The settlement more structured and therefore more powerful can make use of this characteristic to have more access to the tool. An example could be given with the access to the results produced. If, for example, a settlement wants to have access to information which such as the number of cases of malaria in the area and this information is not relevant to the discussions in relation to the upgrading of the area, it is most likely that the municipality is not going to work on that to produce results in media in which community members can understand it. Nevertheless, a settlement with more power can persuade the municipality to let them have access to those results, as this is dependent on the municipality’s willingness to do so.

− As representatives of the community are needed to interact with municipality in this process, the organization of the settlements would contribute to the effectiveness of the communication between the two groups.

− To answer the second research question in relation to the influence of GIS in the decision making process, the research arrived at the conclusion that for the tool to achieve a considerable level of influence, there is still need of decision makers to be more aware of the capabilities of GIS and to give rise to a greater knowledge about the subject. This knowledge is needed as to enable decision makers to trust the tool so that they can rely on the information provided by GIS and make use of it to reach their decisions.

Finally, there is the necessity to improve the participatory process by employing new tools, which can help the argumentation of community representatives and municipal staff members so that the search for agreements can be assisted by these tools. The different levels of GI technology can help to enhance this process. Nevertheless, this would not be made in a near future. Thus, technology should be brought gradually to the groups, in the levels each of them are capable of handling so that the groups can become familiar with the tools with time. This is a long-term process to capacitate the groups (municipality and communities) to deal with increasingly higher levels of technology, which in turn is going to help them improve their discussions and consequently their views of the problems.
7.2. Recommendations

− With the purpose of encouraging informal communities to take part in the implementation of new tools such as GIS in the participatory process, the exposition of these communities to basic GI technology can help the work in the near future and gradually make this population ready to deal with more complex tools.

− As the implementation of GIS is planned to be undertaken in the near future by the municipality of Recife, there is a need of observing the behaviour of informal communities members to their exposure to automated tools and try to engage them in the process step by step, having in mind that the sooner training takes place the greater the probability of making this communities a part of the process.

− The municipality needs to solve the problem identified in the implementation phase of the participatory process and also involve the community in this phase so that the motivation of the communities to continue to take part in the process is not risked by this fault.

− It would be very important to consider the involvement of NGOs in the implementation of new tools in the process as they are trusted by communities and municipality and therefore act as a facilitator (neutral role).

− Nevertheless, even with the possibility of engaging NGOs in the process, it would be important to work the present impression of the communities in relation to the municipality. In the past they were opponents, today they can be the key to the access of new technologies. Therefore, municipality or/and NGOs should undertake a work to change the present impression and introduce the idea of a two-ways partnership between the two institutions.

− A key issue is to build the knowledge of GIS to decision makers and to make them aware of the benefits the tool can bring to projects as at present the knowledge is only present in a superficially. This can be done through the staff in charge of the past GIS projects in the municipality who are those with the knowledge at present. This fact is very relevant to bring about the trust of the decision makers towards the tools applied so that they can rely on those to make their final decisions.
References


COMMUNITY PARTICIPATION AND THE USE OF GEO INFORMATION IN INFORMAL SETTLEMENT UPGRADE PROGRAMS


Interviews with community residents

1. How long have you been living in this community?

This question has no meaning for the interviews, but it was only a manner to know if the person was a new or old resident.

2. What kind of problems you face in this community?

Analyse all the answers given and make a list with possible ranking of the problems.

3. How is your relationship with the community organization?

- Very good
- Good
- Regular
- Bad
- Just ignores

Why? ____________________________

4. The problems faced by the community are discussed and defined with all the community? If yes, how? If no, why?

- Yes, how? ____________________________
- No, why? ____________________________
- More or less, why? ____________________________

5. Does the community try to solve their problems by itself? If yes, how? If no, why?

- Yes, how? ____________________________
- No, why? ____________________________

6. In your opinion, how is the relationship between this community and the Municipality of Recife?

- Very good
- Good
- Regular
- Bad
- Just ignores

Why? ____________________________

7. Who represents the community in the negotiations with the Municipality?

- The leaders
- A commission (population + leaders)
- Population

8. How are the subjects to be negotiated defined?

- In the community’s assembly (leaders + population)
- The different leaders define amongst themselves
- The different leaders define individually
9. Does the Municipality contact the residents and leaders before taking any decisions regarding this community?
   - Yes, how? _____________________________________________________.
   - No, why? _____________________________________________________.

10. If yes, are you satisfied with the community’s participation in this process?
    - Yes
    - No
    Why? ________________________________________________________.

11. Do all the residents of this area participate in this process? If yes, how? If no, why?
    - Yes, how? ____________________________________________________.
    - No, why? ____________________________________________________.

12. Do you participate in the process?
    - Yes, how? ____________________________________________________.
    - No, why? ____________________________________________________.

13. If yes, are you satisfied with your contribution to the process? If no, why?
    - Yes
    - No
    Why? ________________________________________________________.

14. Do you have any comment to add to the information you already gave to us?

This question is only for observations or reinforcement of the previews questions.
Research Interviews

Appendix

 Interviews with community leaders

1. Which are the main problems faced by the community at present?

2. How are the problems of the community defined?
   - Local assembly (leaders + population)
   - The different leaders define amongst themselves
   - The different leaders define individually

3. How are the priorities set inside the community?
   - Local assembly (leaders + population)
   - The different leaders define amongst themselves
   - The different leaders define individually
   - Local assembly (leaders + population) + the different leaders define amongst themselves

4. How does the community see the participatory process with the municipality?
   - Very good
   - Good
   - Regular
   - Bad
   Why? ____________________________________________________________.

5. How does the process take place?
This is only a descriptive answer.

6. Does the community feel that the municipality shares the same view of their problems?
   - Yes
   - More or less
   - No
   Why? ____________________________________________________________.

7. Did it help to achieve any goals, which were not achieved before the participation process?
   - Yes
   - No
   Examples: ____________________________________________________________.

8. Which are the members of the community involved in the process?
   - Everyone has the opportunity
   - Only the leaders
   - Leaders + representative members of the community

9. Is there a rule set by the municipality or community to select the members?
   - Yes. Which? ____________________________________________________________.
   - No

10. How do other members participate in the process, direct or indirectly?
This answer is a description of the process only

11. Is the process useful for the community? If so, in what aspect?

☐ Yes, how? ______________________________________________________________

☐ No, why? ______________________________________________________________

12. In the community’s point of view, does the participatory process influence the final decision-making process?

☐ Yes, how? _____________________________________________________________

☐ No, why? ______________________________________________________________
 Interviews with municipal staff members

This interview is to be carried out with municipal staff involved in the decision-making process and the participatory process regarding community issues. It is part of a study for a master’s thesis, which is being carried out in the Netherlands, with academic purposes. The answers provided in these interviews are for the description of the role of GIS in the processes mentioned above and of great importance for the success of this research.

1st part – Participation and decision making process.

1. How does the decision-making process involving community issues work?
2. Is there any participation with the community in this process?
3. Which are the reasons that lead to a participatory process between municipality and communities?
4. During a participatory process is there a direct contact with the community or is there an intermediate to deal/negotiate with them?
5. Who represents the municipality in this process?
6. What criteria should be fulfilled by a community to be part of a participatory process?
7. Where do the meetings take place?
8. Which members of the community are involved in this process?
9. Is there a rule set for this by the municipality?
10. Which are the tasks of the members of the community in the participatory process?
11. In which way can the community influence the decision-making process regarding their own settlement, through a participatory process?
12. How does the municipality establish priorities regarding the settlements?
13. How does participation influence the decision-making process?

2nd part – The role of GIS.

1. Is GIS used in the decision-making process? How?
2. Is GIS used in the participatory process between community and municipality?
3. Is there an influence exerted by GIS in both processes? Which is that? Can you give examples?
4. Does the GIS built by other institutions, such as NGOs, representing the community’s point of view, take part in the process?

Thank you very much for the time spent in this interview. The answers given by you were very important for the development of this study.
This interview is to be carried out with municipal staff involved with the development and manipulation of GIS. It is part of a study for a master’s thesis, which is being carried out in the Netherlands, with academic purposes. The answers provided in these interviews are for the description of the role of GIS in the municipality and of great importance for the success of this research.

1. How does the municipality see a GIS?

2. Who is in charge of manipulating the GIS in this municipality?

3. How is the composition of the GIS regarding settlement XXX? Are roads, parcels and water pipes represented? What else?

4. Is there any kind of interaction between the GIS owned by the municipality and the community’s GIS through the participation or any other means?

5. If so, does it influence the municipality’s GIS in any way?

6. What is the importance of having a GIS of informal settlements from the municipality’s point of view?

7. What are the uses of this GIS for the municipality?

8. How is the information collected?

9. Does community participation help to build the GIS?

10. Is the community considered as a source of information for collections of data or any other stage of a GIS?

11. Who selects the data that composes the GIS?

12. Who decides which analyses are necessary to be carried out?

13. Can the community influence these analyses?

14. Does GIS influence the decision-making process? Can you give examples of past incidents?

15. If no to question 14, is there use of GIS in this process?

Thank you very much for the time spent in this interview. The answers given by you were very important for the development of this study.