GIS - A POTENTIAL TOOL FOR DEVELOPMENT IN BABATI

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ABSTRACT

The Geographical Information System (GIS) is a popular tool among landscape planners as well as administration departments on both local as well as national level. It is a system that can store and manipulate spatial data and its potential has increased as computers have grown to be more and more sophisticated. However the system is not without its controversy. Maps and geographical information has been accused of helping government maintaining its power thus leading to increased surveillance in society. As a respond to this critique Public Participatory Geographical Information System (PPGIS) was developed. PPGIS quickly grew and has been implemented in a wide variety of projects. The purpose of this paper is to explore to what extent these aspect plays a part in the implementation of GIS and PPGIS in Babati, Tanzania. More specifically, could Babati handle a complex and resource demanding system such as GIS? To clarify how GIS could play a beneficial part in Babati development, a high rate in population growth as well as department clashes will be illustrating examples. In Babati there have been repeatedly conflicts between the water department and the Babati town council and some of them are directly related to communication issues. A hypothesis suggests that GIS has potential in creating cohesion and a communication tool operating through geographical data. In generally results show that GIS could lead to better development, but at the same time risk alienating people from participating in the decision making. Consequently if GIS would be effective in Babati, it would have to be adapted to the region it is applied to, funded on the towns’ resources and knowledge. If it does not it risks failing in the long term as well as not living up to expected standard. PPGIS could possibly avoid some of the issues that might appear when implementing GIS but it is unlikely that it has all the answers. PPGIS can improve the situation for marginalized people but a society undemocratic issue is more likely to stem from several of different aspects.

Keywords: GIS, PPGIS, Third World, Technical Elite.
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Acronym

GIS – Geographic Information System

PPGIS – Public Participatory Geographic Information System

Babati Town Council – Elected member as well as Administration personnel.

LAMP - Land and Agricultural management Project
INTRODUCTION

In a Geographical Information System (GIS) spatial information can be digitally handled and manipulated. This spatial data can be integrated with information and given additional attributes. Moreover, the GIS system can attain map-coordinates of point locations and linear and area features. These functions can be given additional attributes that can be displayed as well as being stored in the database. By doing this, a GIS system can manipulate the spatial information and the additional attributes simultaneously. GIS can as well interconnect geographical data, mainly through overlay of different maps. This way GIS can do advanced analysis of the relationship between different maps and the information they contain (Yaakup, 2004).

In the middle of the 1990s critique concerning the role of GIS as a tool for control was presented. It was initially argued that maps had always been a way for the power to maintain its control over its citizens. These theories lead many to assume that GIS could potentially bring this practice of control to a new level, allowing state control to become even more oppressing (Schuurman, 2000). The main consequences many consider being the result of extensive GIS utilization were;

- Under-representation of marginalized peoples.
- Surveillance enhancement.
- Unregulated dissemination of GIS into marketing.
- Lack of attention to underlying social factors.

The critique given to GIS, suggests that the technique essentially is undemocratic and strengthens the present rulers’ position even to a greater level. New approaches were developed, responding to this critique, involving increased local participation (Cinderby, 2002).

The most common method to be developed was Public Participation Geographical Information System (PPGIS). This development was a direct respond aiming to include local participation and marginalized people when operating through GIS. (Kyem, 2000)
Steve Cinderby (2002) states that “PPGIS have been developed as a way of enhancing local people’s abilities to share and analyze their knowledge of lifestyles and conditions thereby better enabling them to plan for their future.” Some voices argue that in these circumstances, when GIS fails to address local needs, the role PPGIS could play should not be ignored but embraced. However one must consider that some parts of the third world might not be organized and fully equipped to incorporate a technologically complex system such as GIS. (Kyem, 2000)

PPGIS is hard to define and it is interpret in many ways through a variety of projects (e.g. Yaounde, 2008, Wiener, 1999, Fritz, 2003) yet as mentioned they share the goal to include local and marginalized people. In those projects the construction of the maps has been with the help and participation of the local people. Mainly using interviews, workshops and seminars to obtain and share information.

**RESEARCH QUESTION IN FOCUS**

The aim with this work is to get an understanding on how GIS can help development and study possibilities in Babati, Tanzania. Questions in focus were whether GIS promotes democracy and public participation or does it have the opposite effect, and in what way can PPGIS be an additional function, complementing GIS? In a rapidly growing Babati there is a disharmony between local departments could be felt, so what role could GIS play in this situation? As an example of a potential application of GIS in Babati, what support could GIS offer concerning the water conflict between the town council and the water administration?

**BACKGROUND:**

**The development of GIS**

Originally GIS was designed to store and display geographical material. Retrospectively viewed the system was rigid in its structure and formed by positivist’s institutions. At that
time the databases held information mainly concerning natural recourses and only utilized on a national level. However this system soon became an effective tool within the planning area of society on a more local level. And so, this new way of using the GIS system came to reshape it to fit the new users’ requirements (Kyem, 2000). The first critique was directed at the positivistic conception of GIS that many of its users had. Critics, generally human geographers, claimed that it failed to answer many of the issues of the contemporary society and that GIS was a product of scientist viewing the world from a narrow angle and that GIS must be broadened in its attempt to visualizing the reality. (Schuurman, 2000)

Historically, planning had been structured as a “Top-down” arrangement, where GIS had been in use for a longer time frame at the governmental level and then implemented on a lower level. However, more recently popularity had increased in favor for a more “bottom-up” structured way of planning. This new “bottom-up” strategy suggests that, to accomplish sustainable planning in government and in organizations needs to have a galvanizing effect on GIS. They should rather promote and stimulating others to take action and develop in a desirable way then to control with force. GIS function would, from a bottom-up perspective, be to offer support for the role of the stakeholders in consuming information. (Yaakup, 2004)

However, the position of GIS in society was questioned in the late 90s. There was to a large extent consensus that GIS could have negative effects on privacy. But at this time GIS was generally believed to infringe upon the basic ideal of individual freedom. This critic was fueled by the knowledge of how GIS had allowed the U.S government to attract investments by indentifying exploitable resources and consumers. (Schuurman, 2000)

Despite this disapproval GIS grew to become one of the most prominent and popular tool in the planning sector on global scale. The popularity of GIS can not be single-handedly be explained by its capabilities to generate spatial data. Access to technology has
increased immensely as the prices on computers as well as the required software has declined (Yaakup, 2004).

Critic against GIS has been put forward concerning relation GIS can have to indigenous cultures. The critique postulates, that GIS is a western tool incompatible with other non-western societies. The conclusion drawn from this argument is that GIS would not be as effective elsewhere, as it is in the western part of the world. Nevertheless, because of the quality and technical improvements, the progress of GIS has made it hard for underdeveloped countries to ignore it. (Kyem 2000)

It is believed by many observers that, an increase in the gap between indigenous people and their government is likely to widen as a consequence of GIS. Yet the great need for better management in many of the third world communities creates a pressing demand for the incorporation of GIS. Nevertheless much of this demand for GIS is not originally generated within the communities themselves but from outside observers such as NGO’s and aid supported countries (Kyem, 2000).

These issues with GIS are to a great extent applicable, considering the incorporation of GIS in Africa. The lack of GIS-based planning has in particular been apparent in many parts of the Sub-Saharan Africa. The physical obstacles for development of the GIS system have been and still are in some regions lack of electrical power and general infrastructure. Furthermore, there is an obvious absence of experienced personnel planning through this kind of a system that could maintain it. However, some voices claims that due to the extreme crisis many of the countries have encountered and is still ongoing, GIS might not be the most urgent of necessities in these regions. This situation in Sub-Saharan Africa has turned out to be even more difficult because of the involvement from outside donors and organizations, demanding improved resource management. Consequently much of the existing GIS in this region stem from aid donations or economical loans aiming to achieve further development (Kyem, 2000).
GIS FUNCTIONS AND ITS IMPLICATIONS

To broaden the concept of GIS, an article by Yaakup (2004) presents three key functions that can be obtained from incorporating GIS.

1. The descriptive function – “information should help to describe a situation.”
2. The cognitive function – “information system also contribute to improve understanding of urban and regional problems by providing the key factors and variables that can be analyzed using urban and regional modeling and other statistical technique.”
3. The normative function – “the information system can also contribute to improved action by reducing the financial cost of actions with known consequences or by reducing uncertainty concerning the consequences of actions already taken or about to be taken.”

The descriptive function; On this matter Yaakup (2004) describes how GIS has the potential to combine a great amount of geographic information with a database containing attributes for the maps feature. Once all the information is merged it is possible to manipulate it all at the same time. Thus GIS can play a major part in integrating information and thus illustrate complex problems. According to Yaakup this is a necessity when planning for land use which needs a wide variety of physical information.

Obermeyer (1998) describes a general worry concerning ability of GIS to manipulate and simplify reality. Potential distortion of reality of GIS has been the fuel to many debates, furthermore stating that “GIS can make a report seem more authentic and authoritative than it otherwise might seem.” Consequently misrepresented information can be difficult for individuals, not familiar with GIS, to criticize. On the other hand Obermeyer acknowledged the transparency that occurs when using GIS. Software data and digital information is easily shared and spread through compact discs and internet, suggesting that the system therefore rather erodes hierarchic structures then maintaining them.

The cognitive function; This function is in many aspects coevolving with the technological development of GIS. As the equipment improves the possibilities to organize spatial data as well as overcoming geographical complication are increasing.
(Fotheringham, 2000) Furthermore, GIS has the ability to allow geographers to participate in other disciplines, hence strengthening their understanding of changes in society. (Schuurman, 2000)

Renger and Cimetta (2002), point out that project evaluation tends to be an area where GIS has not fully been utilized. The article derives this assumption from the ability of the systems to illustrate the progression of development. Technically this would be accomplished by merging maps from an earlier time period together with maps analyzed further into the progress. The changes can then be illustrated by creating a layer showing what areas have been undergoing changes and if so, to what extent it has been altered. This form of utilization of GIS is not common in the evaluation stage of projects. One reason for this lack of interest is that the process is generally time consuming. Nevertheless the authors advocate that this is due to a misconception of abilities and technical purpose of GIS.

The gains from evaluating observed from a cognitive point of view could potentially be vast. The authors expect that the information withdrawn from previous GIS analyses can function as a foundation for future projects. (Renger, 2002)

Relating to the cognitive function, O’Looney, (2000), author to the book Beyond Maps: GIS and Decision Making in Local Government, elaborate on the potential of GIS. O’Looney presents the results from a study of four different agencies concerning indicators for operational efficiency and decision making. The study showed that GIS particularly improves the accessibility of data and the possibility to communicate new information. It also supports the theory that GIS has a time reducing effect on governmental work and that it stimulates integration of different information sources.

O’Looneys (2000) assumption that GIS can be used as a way of communicating information between citizens and their government is believed to be an effect of derived from GIS the ability to create a simplified and easily attainable visualization. O’Looneys (2002) point out that this is done on accurate numerical data.
Moreover, O’Looney (2000) claims that GIS has other payoffs more strictly within the realms of administration and urban planning. To support his argument O’Looney presents previous research made on this matter. The result was drawn from 98 local governments in England, asking them where there have been most benefits from using a GIS system.

- Improved information processing  61.4%
- Better quality decision  20.8%
- General resource savings  11.4%

Furthermore some experts suggest that GIS has more profound effect on the political sphere. They are advocating that GIS has the potential of decreasing political conflicts thus creating cohesion. They postulate by giving more accurate information closer to reality, it can be more effective in ruling out flawed assumptions and misconceptions.

However, these claims can be criticized for several of reasons. One counter-argument is that many conflicts are not of a simple nature, where one perspective of the conflict is right and then automatically the other perspective must be wrong. Instead political conflicts often tend to stem from different values where more certain facts will not solve the issue. A second argument would be that GIS rather adds to the numbers of alternatives rather than to reduce them. O’Looney (2000)

*The normative function* On this matter Yaakups (2004) elaborate by stating that “the advantage of high technological tools such as GIS offers the possibility to respond more rapidly to analytical questions as well as improving the matter of monitoring.” Additionally, O’Looney (2000) states on this matter that “GIS is an important tool in early identification of situations that can become problematic.” Hence not only can the system act with speed it has the potential to foreseeing complications.

However, Yaakup (2004) acknowledges that the results derived through GIS would be easy to be manipulated by the operator. Users unfamiliar to the GIS system of
geographical material may also draw incorrect conclusions and so be unintentionally mislead.

Concerning the financial benefits supposedly derived from implementing GIS, the subject becomes ambiguous. According to O’Looney (2000) it has been difficult estimate the financial benefits from utilizing the system. This is mainly due to the great costs of incorporating such a large new system of hardware and software, as well as continuously upgrading the system and keeping the personal updated. Furthermore, once the system is working and the personal is updated there will be a large cost of converting existing hardcopies into data.

Some research has shown that measuring GIS financially from the perspective of the efficiency increase, there are no actual benefits. However including its ability to function in a variety of different areas, integration and the improved quality of the decision making may give great payoffs that often are overlooked (O’Looney, 2000).

More tangible financial revenues can be gained from the information that GIS can supplied. This works from two main perspectives, one being that the government can sell geographic information to the private sector, in particular geographic information that would be resource demanding for the industry to attain on its own. The second opportunity would be to release this information without charge. By giving geographic information away the government can stimulate industrial development and strengthen the national industrial competence (O’Looney, 2000).

**GIS IN A SOCIAL CONTEXT AND PPGIS**

Authors Craig and Harris (2000), provide three aspects crucial to take under consideration when initiating a GIS system into an organization or society. They propose that the correctness for proceeding with the incorporation of GIS into a community can be evaluated from three perspectives. The first perspective states that “GIS availability is based on financial considerations, such as the possibilities to purchases the systems as
well as the cost to maintain it. Furthermore the possibility to attain spatial data and its total expenses should be included. Financial aspects must also take account of expenses of geographical and technical expertise.” The second perspective turns to the democratic aspect of GIS. “It is believed by many that GIS creates new elite holding the key to the information which GIS is able to provide.” Fundamentally, the authors consider that by having this effect on organization and society, GIS may counteract against general cohesion and comprehension. Third perspective continues on the democratic aspect stating that GIS systematically simplifies and generalizes the physical reality. By doing so, it risks falling to represent the small scale and local issues.

The subject of possibility of GIS is to create a new technical elite group in society has been heatedly debated. The argument is essentially derived from the notion that maps always have been a way for the government to maintain and strengthen its power over its citizens. The result could be that the complex nature of GIS makes it hard for people lacking the technical education to be critical towards the information they are given, thus having a weakening effect on their opportunities to participate in the decision-makings. (Craig 2000) Nevertheless it is a fact that the system essentially relies on gathering and interpretation of information, for example Lejano (2008) suggest in an article that the place of GIS in society is not fixed and self-determined. Hence, it is neither bad nor good in its existing structure. Technology in general is simply something taken on by a society. Its purpose and consequences must be seen from its social context. From this perspective the role of GIS becomes more ambiguous and diverse since it may vary from one society to another.

On this matter Yaakup (2004) suggests that the indistinct nature of GIS implies that more light needs to be shed on its position as well as its future. According to Yaakup many social scientists stipulate that GIS must be seen from social aspects as well as being evaluated from an even more outcome-oriented perspective. Hence what will the results be from using a powerful technology like GIS and where social dilemmas could appear?
Whether GIS has been successful in supporting social inequity is difficult to establish. However the strive for a more democratic use of GIS and the concept of PPGIS is believed by many scientist to be playing an important role in liberating and supporting marginalized groups of society, especially in the third world. Yet the local people lacking the ability to run the system are not the primary user in this case. Instead, Aid organizations, NGOs as well as developing scientists are to be seen as the supporting administrators. Regarding this matter, a short example given by Kyem (2000) states that “GIS played a big part in a forest management project in Ghana where the local communities helped gathering information that could be processed through GIS. In this way GIS facilitated the processes of planning for the forest.”

The view that PPGIS projects in general have positive results is shared by Kyem (2000) states that “the PPGIS application successfully addresses inequities in GIS technology, among some of the most vulnerable members in society”. He also adds that it is to some experts’ conviction that PPGIS has the potential to elevate issues of less privileged group’s on a national agenda. On the other hand, Kyem acknowledges that increased participation from the public sector is a complex issue and such an ambition is a matter of redirecting power flows, hence aiming for a more “bottom-up” structure in the government. PPGIS can in that aspect play a vital part.

Yet, Kyem concedes that some voices express valid critiques concerning the ability of PPGIS to improve the status of marginalized people, furthermore suggesting that it can be hard to evaluate whether a project is successful or not because the achievements of a PPGIS project is generally ambiguous in its nature. Kyem states three different questions at this point to depict the complexity surrounding the matter of empowerment in relationship to PPGIS. “What is empowerment about? Does occasional involvement of communities in PPGIS applications translate readily into their empowerment? Alternatively, can the empowerment of communities be attained through simple participation in PPGIS projects?” (Kyem 2000)
According to Kyem, empowerment through public participation is a concept that has been defined in many different ways and the process to achieve it is not linear in its structure. Instead it is a long period of administration adjustments, negotiation and education. The role of PPGIS in this development can have very minuet or no effect, if it does not realize its potential and restrains. Consequently PPGIS must be able to adapted to its context and be flexible in its operations if it ought to be of any assistance.

Articles critical to GIS are numerous, but O’Sullivan (2006) confirms that the concept of PPGIS is not with out its problems. He states that it is unquestionable that PPGIS has come to alter GIS position in society and that it has initiated a more reflecting phase regarding the system. On the other hand PPGIS can not be seen as the final answer to the critique that GIS would be undemocratic. O’Sullivan claims that such an assumption would hurt further development of the system. O’Sullivan strengthen his argument by concluding that PPGIS has yet to prove that it fits the requirements society and that it is clear that PPGIS is in need of more flexible tools.

METHOD

The main method that has been used to obtain information has been through semi-structured interviews. Moreover the interviews was only loosely constructed around the research subject and the questions where few in number. This was because the intention was not to get short answers that could be collected and statistically calculated. Instead the aim was to understand the extent of which GIS was being used and where it could become a future complement. The reason for the few number of people included in the interview was because of the fact that there are not many people in position with insight that could respond to the subject of GIS and landscape planning.

The interviews were conducted with the Town Officials in the Town council. Altogether four people were interviewed on several occasions. The central sources of information came in this study came from: Mr. Kweka - Town planner at Babati Town Council, Monish - Landscape planner at (LAMP), Gaphary Shenashiu - Landscape planer and GIS
engineer employed by the Babati town council and Iddy Yazidi - Water engineer at Babati Water Administration.

The meetings included gathering of spatial information such as maps, both as hard copies or in a digitally form. These maps would then functions as a way of concretely illustrate what can be accomplished through GIS.

Moreover the research consists of secondary sources to complement and put Babati in a bigger context. In the Babati section the main source is a document (Unpublished) obtained from the Babati town council which contains much of the information concerning the towns’ general situation and should not be confused with the information derived from interviews. During the interviews it is possible that misunderstandings have occurred and so the information can be misinterpreted. Some of the interviews where supported by a guide but most of the time it was not necessary because many of the interviewed spoke English well. This fact suggests however that much of the information withheld from interviews should be correct.

Articles and books are all downloaded from the internet; more precisely search engines containing scientific studies, derived from Sodertorns university homepage. The main flaw with some of them can be that the information is outdated, however it is chosen because it is relevant.

**GIS IN AFRICA**

Despite the criticism aimed at GIS the system has been adopted in most parts of Sub-Saharan African countries. The main source has been external agencies, yet this distribution of GIS has not been successful in reaching the local administrators or research institutions such as universities. The effect of this shortcoming creates a deficiency regarding further development and skilled manpower.

On the other hand, according to Kyem (2004) there are many studies done showing that PPGIS works well considering both actual results as well as the integration of local
indigenous people. Therefore he concludes that PPGIS could have a great potential in solving many of the problematic issues taking place in sub-Saharan African.

An example of when GIS worked as a positive force in Africa was in South Africa during the end of apartheid. At that time GIS was being used to locate and illustrate new land reforms. These procedures were based upon interviews, workshops and transect walks hence incorporating the local communities and stakeholders. In this case it is obvious how GIS played an important part in supporting South Africa’s modernization process (Weiner & Harris, 1999).

More light is shed up on the matter of GIS in Sub-Saharan Africa region, in a provisional document created by the Economic Commission for Africa Development Information Services Division. It depicts some of the circumstances hindering further development of new technology in general and GIS in particular.

The document which states that the general knowledge of technology and so called “computer literacy” is low in Africa and much of what could be done with computers are still being processed manually. A system such as GIS demands manpower with interdisciplinary knowledge as well as employees with a great range of specializations. In addition from a long term perspective manpower must be kept updated and well informed concerning new technology development. These basic requirements, however, are a scarcity in many parts of Africa and the document views this as an urgent issue. Furthermore to create a well functioning GIS system there is a need for a cooperating management structure supporting its progress. Hence it will become necessary for involved departments and planners to work together rather than compete. (Chukwudozie, 2000)

Even though the technology has grown to be more accessible in terms of financial matters the document which views economy as an issue. African countries are struggling with sever fiscal difficulties and so possibilities to establish a GIS system on their own is
limited. According to the document, this is why the majority of GIS systems operating in Africa are founded by outside organizations and nations. (Chukwudozie, 2000)

BABATI TOWN

Babati, Tanzania is a fast growing region. Between 2002 and 2006 it grew with an average of 5.6% and currently the population is at 41589 in urban Babati, while the rural area has a population 230630. If the growth rate in urban Babati continues at the current rate, then urban Babati will accommodate ca.137970 people shortly. This rapid growth gave reason to a land use plan carried out by the Babati town council in collaboration with the Ministry of Lands, Housing and Human Settlements Development and their partners. The planning process was coordinated through a GIS system utilizing maps over current Babati. One result from this collaboration was also maps illustrating future expectations. Politically, Tanzania is a democracy, the document obtained from Babati Town Council states that “it is a Multi-Party Democracy which was reintroduced effectively July 1992 in Tanzania, Four Political Parties contested the 2005 Local Government Elections and 4 parties participated in the 2005 Presidential and General Elections.” Furthermore the document acknowledges that there is some disharmony between departments in Babati (Babati Town Council, 2008 Unpublished).

“There is also a general feeling that the Council sometimes operates against an aggressive background of political environment with the regional and district administrations. When the Council executes measures such as restriction to unsustainable use of environmental resources, the Regional and District Administration sometimes shies away from supporting the Local Government. As a result the Council fails to perform its functions effectively and revenue collection is retarded” (Babati Town Council, 2008 Unpublished).

According to the Landscape Planer in Babati Town Council, Gaphary Shenashiu (2009), the current management of geographical information in Babati is divided between
different departments. Every department manages maps related to their area of responsibility. These maps are all hard copies, to maintain them compatible. In situations of advanced planning and integration these hardware copies will be transferred to the central office for analysis. This system is described as time consuming as well as resource demanding for the departments. Furthermore it can become a source of conflict when departments with differing interests come in collision course. Making planning and development even more resources demanding due to prolonged conflicts.

In Babati town council there are two employees working with GIS. Here, all GIS is managed through one stationary computer and this system has been operating for one year, starting the year 2008. However there has not been any major new update on software or hardware since GIS was incorporated in to the office. In the office all geographical information has not been converted into the GIS system and much of the work is still processed through hard copies. This lack of geographical information becomes a source to inefficiency when operating in the system. Nevertheless the need for additional expertise and further updating on new data is the Town Councils biggest disadvantages (Landscape Planner, Babati Town Council, 2009).

The main reason for these problematic circumstances appears to stem from a lack of resources but also from a general ignorance about GIS and its potentials. However, due to the land use plan, there have been steps of progress; maps over central Babati with residents combined with topographic maps have been rendered into soft copies. Nevertheless much of the spatial information is not digitalized, a fact that hinders GIS to reach its full potential (Landscape planner, Babati Town Council, 2009).

In the rural office of Babati no GIS is available for operation, although plans for a geographical survey incorporating GIS is planned to be conducted in 2010. This planned survey aims to identify and evaluate where the residents of rural Babati are located, aiming to improve future planning for the rural region. This issue of efficient planning becomes evidential when considering the additional problems with planning for remote areas. The long distances and difficult terrain makes it especially resource consuming to
be kept informed, if for instance people relocate or if the landscape would alter in any way (Landscape Planner, Babati Town Council, 2009).

The current relationship between the departments in Babati and the public sector in general is not in a situation of cohesion. Instead conflicts of interest separate many of the sectors. Their challenges follow into categories such as “community participation, planning, education, evaluation, sustainable use and management and facilitation on alternative ways of income generation. Babati urban region is the described to have problems with the fact that many actors in the public sector are reluctant to cooperate, thus creating conflicts” (Babati Town Council, 2008 Unpublished).

“It is therefore necessary to introduce a cross-sector relationship to resolve conflicts and utilization of information from different stakeholders to better execution of the project”. By doing so one can remove duplication of efforts as well as attaining optimum deployment of limited technical and financial resources (Babati Town Official, 2008).

The situations of lacking dialog and clashing between departments’ are manifested it self in the matter of Babatis’ water distribution. Plans of the water administrations are undermined by ongoing road expansion of the Town Councils in Babati. The consequence in this situation is that water pipelines supplying water to the residents of Babati are being demolished when new roads are constructed (Fig: 1. Interview with water engineer, Babati water administration, 2009). This is a problem that has flared up into a heated debate concerning what can be done to avoid these situations.
A second illustration of the disharmony between the town official and the water department becomes apparent when comparing their geographical material as well as future planning. Town official has made up plans using GIS, preparing for the expansion of the city, based on an expected growth in population. Their planning consists mainly on building new residents as well as institutions (Interview with water engineer, Babati Water Administration, 2009).

At the same time new water pumps are being planned to be constructed to meet the need for water supply of the growing populations. In accordance with the current Tanzanian environmental law that states that no citizens can occupy land within two hundred meters from the pump area for health reasons. Approximately two hundred people will be forced to move. Conversely geographical information attained in the town official clearly describes plans for further development in the same area planned for the new pump system. Consequently the departments clash and if this fact is overlooked chances are that proceeding with the plans in their current form will infringe up on national environmental laws (Interview with water engineer, Babati Water Administration, 2009).
Fig: 2 First layer Map over Urban Babati - Second layer illustrating the new pump area (Town Council, 2009).
The basic map is depicting Babati urban area in 2008 (Fig: 2), with the main features being the residential areas (yellow) and institution areas (red) are represented. The top layer in grey scale is originally a hardcopy from the water administration office. The outlined area represents the area where people will have to relocate because of environmental laws. When asking if the employees at the water administration if they ever have seen the map from the town council the response is negative (Babati Town Council, 2008).

**DISCUSSION**

Based upon the heated debate concerning GIS, it has become apparent that it is within the strength of GIS, the weakness can also be found. It is a powerful and complex tool and therefore helpful but because of the possibilities it possesses it can turn out to be harmful, promoting surveillance as well as creating a new technical elite. These claims become clear when discussing whether GIS system will or will not be successful. One cannot answer this matter by simply looking at its attributes and functions. Furthermore it is probable that a GIS system put in a western country with basic infrastructure and democratically institutions could provide the country with effective and accurate decisions, in such a case it is with little doubt a positive tool. Conversely it is probable that GIS incorporated in a country where the government is undemocratic and the infrastructure is poorly developed or none existing. The effect could instead very well be that this government is given another opportunity to increase their power, whether it is financially or because of improved surveillance. From this discussion it is clear that GIS can function either as good or bad depending on the circumstances.

Nevertheless marginalized and underprivileged people cannot control the procedure in a GIS system and so they still rely completely on their governments’ decision. It is not likely that GIS alone can alter the power flow from a top down structure to one being more bottom up. If, however, it is assumed that GIS will be able to have this great effect on the governmental structure then chances are that vital aspects are being overlooked. Since much of the GIS in the third world stems from donors and loans from the western
world and some of the responsibility is theirs. The donors and help organization must consequently take in account that GIS is not the only answer. Maybe some of the issues that the western world has solved with GIS will not be as successful in the third world. There are cultural and traditional differentiations that can make GIS into a less effective process.

Hence the outside organizations should ask themselves; is GIS the right tool for this particular problem and this particular region? If so, to what extent should it be incorporated into the issue? The risk of not proceeding with caution when promoting GIS in the third world is that the donors and loan givers themselves develop a top-down structure towards the loan taker. By having a holistic understanding of the social context and adjusting the demands accordingly, one can develop a more flexible and useful system.

PPGIS seems like a positive reaction to some valid critiques. It however should probably be seen as a step in the right direction rather then and complete answer. It could as well function as a chance to balance the inequity that might emerge when a government obtains GIS. PPGIS could for instance work as a powerful tool, amplifying the people’s voice.

The examples derived from Babati clearly depict a region where there is a need for communication between the departments. GIS has the potential of improving their situation by storing and distribute the material digitally. Thus promoting cohesion and smoothening the administration process. It is clear that in both cases, the main issue is that spatial information is not being shared. The two departments, being in this case the Town Council and the water department have different sources of spatial information as well as different directives and so consequently they clash. Most likely this problem of clashing administrators is the result of many problems one being GIS and hence it might not be the solution but and improvement.
On the other hand, it is well established that GIS requires a democratic system to have a positive effect on the social sphere. This is obvious when considering that GIS is a tool and essentially relies on the social context and not the other way around. Thus Babati and its governing forces should view GIS as an incitement for improvement in their administration. Not only as an answer to their problems concerning department cohesion and administration efficiency.

Secondly a GIS system would be highly resource demanding both in terms of expertise as well as financially. Since Babati has very little GIS incorporated it is easy to guess that this is because it lacks the required resources. This is an important observation concerning the fact that many donors and western organizations demand the incorporation of GIS. Even if they would provide Babati with the necessary resources it is unlikely that they could sustain the region with GIS in a long term perspective. On the matter of expertise and qualified personal the most promising source would be the Open University, Babati.

Concerning the rapid population in Babati town it is likely that it will require planning with precision as well as being less time consuming. In this area GIS has great potential and much to offer Babati. However it is, as mentioned before, within the strength of GIS that its weakness lays. The critique against GIS, as an essentially undemocratic system, must be regarded as highly problematic. GIS might not prevent the constructions of pumps in Babati but it could help to inform the people that they have to move and easily explain why. Furthermore a PPGIS project could help the population being forced to move to respond or provided them with alternative areas to move to.

Taking these facts in consideration it becomes necessary that GIS is implemented in a slow and sustainable transition. It is important that it is based on the regions own conditions so that it can function optimally in a long term perspective. At the same time PPGIS projects should be initiated to help marginalized people to express their opinion
and help them understand their situation. This is to avoid an increasing gap between the residents of Babati and the government.

It appears as if GIS is inevitable and will eventually become a part of the planning process of Babati. The obvious gains the town can obtain from utilizing it are too great and one can imagine that the outside pressure is big. The definition of technical elites, according to the critics, is a group of experts and engineers operating the systems and thus is given much of the planning control, it seems probable that it will become a reality. Whether this is a big problem or not depends on the social development. As for now, Babati and Tanzania is a democracy with a need for better planning, hence the critiques are the real issues, but not strong enough to discard GIS completely.

CONCLUSION

The purpose of GIS system main is to organize and visualize large amounts of information. Hence GIS is offering planners, politicians and private corporations wide variety of options including both negative and positive aspects from a social perspective.

**What a GIS system requires optimum utilization.**

- Financial income in a long-term perspective
- Infrastructure, such as electrical power
- A broad variety of expertise
- Continually updated knowledge
- Continues updating on spatial information

**The achievements that can be attained from incorporating a GIS system are:**

- Saving time and resources
- Financial gains
- Avoiding conflicts in the public sector
- Achieve more accurate results
- Promote interdisciplinary research
The main risks of incorporating GIS are:

- Less democratic decision making
- Increasing Surveillance
- Simplifying complex matters
- Disregarding marginalized and indigenous people
- Results can be hard to citizens criticize

PPGIS is a response to some of the negative aspects of GIS, aiming to include marginalized people. However its effect is debated and despite the fact that computers and equipment are getting more and more attainable there are great obstacles. It is unlikely that marginalized people in the third world can reach the demands that a GIS system stipulates in order to function.

On the other hand once the system is incorporated it has shown some potential facilitating a modernization process as well as promoting cohesion between departments. Yet it is likely that many parts of Africa dealing with major crisis and at the same time lacks proper infrastructure simply are not ready for GIS. Instead small scale projects seem more suitable to improve local peoples understanding of their environment and resource opportunities. If these smaller projects will have any long lasting impact or reach national attention is debatable.
Appendix

Map illustrating residents in Babati, Tanzania (Town Council, 2009).
Map illustrating areas where new water pumps are planned to be constructed (Town Council, 2009).
Reference:


Interviews Conducted with Babati Town Councils (2009): Mr. Kweka - Town planner at Babati Town Council, Monish - Landscape planner at (LAMP), Gaphary Shenashiu - Landscape planer and GIS engineer employed by the Babati town council and Iddy Yazidi - Water engineer at Babati Water Administration.