

USING PGIS TO CONDUCT COMMUNITY SAFETY AUDITS

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ABSTRACT

Crime is one of the major factors influencing the quality of life of all South Africans and it is therefore a priority to reduce it. To reduce crime, crime prevention is important. Crime prevention is where the focus shifts from the traditional way of the police fighting crime, to the active participation of the community in preventing crime. Doing a safety audit is the first step in implementing a local crime prevention strategy.

The hypothesis of this paper is that using Participatory Geographic Information Systems (PGIS) is a very competent method for conducting safety audits. The hypothesis will further be developed by looking at the importance of community participation and the spatial aspect of crime when conducting safety audits. Attention will also be given to the best methods and tools to be used when conducting these audits. To conclude, the effectiveness of the use of PGIS will be discussed utilizing results from a case study.

Preliminary results indicate that PGIS is very efficient in this context. Firstly, participation allows the community to take ownership of the local crime prevention strategy. Secondly, because the spatial component of the information is not lost, crime prevention hot spots can be identified. Accompanying GIS systems allow different datasets to be integrated. This provides a platform for collaborative planning between the community and local authorities. Methods applied involve integrating the P-Index technique with existing PGIS techniques to facilitate participation. Useful tools in the process of linking PGIS and Spatial analyses of crime hotspots were aerial photographs and the Schutte Scale.

Keywords: PGIS, GIS, safety audit, crime prevention, participation, Schutte Scale

1. INTRODUCTION

Since South Africa (SA) became a free and democratic society in 1994 it has been experiencing very high levels of crime (Minnaar, 2005). SA is the only country in the world to have shown an increase in all the major categories of violent crime during the early 2000s (homicide, robbery, serious assault and rape) (Interpol, 2004). Typical explanations for crime in South Africa centre on seeing crime as being induced by poverty, inequality and the breakdown of social capital by the apartheid regime (Hodgskiss, 2004). Due to the need to reduce crime levels, the concept of crime prevention¹ is receiving a lot of attention. The reason for this is the long-term advantages of an effective crime-prevention strategy. It is cost effective and easy to implement; it lessens the impact of crime on victims, as well as the destructive effects of imprisonment, particularly on young offenders; it improves the quality of life in communities; and it helps to create safer environments in which people live (CSIR & ISS 2000).

¹ Crime prevention involves responding to a few priority problems, using targeted multi-agency programmes. These programmes aim to address the causes of and opportunities for particular crime problems. They should also enforce laws, ensure that order is maintained in the day-to-day activities of the community and reduce public fear of crime (CSIR & ISS 2000).

The CSIR² and the ISS³ (2000) have developed a comprehensive manual for community-based crime prevention in a SA context. They identified four crucial stages for such a strategy: the first stage entails doing a community safety audit to identify problems and understand the community; the second is developing a crime-prevention strategy involving all possible role players, those who enforce the law as well as those who see to it that people do not get on the wrong side of the law; the third is managing and implementing the strategy; and the fourth is monitoring and evaluating the strategy. This is a circular process. New crime problems can develop while prevention programmes are focusing on one area and therefore the process must be repeated continuously.

The safety audit is equally important to the other three stages in a crime-prevention strategy, but even though a crime-prevention process is continuous, the safety audit remains the starting point which directs the process that follows. To date most crime prevention strategies haven't even got off the ground because communities have a problem in conducting the safety audit. This can be attributed to the fact that an effective and easy to use methodology has not been designed. The main objective of a safety audit is to establish the focus of the crime-prevention strategy, in other words identifying the priority areas and crimes in the community (CSIR & ISS 2000). The hypothesis of this paper is that Participatory Geographical Information Systems (PGIS) is a relevant, easy to implement method for conducting safety audits.

2. WHY PGIS?

PGIS is the result of a spontaneous merger of Participatory Learning and Action (PLA) methods with GIT&S⁴ and builds on using combinations of geo-spatial information management tools to compose peoples' spatial knowledge in the forms of virtual or physical maps used as interactive vehicles for spatial learning, discussion, information exchange, analysis and decision making (<http://pgis2005.cta.int/background.htm>). In terms of this definition, PGIS can be broken down into two components: (1) participation (obtaining local/indigenous knowledge); and (2) a conventional Geographic Information System (GIS).

2.1. The Need for Participation

It is important that the community should take ownership of the implementation of a crime-prevention strategy and the best way to do this is through participation (CSIR & ISS 2000). However, before implementing such a strategy, crimes and potential crime areas must be prioritized. This prioritization is the outcome of the safety audit. The crime-prevention strategy is then focused on these priority crimes and areas. In order to do this, relevant and recent data are needed.

In SA the only crime database which is relatively accessible and up date is the database of the South African Police Service (SAPS). The problem with the SAPS data, however, is twofold. Firstly, the SAPS data contains only reported cases of a certain crime. Although a pattern can be established from this data, most crimes such as domestic violence and rape are not reported to the police (Erasmus & Mans 2005). Secondly, there is the issue of police corruption. Looking through any one of the major newspapers you are almost guaranteed to see stories of police corruption on a daily basis. Allegations of police involved in drug trafficking, car hijacking, docket theft, obstructing the ends of justice and other criminal activities such as murder, theft, rape and assault are common place (Sayed & Bruce

² Council for Scientific and Industrial Research (CSIR)

³ The Institute for Security Studies (ISS)

⁴ Geographical Information Technology & Systems/Science

1998). Due to these factors an alternative source of information is needed. Information about the untold stories must be used to supplement the police information.

The only other source of information about crime is the community themselves. There are different ways of getting information from a community, such as a questionnaire survey, for example. However, the data gathering for the safety audit can be done through community participation by making use of focus group discussions. Making use of community participation serves a dual purpose in the bigger picture of implementing a crime-prevention strategy. SAPS data can be verified due the availability of another information source. A process of participation is initiated which is essential for a community to take ownership of the crime-prevention strategy.

2.2. Advantages of a GIS

The information from the focus group deliberations must be used to supplement the police data. In other words, the information from the community must be integrated with the other secondary data sources. The data must also have a strong geographical component in order to identify priority areas for crime-prevention strategies. Proper storage and management of the information must be ensured, if the information is to be made available and accessible for quick analysis and manipulation to all those who need it.

GIS is capable of performing these functions. GIS is a computer system for capturing, storing, manipulating, analyzing and display of spatial and non-spatial information (Maguire 1995). GIS is widely used in the management of information for planning and decision-making purposes (Tripathi & Bhattarya 2004). Another advantage of the GIS is its information-integration possibilities. When data are incorporated into a GIS, the data are geo-referenced, bound to a specific geographical location. Based on the geographical origin of the information, different datasets can now be compared with each other, which may not have been possible previously. This provides the enquirers with a wealth of data analysis possibilities. The use of GIS allows the production of meaningful, attention-grabbing maps that visually illustrate important issues (Jones 1997; Queralt & Witte 1998). This enables people to gain new insights into issues and enhance communication between them.

2.3. Relevance of PGIS

The arguments for the necessity of community participation and the use of GIS can be summed up in the following way. Participation plays a dual role in safety auditing because:

- valuable information from the community are obtained necessary to supplement the police data;
- it allows the community to take ownership of the process which is essential when looking at crime prevention in its entirety.

GIS provides a platform:

- with data-management capabilities;
- for the integration of different datasets;
- for producing outputs (maps) that allow easy and effective communication.

Based on these factors, it can be argued that PGIS encapsulates all the necessary aspects of a safety audit and is an effective and relevant methodology.

3. CONDUCTING THE AUDIT

To apply PGIS there are three different factors that must be kept in mind. There must be a way of facilitating the process of participation by the community. The information elicited

from the community must be captured in such a format that it can be incorporated into a GIS. All of this must form a holistic process which is easy to implement. Before looking at these processes, some background to the community in which the safety audit was conducted will be given.

3.1. Participating Community

The area serviced by the Kuilsriver police station was the area in which the safety audit was done (Figures 1 & 2). Kuilsriver police station covers the south-eastern suburban areas of the City of Cape Town. It was chosen because it was identified by the Department of Community Safety as one of the priority areas in which to conduct a safety audit. Van Riebeeck Street forms the backbone of the area, with most of the businesses situated in this street. On the eastern side of Van Riebeeck is an area with residents in the middle to upper socio-economic class. This area was traditionally an area for white residents, but is becoming more integrated, with about 70% of the residents being white, 24% coloured and 4% black. On the western side of Van Riebeeck is an area in the middle socio-economic class, with most of the residents being coloured (80%). Black residents make up 13% of the community and the remaining 7% are white. The black residents, however, are concentrated in an area called Kalkfontein, which is situated in the south-western part of the area under discussion. Kalkfontien is a lower socio-economic area, with about 35% of the residents living in informal dwellings (Statistics South Africa 2004).



Figure 1: The study area in relation to the rest of the Cape Peninsula and Western Cape Province



Figure 2: The Kuilsriver Police Station Area

3.2. Facilitating Participation

An important prerequisite of a safety audit is that crimes and places where they might occur must be prioritized. It was also established earlier that community participation is essential. Schutte (2000) developed a process which merges the processes of participation and prioritization. It is a process through which a priority index (P-index) is obtained during focus group deliberations. The process was initially developed by him to establish community⁵ needs for local community development projects. Schutte found that in communities people always have a pressing need for whatever one cares to mention. The P-index technique surmounts this problem by conflating respondents' perception of the importance of something with their current level of satisfaction with it. As a result of this technique, something which the respondents regard as very important – e.g. a crime such as robbery, while at the same time being quite satisfied with the current state of affairs (police and security guards are fast to respond and regularly catch thieves) – will have a lower priority than a crime sharing the level of same importance, while there is at the same time a widespread view that not enough is done to curb it. In other words, first the importance of the crime is established, then the satisfaction with what is being done about it, and finally these results are looked at in relation to each other and priority crimes established. To implement this process of participation, data-gathering groups must be formed.

When composing a data-gathering group, two aims must be kept in mind. First you must see to it that it is a representative sample of the community in which the study is being

⁵ There is a measure of consensus amongst scientists that community refers to a group of people within a particular geographical area (Schutte, 2000).

done. It is also essential to ensure that each participant feels free to express his or her point of view (Shah, Zambezi & Simasiku 1999). In order to secure these two aims, a process suggested by Schutte (2000) was followed. He suggests that the study area must be geographically sub-divided into eight more or less equal cells. From each one of the eight cells, six people are selected, three from each gender. The gender categories are further subdivided into age categories, the categories being 45 years and older, 25 to 44 years old and 16 to 24 years old. The participants then form six focus groups, each comprising eight people of the same age and gender; in other words, each focus group is homogenous in terms of age and gender and has a representative from each one of the sub-areas. Each one of these groups then has a facilitator.

3.3. Tools Used

When using PGIS, there must be a way of combining the local mostly qualitative information with quantitative spatial data in order for it to be incorporated into a GIS. Approaches include a combination of methods from drawing in boundaries on hardcopy maps (Cinderby & Forrester 2005; Harris & Weiner 2003; Zurayk 2003, Mbile et al, 2003)), using digital cartography (Harris & Weiner 2003; Tripathi & Bhattarya 2004), sketch mapping (Harris & Weiner 2003; Zurayk 2003), satellite image and aerial photo interpretations (Gonzalez 2002; Harris & Weiner 2003; Mapedza, Wright & Fawcett 2003; Tripathi & Bhattarya 2004), GPS transect walks (Harris & Weiner 2003), mental mapping exercises (Harris & Weiner 2003; Zurayk 2003), spatial multimedia (Harris & Weiner 2003), geo-visualization (Harris & Weiner 2003), GIS and virtual GIS (Harris & Weiner 2003; Voss *et al.* 2004).

The method which elicits the P-Index is essentially a qualitative interview. However, in order to calculate the P-Index the importance of – and satisfaction with – something must be measured. The Schutte Scale⁶ is a tool developed to quantify data from a qualitative interview situation. It is used to measure importance and satisfaction scores during group deliberations in order to calculate the priority index⁷. The scale works in the following way. It has two sides. The one is a graphic representation and the other a numeric interpretation of the graphic. The scale is held by the participant in such a way that the graphic is faced towards them. The more important something is, the more the indicator is moved toward the filled dots. The less important something is, the more the indicator is moved toward the empty dots.

3.4. The Process

The method of facilitating participation and the tools used to quantify the qualitative information from the focus groups are all integrated in a process to do the safety audit. The tools that were used during the facilitation of the focus groups were hard-copy maps consisting of a street plan of the area, with an aerial photo as backdrop; coloured pens; coloured stickers; tape recorders; and of course the Schutte Scale®. The venue for the focus group discussion was one of the primary schools in the area and each one of the focus groups gathered in a classroom. This provided each team with a table and chairs so that the focus group members could position themselves around the map. The process of facilitating the focus group started off by the facilitator introducing him/herself to the members and explaining in general what the survey is about. The next step in the process was for the facilitator to introduce the hard-copy map to the participants. The facilitator gave the focus group members about ten minutes to orientate themselves on the map. The way in which this

⁶ The Schutte Scale has been scientifically tested and patented.

⁷ Priority-Index is equal to the importance score of something minus the groups' satisfaction with what is being done about it.

was done by using coloured stickers to locate certain prominent places in the area like schools, places of worship, police station, clinics, etc. on the map.

After the participants orientated themselves on the map, the facilitator asked the participants to talk about crime in general. This was an open discussion where the facilitator gave everybody a chance to tell their story. This was done to get participants to focus on the topic of crime and safety in their neighbourhoods. After the general discussion about crime, two structured processes were followed in order to determine priority crimes and priority crime areas.

First the participants were asked to name the crimes in their areas which they specifically knew of or had experienced. The facilitator made a list of these crimes and used the list to establish the following for each crime:

1. Identify the areas by indicating on the map where the crime is most likely to occur. These spatial locations were coded and a legend created for the map. For each of these crimes the following was then determined:
 2. Who the people are who are most likely to commit the crime;
 3. Expected time of day when the crime is likely to be committed
 - 05:00 – 11:00 (morning)
 - 12:00 – 17:00 (afternoon)
 - 18:00 – 00:00 (night)
 - 01:00 – 05:00 (early morning; after midnight).
 4. Prioritize the crime. This was done by using the priority-index technique developed by Schutte (2000).

The second step involved the participants going back to the map. They were then asked to indicate which suburbs belong together based on the way in which the residents naturally interact as well as the socio-economic and crime profile of each. The following were then established for each of these areas:

1. Priority of the area based on importance/intensity of crimes and satisfaction with services provided to address it. This was done using the P-Index technique;
2. The major service providers (in fighting crime) in each area.

4. RESULTS FROM THE AUDIT

The implementation of PGIS produced results which prioritized crimes and crime areas through a process of participation. These results were available in a format that made them comparable with the crime data from the SAPS.

4.1. Priority Crimes

After the focus group deliberations all the groups' data were processed and the priority crimes for Kuilsriver Police Station established. These priority crimes can be seen in Figure 3. The prioritization was done by using the P-Index technique. The discussion will focus on the priority crime. This is done in order to indicate the kind of results obtainable from applying PGIS, rather than to give a full report on the safety situation in the Kuilsriver area.

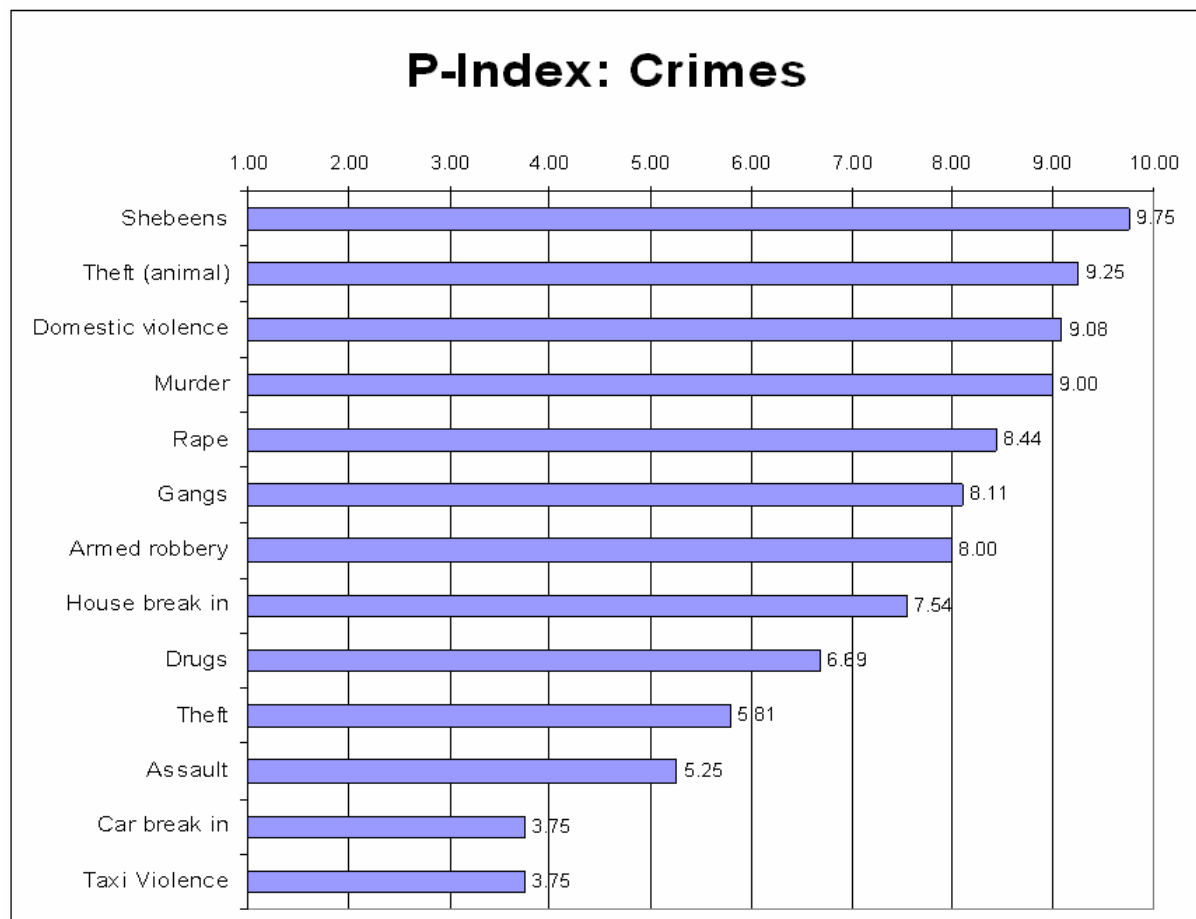


Figure 3: Prioritization of the crimes identified by the community

The problem with shebeens⁸ is the highest on the priority list (Figure 3). When the reason behind this is explored, it emerges that the problem of shebeens and the problem with drugs are strongly interlinked. The responses from the residents indicate this:

“There are a lot of shebeens in the area. The shebeens do not only sell alcohol; at the back they sell drugs!”

“A lot of places apply for licenses to sell alcohol. This is just a front. The people who go there buy drugs. The police leave them alone, because they think it is a legal place where alcohol is sold.”

“The police do nothing to these people with the shebeens. The drugs make them enough money to bribe the police.”

“If the shebeen people drive fancy cars, you know they sell drugs at the back. There are too many places selling alcohol for a person to get rich from that!”

Without community participation it would not have been possible to pick up this relation between two different problems.

⁸ Shebeen is slang for a certain type of place which sells alcohol. These places are usually somebody’s house, a structure in a backyard or an informal structure in squatter camps. Usually these places do not have licenses to supply alcohol.

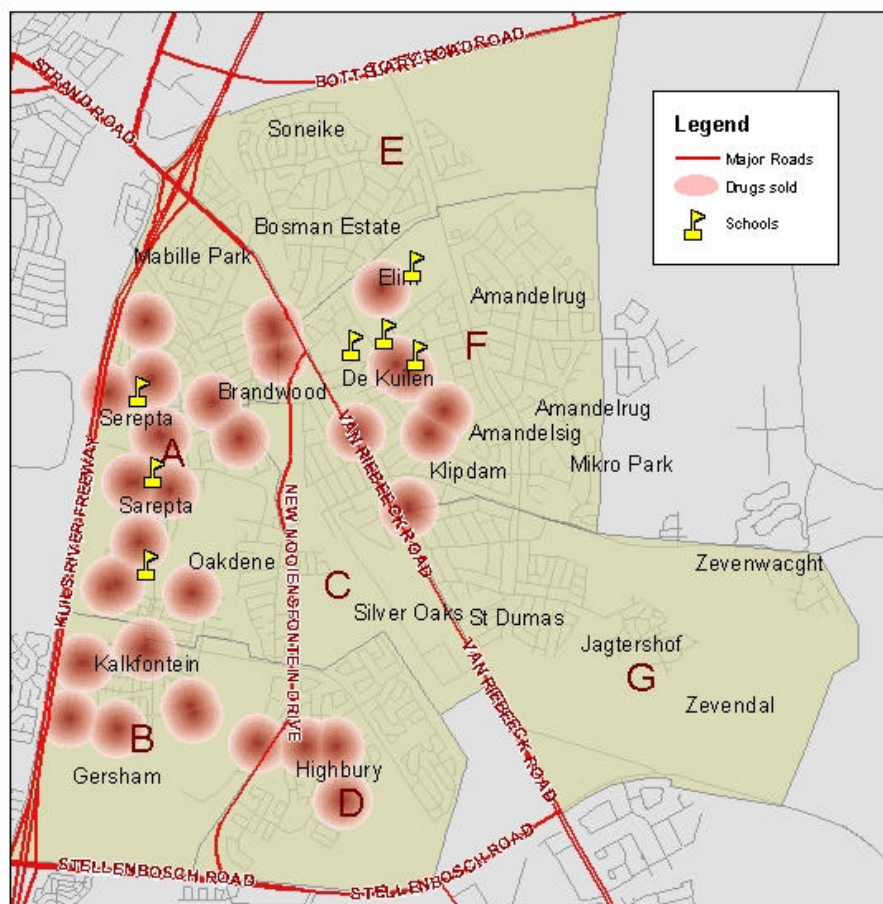


Figure 4: Most likely places where drugs are sold according to the community

Figure 4 shows the most likely places, indicated by the community, where drugs are sold, or drug-related problems will occur. What is interesting in this instance is the strong geographic correlation between these places and the schools in the area. Again responses from the community further indicate that the youth are vulnerable regarding drug problems.

“There are no recreation facilities in the area. Children are bored after school and then start doing drugs.”

“Children do not get enough attention at home; they then get involved with the wrong people, who introduce them to drugs. It becomes an escape.”

“Teenagers want nice clothes and stuff. They see the good life of the gangsters with their nice clothes and cars. The gangsters use the children to sell the drugs.”

The most likely perpetrators and times when this crime is committed were also established during the focus group discussions. As was mentioned above, it is mostly the youth involved in the use of drugs. The group indicated that the people who distribute the drugs are shebeen owners and gangs. There is no specific time of day when the problem is more prevalent.

4.2. Priority Areas

The second phase of the focus group discussions was to establish priority areas for crime prevention. First the community created suburb clusters based on the way in which the residents naturally interact as well as the socio-economic and crime profile of each. The

priority areas were then established (using the P-Index technique) by looking at the degree of crime in the area versus the satisfaction with what is being done to curb it.

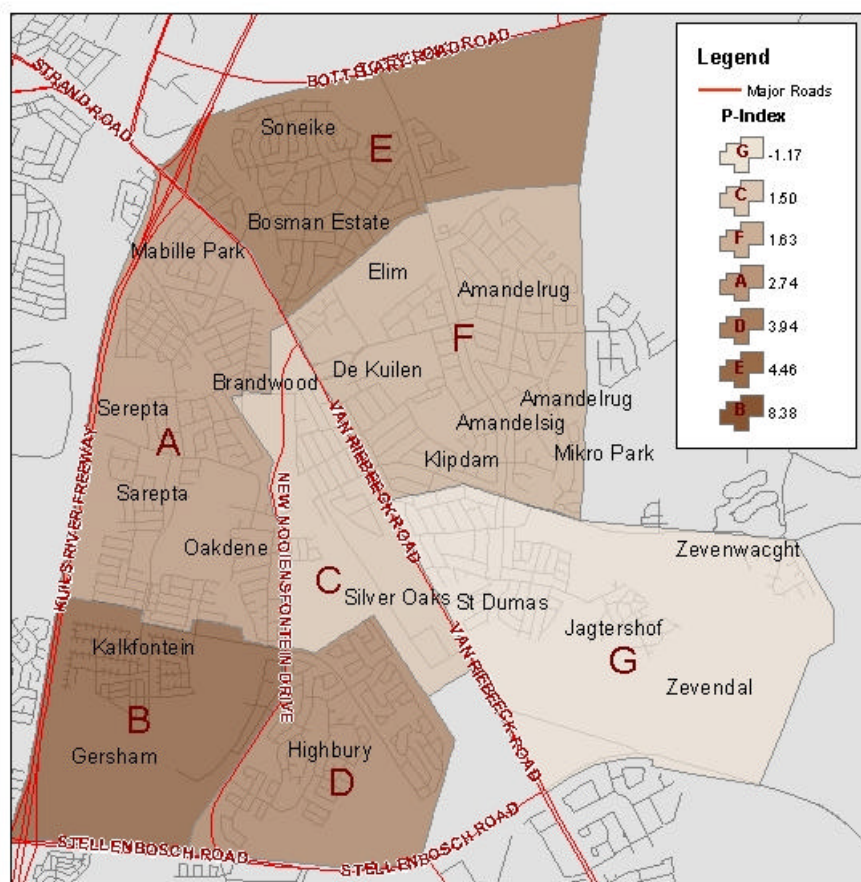


Figure 5: Priority areas for crime prevention

Figure 5 is a thematic map using graduated colours to indicate the priority of each area. Area B, the Kalkfontein area, has the highest priority. What this priority indicates is that the people feel that crime is a real problem and not enough is being done to curb it. After that is an area (Area E) in the eastern part of the study area. The rest of the prioritization of areas can be viewed in the legend of the map. These data are comparable with that of the SAPS database.

4.3. Comparing Data and Information

The SAPS data for reported crimes in the study area were obtained. The SAPS information is geo-referenced and can therefore be incorporated into a GIS. The data were generalized by putting together all reported cases of crime. The data were then further generalized by aggregating the smaller areas, used to capture police statistics, to the areas established by the community. This was possible due to the fact that the data were processed in a GIS. The result can be seen in Figure 6.

A thematic map with graduated colours was used to indicate the areas with the most reported cases of crime (Figure 6). As can be seen, there is quite a large discrepancy between the area with the most reported cases of crime and the priority areas established by the community. The order of the areas indicating most to least cases is: A;F;D;B;C;G;E, while the priority areas for crime prevention is: B;E;D;A;F;C;G. Ascertaining the reason for this will entail a more in-depth analysis of the data. This discussion was intended only to illustrate the comparative capability between different datasets when using PGIS.

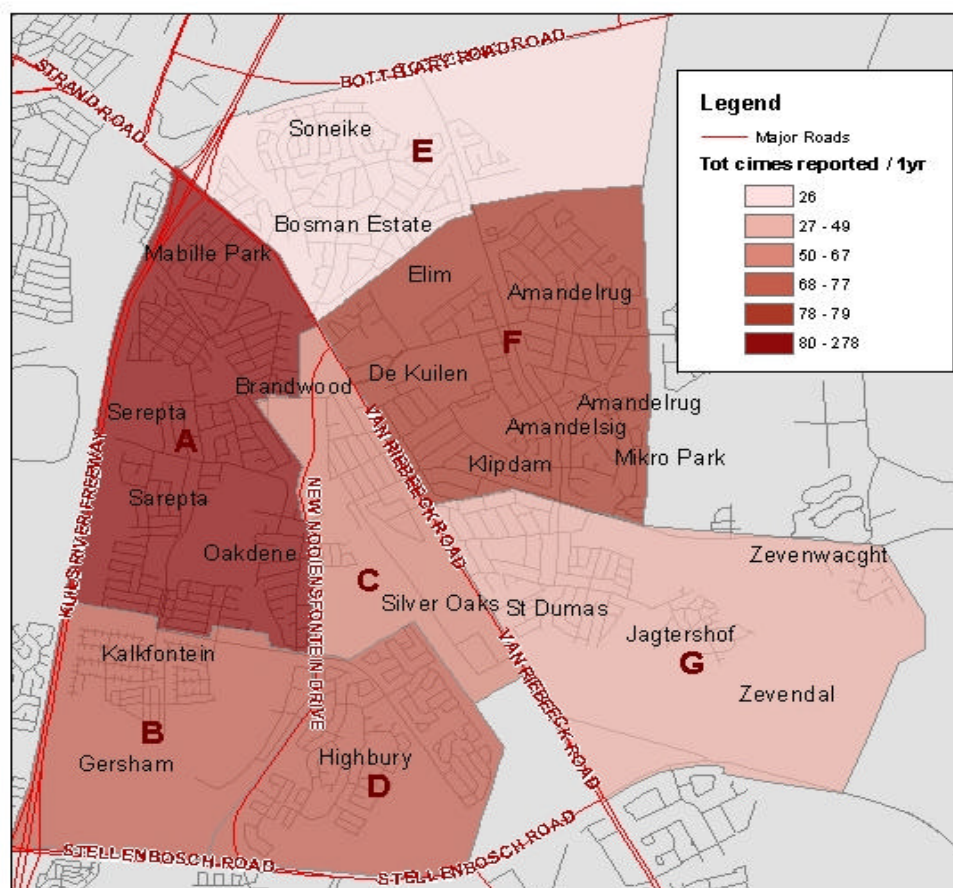


Figure 6: Number of reported cases of crime in one year

5. SYNTHESIS

To conclude, it can be argued that PGIS is a relevant methodology for conducting safety audits. The reason for this is that the principles of PGIS and the needs of a safety audit are the same. Participation is important to gather information and to verify data with doubtful reliability. At the same time participation is central in the bigger picture of a social crime-prevention strategy; for which the safety audit is the starting point. Secondly, GIS provides the information management capacity which is needed. It also produces outputs which very effectively illustrates and communicates results to all role players.

A safety audit relies on the prioritization of crimes and crime areas. The need to prioritize introduced the P-Index technique and a new tool, the Schutte Scale®, to PGIS. This technique, together with the tool, is a valuable contribution to PGIS. This is because PGIS relies heavily on effective ways of combining local mostly qualitative information with quantitative spatial information in order for them to be put into a GIS. This technique and tool provide a very effective and easy way to do this.

REFERENCES

- Cinderby, S & Forrester, J 2005. Facilitating local governance of air pollution using GIS for participation. *Applied Geography* 25: 143-158.
- CSIR & ISS 2000. *Making South Africa safe: A manual for community based crime prevention*. Pretoria: National Crime Prevention Centre.

- Erasmus, JC & Mans, GG 2005. Churches as service providers for victims of sexual and/or violent crimes. A case study from the Paarl Community. *Acta Criminologica* 18, 1: 140-163.
- Gonzalez, RM 2002. Joint learning with GIS: multi-actor resource management. *Agricultural Systems* 73: 99-111.
- Harris, T & Weiner, D 2003. Linking community participation to geospatial technologies. *ARIDLANDS Newsletter* 53: May/June. Source: <http://ag.arizona.edu/OALS/ALN/ALNHome.html>
- Hodgskiss, B 2004. Lessons from serial murder in South Africa. *Journal of investigative Psychology and Offender Profiling*, 1: 67-94.
- INTERPOL 2004. International Crime Statistics. Source: <http://www.interpol.int>.
- Jones, C 1997. *Geographical information system and computer cartography*. Addison-Wesley Longman.
- Maguire, GJ 1995. An overview and definition of GIS. In Maguire, GJ & Goodchild, MF & Rhind, DW (eds), *Geographical information systems: Principles and applications*. New York: John Wiley & Sons.
- Mapedza, E & Wright, J & Fawcett, R 2003. An investigation of land cover change in Mafungautsi forest, Zimbabwe, using GIS and participatory mapping. *Applied Geography* 23: 1-21.
- Minnaar, A 2005. Private-public partnerships: Private security, crime prevention and policing in South Africa. *Acta Criminologica* 1, 18: 85-109.
- Queralt, M & Witte, AD 1998. A map for you? Geographic information systems in the social services. *Social Work* 43, 5:455-467.
- Sayed, T & Bruce, D 1998. Police corruption: Towards a working definition. *African Security Review* 7, 1: 20-30.
- Schutte, De W 2000. *People First – Determining priorities for community development*. Parow-East: Ebony Books.
- Shah, MK & Zambezi, R & Simasiku, M 1999. Listening to young voices: Facilitating participatory appraisals on reproductive health with adolescents. Source: <http://www.futuresgroup.com/abstract.cfm/47>
- Statistics South Africa* 2004. Community Profiles, Census 2001. Pretoria: SSA
- Tripathi, N & Bhattarya, S 2004. Integrating indigenous knowledge and GIS for participatory natural resource management: State-of-the-Practice. *Electronic Journal on Information Systems in Developing Countries* 17, 3: 1-13.

Voss, A & Denisovich, I & Gatalisky, P & Gavouchidis, K & Klotz, A & Roeder, S & Voss, H 2004. Evolution of a participatory GIS. *Computers, Environment and Urban Systems* 28: 635-651.

Zurayk, 2003. Participatory GIS-based natural resource management: Experiences from a country of the South. *ARIDLANDS Newsletter* 53: May/June. Source: <http://ag.arizona.edu/OALS/ALN/ALNHome.html>