WARD BASED COMMUNITY ROAD SAFETY PERFORMANCE BENCHMARKING, MONITORING AND INTERVENTION PROGRAMMES IN THE CITY OF JOHANNESBURG

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ABSTRACT

The current road safety situation in the City of Johannesburg is a major concern to the city authority. More than 120 000 road accidents (on average about 330 accidents per day) occur every year leading to about 600 fatal and 16 000 injury accidents. In 2005, road accidents were costed at R8,5 billion. Pedestrian accidents are a major feature of the problem, representing about 60 per cent of all fatalities. A large proportion of these fatalities occur on the higher order roads such as freeways and distributor roads but also on residential streets. Until now, the approach to address the problem has been two-fold by focussing on the identification of hazardous locations based on accident records and, secondly to conduct road safety assessments on the existing road network. The city management decided to broaden its strategy to reduce the road carnage on the City's roads by also focussing on the inputs of local communities through the development of a ward based community road safety performance benchmarking, monitoring and intervention programme. Community road safety needs in the respective wards are articulated through the ward councillor. The rationale is that the community exactly knows where these problem areas are, because they suffer as a result thereof. The benefits of this approach are multiple. It allows specific road safety problem areas to be highlighted in communities by the community members, and also provides a benchmarking and monitoring mechanism so that the service delivery and performance levels of the ward councillors to address the problem can be properly monitored. The paper describes the process followed to activate the community based road safety programme. In essence the process consists of the following activities: the encouragement of community participation in identifying road safety problems in the community; the empowerment of all stakeholders to deal with the road safety problem, this includes the councillors and the public; the development of integrated information systems to capture the details and dynamics of each ward; the establishment of scientific decision-making tools to measure individual ward road safety performance; and the application of a multi-disciplinary approach to planning, implementation and evaluation of the road safety problem communities are confronted with. The paper also illustrates how the community road safety programme are designed to used web-based technology and how it could be linked to the CSIR's NyendaWeb, a research platform development programme.

1.   BACKGROUND

The current road safety situation in the City of Johannesburg is a major concern to the city authority with more than 120 000 road accidents (on average about 330 accidents per

day), in excess of 600 fatalities and about 16 000 injury accidents per annum. Pedestrian related casualties are representing a major component of the road safety problem, up to 60 per cent of all fatalities (1). Figure 1 gives an overview of the fatal and serious injuries per 1 000 accidents. The proportional involvement of pedestrian casualties per 1 000 accidents is very prominent at 305 casualties per 1 000 accidents followed by the category of overturned vehicles at 195 casualties per 1 000 accidents. Furthermore, the extent of the current road safety problem has huge financial implications for the City. In 2005, road accidents were costed at R8,5 billion.
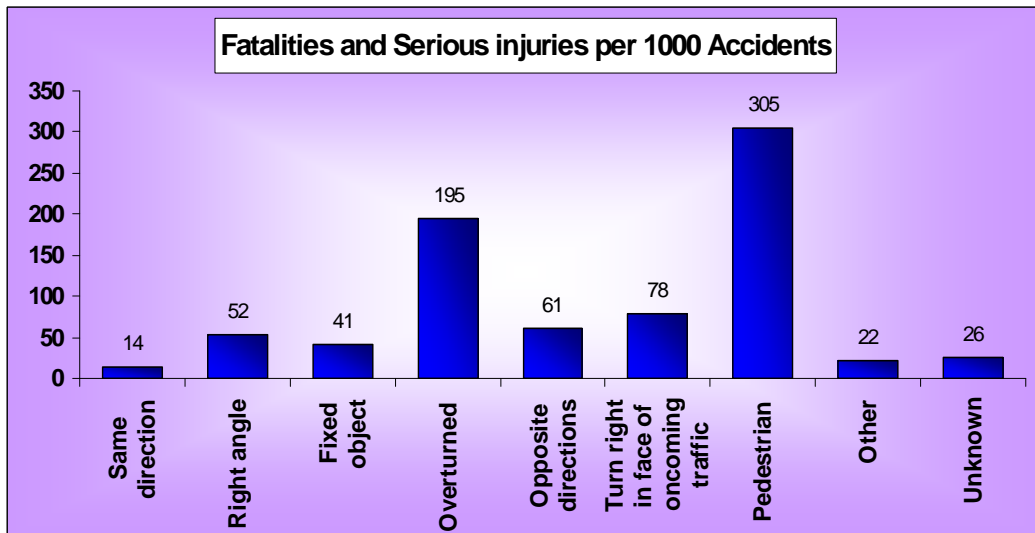

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Figure 1 Fatalities and serious injuries per 1 000 accidents in JoBurg

Figure 2 shows the involvement of vehicle type in pedestrian fatalities. From the diagram it is clear that passenger cars (56 per cent) are mostly involved in pedestrian deaths, followed by mini buses (12 per cent) and LDV's (11 per cent). Many of these fatalities are recorded in residential areas.
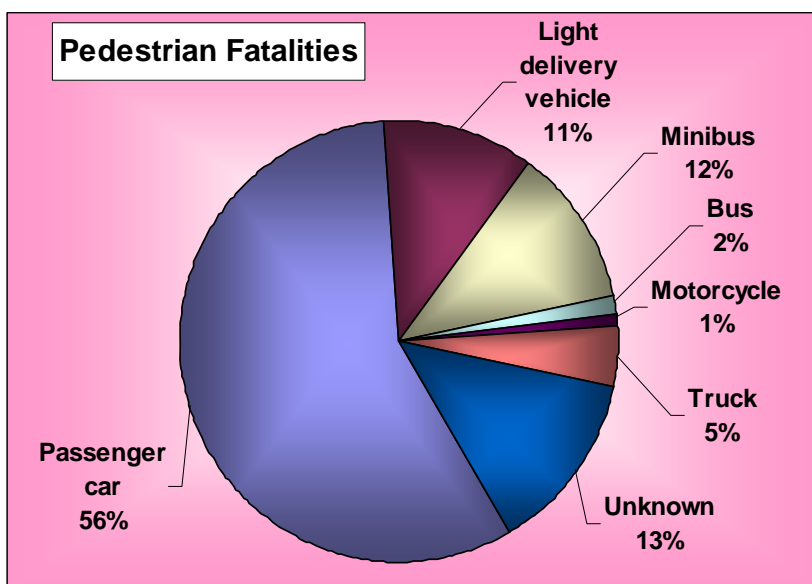

Figure 2 Pedestrian fatalities by vehicle type in JoBurg

In a study conducted by the CSIR in 2005, an analysis of fatal accidents by suburbs showed that high levels of fatal accidents can be linked to specific suburbs in the city. This has lead to the concept of addressing road safety in these specific areas through a more
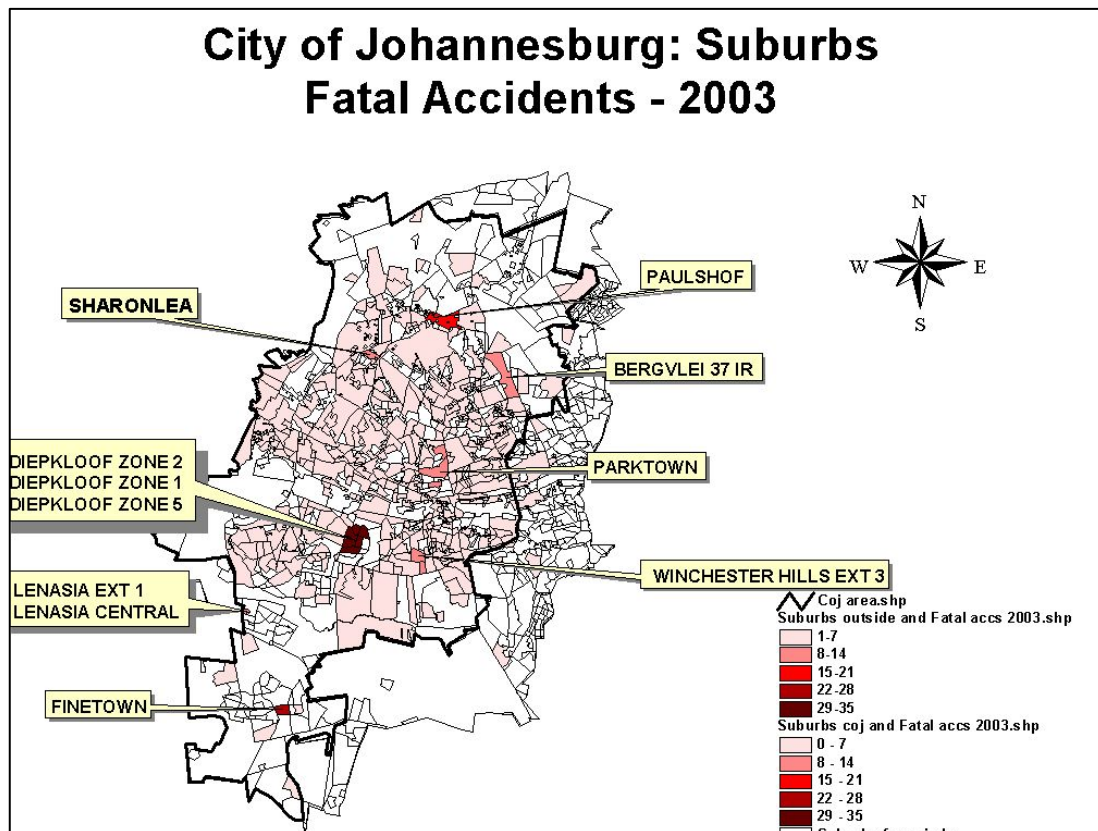
localised approach.

Figure 3 Fatal accidents by suburb: 2003

In 2007, the city management decided to broaden its strategy to reduce the road carnage on the City's roads by also focussing on the inputs of local communities. Many of the casualties occur either on the higher order roads in the City or on the residential streets. The more conventional approaches have always been through the identification of hazardous road sections based on accident records, or alternatively, road safety audits/assessments to identify potential problem areas. This approach has now been expanded through the development of a ward based community road safety performance benchmarking, monitoring and intervention programme. This programme is based on the inputs of the community members in each ward whose road safety needs are articulated through the ward councillor. The rationale is that the community exactly knows where these problem areas are, because they suffer as a result thereof. This concept has been piloted elsewhere in the country with great success (2). Examples are the community of Mpumalanga in the KwaZulu-Natal Midlands and Phokeng in the North West Province. The benefits of this approach are multiple. Not only does it allow specific road safety problem areas to be highlighted in communities by the community members, but it also provides a benchmarking and monitoring mechanism so that the service delivery and performance levels of the ward councillors can be monitored.

2.   THE WARD BASED COMMUNITY ROAD SAFETY APPROACH IN JOBURG

2.1   Joburg City profile
According to the 2007 Community Survey (SSA, 2007) (3), the population of the city   is almost 4 million. Johannesburg's land area of 1,645 square kilometres   (635 sq mi)   the city is divided in 109 wards as graphically illustrated in Figure 4.
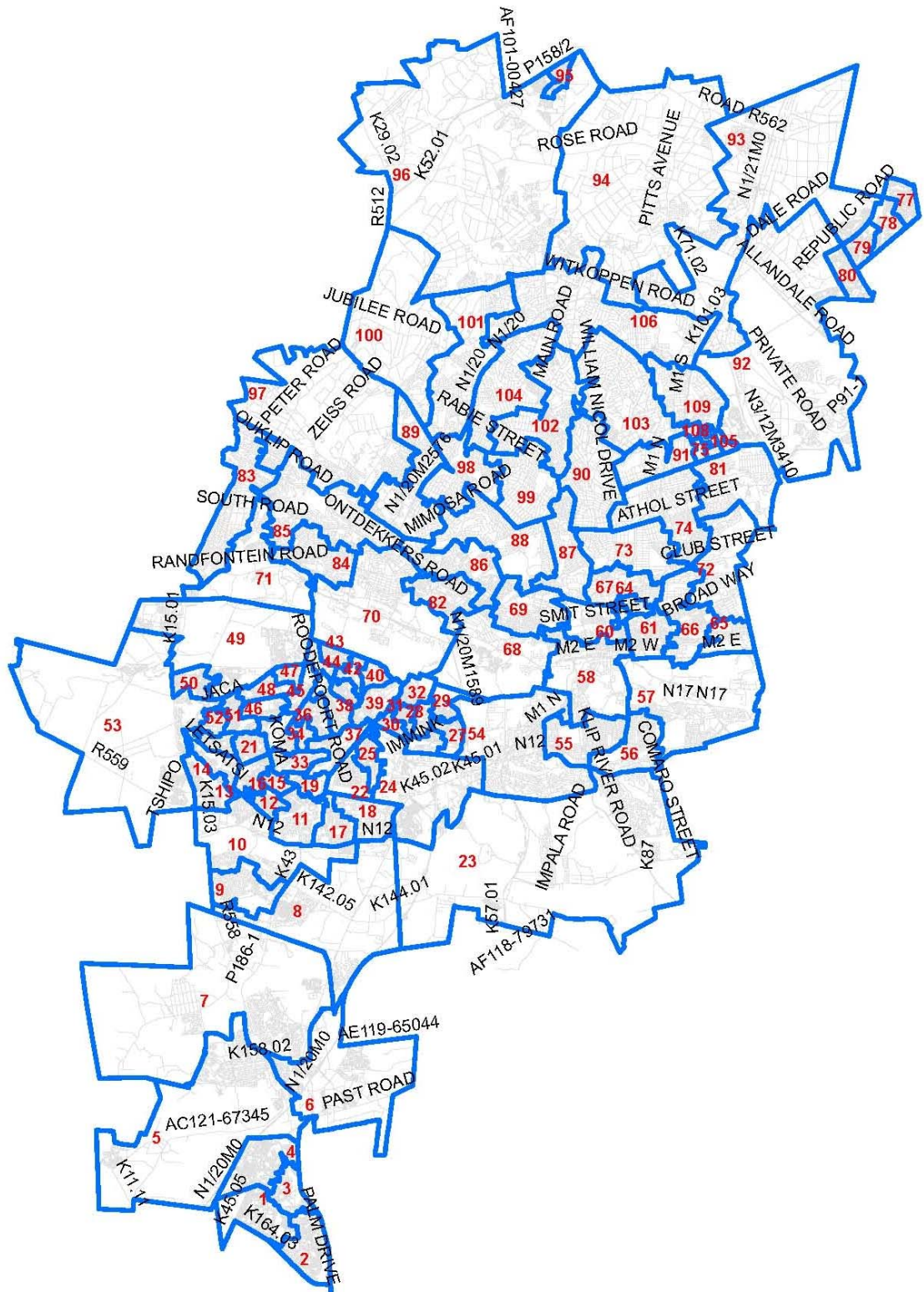
Figure 4 Joburg map indicating location of 109 wards

The **inner city** buildings have been let out to the lower income groups and immigrants and as a result abandoned buildings has become a feature of inner city life. The **suburbs to the south** of the city are mainly blue collar neighbourhoods. The **suburbs to the west** have in recent years floundered with the decline of the mining industry but have in some cases experienced some revival with properties being bought up by the black middle class. The biggest sprawl lies to the east and north. The **eastern suburbs** are relatively

prosperous and close to various industrial zones. The **northern suburbs** have been the recipient of most of the flight from the inner city and some residential areas have become commercialised particularly around the area of Sandton, stretching north towards Midrand. Traditionally, the northern and north-western suburbs have been the centre for the wealthy, containing the high-end retail shops as well as several upper-class residential areas such as Hyde Park, Sandhurst, Northcliff and Houghton. To the **southwest** of the City Centre is Soweto, a mostly black urban area. Many parts of Soweto rank among the poorest in Johannesburg, although individual townships tend to have a mix of wealthier and poorer residents. In general, households in the outlying areas to the northwest and southeast have lower incomes, while those in southwestern areas tend to have higher incomes (Source: Wikipedia)

2.2   Elements of the ward based community road safety approach
The ward based community road safety approach is based on the following broad groups of activities:

- o The development of integrated information systems to capture the details and dynamics of each ward
- o The establishment of scientific decision-making tools to measure individual ward road safety performance
- o The empowerment of all stakeholders to deal with the road safety problem, including councilors and the public
- o The encouragement of community participation in identifying road safety problems in the community
- o The application of a multi-disciplinary approach to planning, implementation and evaluation of the road safety problems communities are confronted with.

2.3   Integrated information systems and scientific decision-making tools
Community profiles are important to understand the road safety needs and composition of each community. Aspects that need to be considered in each ward include the following:

- o Socio-economic factors: The income, age distribution and education levels of the community members. As already indicated, the city suburbs display specific socio economic features.
- o Culture: Understanding the religion and language groupings in the community plays an important role in understanding the approach to be followed in addressing the problem.
- o Consultative structures, forums, and the like to articulate the needs of the community.   This includes ratepayers associations, local policing forums, community road safety committees, and similar structures.
- o The current road infrastructure including road function and layout, traffic calming measures implemented, pedestrian facilities, road signs, speed limits, and so on. Also of importance are public transport routes such as rail, bus and taxi intersecting the wards and the provision of pedestrian facilities along these routes.
- o Road safety issues in the ward such as problem areas, accident spots, road fatalities and injuries, levels of traffic offences, and so on.

Based on this information a Road Safety Index will be calculated for each ward to not only understand the road safety risks in each ward, but also to compare the current road safety risks between wards and to identify critical areas for upgrading.   Table 1 illustrates an example of a Road Safety Index.

The road safety index will be integrated into the NyendaWeb (4), which will provide a new innovative way of analyzing the road safety problem in the city on a ward basis. The road safety issues in each ward will now be quantified through a set of numerical indices, but at the same time it will possible for the city to analyze specific road safety issues citywide. This tool will also make it possible to conduct safety performance benchmarking of and between wards over time (e.g. per annum, councilor's term of office, and so on).

Table 1 Road Safety Index

EXAMPLE: Road Safety Index for each Ward: City of Johannesburg												
Ward	Ward Profiles				Road Safety Index							
	Socio-economic			Consultative structures	Road Infrastructure				Road Safety			Overall Index (100)
	Income	Age	Education		Pedestrian facilities	Road signs	Road function	Speed limits	Accident rate	Fatality rate	Offence rate	
1					X	x	x	X	X	x	x	73
2					X	x	x	X	X	x	x	72
3					X	x	x	X	X	x	x	53
4					X	x	x	X	X	x	x	67
5					X	x	x	X	X	x	x	84
109												

2.4   Community participation

2.4.1 Current initiatives
A community participation process was initiated by means of community meetings that were held in each ward, coordinated by the ward councillor. The public was invited to complete questionnaires at these meetings that prompted them on road safety issues such as:

- o   Where in your community is the biggest road safety problem?
- o   Give a short description of the problem.
- o   Who are mostly involved in these accidents?
- o   What is the cause of the problem?
- o   How many people have died or were injured?
- o   What do you think is the solution to the problem?
- o   And so on.

In order to facilitate these public meetings, the councillors were briefed on road safety matters during a two-day workshop before the public consultation process was initiated. A Community Consultation Toolkit (CSIR, 2008) (5), as shown in Figure 4, was also developed to familiarize the councillors in addressing the road safety problems in their wards. All councillors were invited to a two-day workshop at the Joburg Civic Centre during which the Toolkit were presented to them. The Toolkit content covered some basic information that is required to facilitate the community consultation process. This included the following subject matter:

- **Part 1: The Community Consultation Process**
  - How to approach the Community
  - How to identify community road safety issues and target groups
  - How to identify road safety partners in the community
  - How to hold effective meetings
  - Agenda for Community Consultation Sessions

- **Part 2: Road Safety Issues and practical Solutions**
  - Overview of Road Safety
  - Measuring road safety
  - Complexity of Road Safety
  - Identification of Road Safety Problems
  - Changing behaviour through Road Safety Functional Areas
    - Introduction
    - Safety engineering
    - Traffic Law Enforcement
    - Road Safety Education
    - Road Safety Communication
  - Key interventions
    - Pedestrian safety management
    - Alcohol and drug management including impaired driving
    - Speed management
  - Partnerships to improve road safety
  - Political will

2.4.2 Longer-term community participation

The longer-term objective of the project is to introduce road safety monitors to each ward. These would be individuals that will volunteer to report any unsafe human behaviour or unsafe road condition such as potholes, missing road signs, worn road markings, unsafe road crossing movements, vehicle speeding or unsafe human behaviour such as not stopping at road signs of traffic lights, jaywalking, and so on. The monitors will be issued with GIS enabled cell phones to capture images and the actual location of the incident or hazard and then forwarding it to the NyendaWeb. They will then only punch in the code and the data will be recorded in the NyendaWeb with a link to the Joburg website.

Another option is that GPS-enabled Personal Digital Assistants (PDAs) that are currently available in the local market will be procured and that these be rotated among the ward community sensors on a bi-weekly or other period basis to ensure covering all wards at least once a year.

Another experimental design that will be deployed on an experimental basis in a ward is the Digital Doorway. This facility will be installed at a public facility such as a library where community members can then enter their road safety complaints.
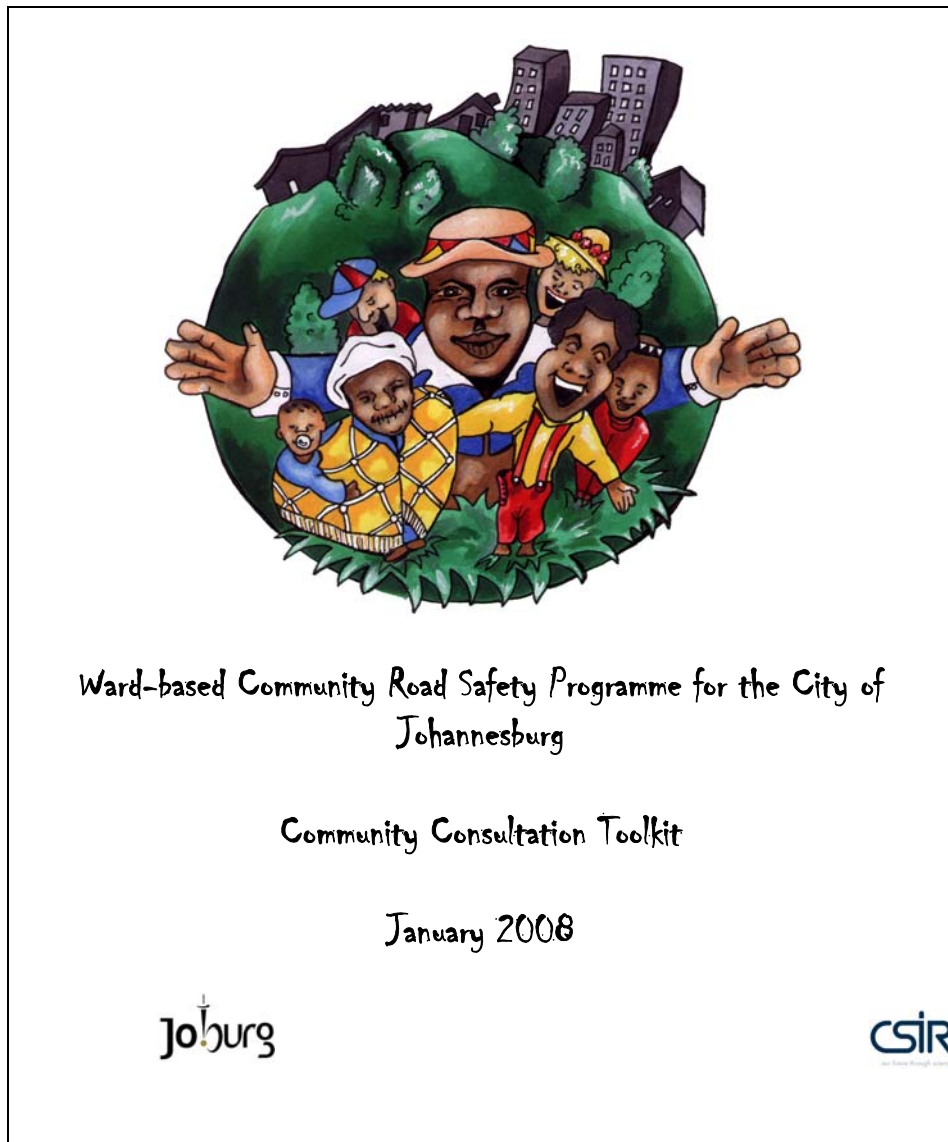
Figure 4 Community Rood Safety Toolkit

2.5   Empowerment of stakeholders

The empowerment of all the stakeholders involved in a community is an essential part of the process. These processes illustrated above showed how the community members, monitors and councilors are being empowered to make constructive inputs to improving road traffic safety in local communities. This empowerment process will provide basic information about what will feasible in a community setup and at the same time improve the understanding of community members about realistic options to improve the current unsafe conditions in the wards.

2.6   Multi-disciplinary outcomes based approach

Another benefit of the community empowerment process is the broadening of the community's understanding of effective solutions. Very often communities see traffic calming as the only solution, forgetting that factors such as human attitude and behaviour also play a major role in accident causation. The role of traffic law enforcement is often also overlooked. The purpose of the Toolkit is to encourage this multi-disciplinary outcomes based approach.

3. WEB-BASED COMMUNITY ROAD SAFETY PLANS

3.1 Introduction

The ultimate objective of the project is to display a community road safety plan for each ward electronically on a website. All the information for each ward collected during the project, will be captured on the website. The website will provide the City officials, the councillors and the public with a live plan of action about each ward.

Some of the potential functionalities of the website are illustrated below:

Data inputs: All individual and group questionnaires completed during the community consultation meetings will be captured. Data items to be captured will include ward number, suburb, location of road safety problem, road safety issues, road users, etc.

Decision support searches to determine priority sites are illustrated in Table 2. Information on different entities, e.g. ward, suburb, street, issue, priority site, etc. can be accessed in this way. This will be a very useful road safety improvement tool once all the electronic ward plans have been completed.

Table 2 Decision support system by different parameters

	Wards	Suburbs	Streets	Road safety issues	GIS Maps	Priority sites	Photos	Socio economic profile	Accident statistics
Ward		X	X	x	x	x	x	x	X
Suburb	X		X	x		x	x		X
Street	X	X		x	x	x	x		X
Issue	X		X				x		
Priority site*	X	X	X	x			x		X

*Data pertaining to Priority Sites captured after selection process

- o **Site visits:** Information that will be captured will include the date of the site visit, the exact location of the problem area, problems observed, recommended solutions per discipline, and so on.

- o **Photographs:** A record of all photographs taken during site visits, including photo ID, ward, street, description of problem, keywords, etc. will be kept.

- o **GIS maps:** Pre-prepared GIS maps in jpeg format will be uploaded. Customised GIS software will be used to produce very detailed sophisticated maps.

- o **Socio-economic profiles:** Socio-economic data per ward (as per latest Census) will be displayed. Outputs are in the form of indices and graphs.

- o **Petitions/requests for traffic calming:** Current information will be captured by location, description and name of requestor.

- o **Road safety plans/reports:** All relevant information, including recommendations for improvement of road safety, will be contained in a Community Road Safety Plan. The ward number, name of councillor, date of community meeting, and so on will also be included. Chapters of the Plan could be exported as Word or PDF documents, or printed.

3.2   The role of the CSIR NyendaWeb in establishing a website for community road safety plans

The envisaged role of the CSIR NyendaWeb is covered extensively by Labuschange in his paper "The CSIR NYENDAWEB - Instrument of the ITS® Collaboratory, and Research and Development Platform" (4). In essence, the NyendaWeb is aimed at establishing an open, universally accessible data source to facilitate more intensive research and development on traffic and transport engineering and traffic management, including road safety. The value of NyendaWeb lies in the integrated transport and traffic data it offers. It will be using sensors to monitor or measure conditions at different locations. Any person can therefore provide geo-spatially data that could be included in the NyendaWeb Sensor Observation Service database. This could be extremely useful in identifying specific road safety shortcomings in the road network, especially for the community road safety approach as covered in this paper.

3.3   The interface of the NyendaWeb with the Joburg Community Road Safety Plan Approach

The specific advantages that the NyendaWeb platform will provide to projects such as the Joburg community road safety project are summarised below:

1   NyendaWeb provides a common structure for the collection and archiving of data for community safety related and other data collection projects. Once the input interfaces are developed, any consultant or service provider can collect the data and utilise the NyendaWeb.

2   NyendaWeb could automate general monitoring services and aggregate near real-time continuous streams of data in an efficient way. The benefit of this development is that before and after studies in the future need not be done on a project by project basis – it will be possible to create baseline measurements through NyendaWeb applications at any selected point in time.

3   The ward monitors in the Joburg project will ultimately be able to provide direct input to the NyendaWeb either through the Internet of through GPS-enabled cell phones. A person carrying such a GPS enabled cell phone becomes a sensor when a phenomenon or observation is coded with a time stamp and attached to a geospatial reference. By distributing appropriate sensors in a community, the community is empowered by using them actively, and in the future to continue to contribute towards providing data that would enable the community to report any relevant issue whether it is a unsafe road condition, damaged road sign, potholes, unsafe driver and pedestrian behaviour, and so on.

4   The NyendaWeb will be the tool to provide councillors and JoBurg with up to date information on any specific ward at any specified point in time. This implies that the ICT capacity of councillors and other users will need to be enhanced. NyendaWeb will have flexible functionality to facilitate presentation and reporting in formats as required. Furthermore, it will facilitate uniformity in ward status reporting which should contribute towards more efficient prioritisation and budgeting processes. NyendaWeb will therefore deliver an invaluable tool for benchmarking and other developmental decision support.

5   The ongoing monitoring functionality that Nyendaweb will be providing will make it possible to provide information necessary for performance measuring and appraisals. The communities will also be able to access the information about service delivery. Through these processes communities will be empowered by having knowledge of the Council processes regarding needs prioritisation and budget allocation.

4.   REFERENCES

[1] City of Johannesburg, Traffic Safety Management Information System, CSIR Transportek, 2006.

[2] Vermaak, L. Community driven road safety. CSIR Technical Report 97/018. Transportek, CSIR, 1997.

[3] Statistics South Africa (SSA), Community Survey, 2007.

[4] Labuschange, K L. The CSIR NYENDAWEB - Instrument of the ITS® Collaboratory, and Research and Development Platform NyendaWeb. Paper presented at the Southern Africa Transport Convention, Pretoria, South Africa, July 2008.

[5] City of Johannesburg. Ward-based Community Road Safety Programme for the City of Johannesburg - Community Consultation Toolkit, CSIR, January 2008.