IS SOUTH AFRICA READY FOR AN INTERNATIONAL SAFETY COMPARISON?

M J W A VANDERSCHUREN and **C C IRVINE**

Civil Engineering, Faculty of Engineering & the Built Environment,
University of Cape Town, Private Bag, 7701 Rondebosch

ROAD SAFETY IN SOUTH AFRICA

In traffic high speed causes a lot of problems. Various studies have proved that a reduction of speed results in fewer fatalities on the road, a reduction of fuel consumption and emissions. In the Netherlands the calculation is that, if everybody would drive to the speed limit, the amount of fatalities on the roads would decrease by 21% and the amount of injuries by 15% (Peters, et al, 1996).

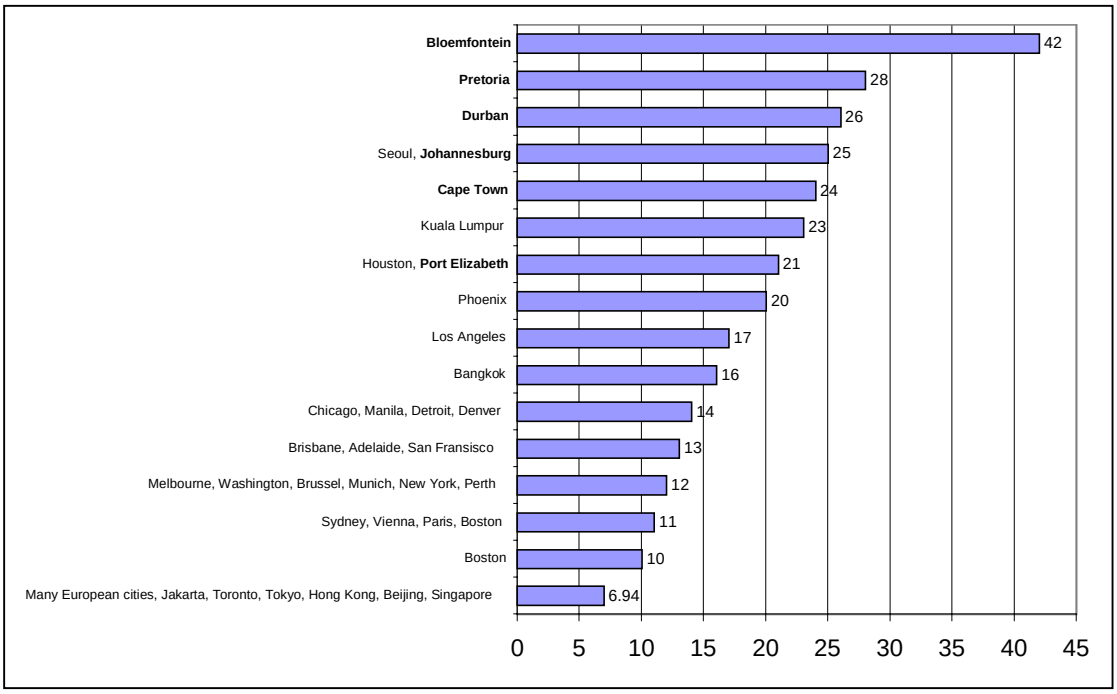

Figure 1: Road accident fatalities in various international cities (per 100 000 inhabitants)[1]
(Sources: Newman and Kenworthy 1999:344-345, CMC 2000:26, Pladsen 2002)

South Africa has very high fatality rates on the road. Although the amount of cars present and the amount of kilometres driven per year are virtually the same as the Netherlands, the number of fatalities are about ten times as high in South Africa. A more detailed international comparison also shows that South African cities have exceptionally high percentages of people killed on the roads (figure 1). Bloemfontein's fatality rate is particularly high. The reason has not been established yet and will be investigated further.

[1] The cities with less than 10 fatalities per 100 000 inhabitants are combined. The fatality rate of 6.94 is the average. The European cities with less than 10 fatalities per 100 000 inhabitants are: Amsterdam, Stockholm, Copenhagen, Zürich, Frankfurt, Hamburg and London.

FACTORS CAUSING ROAD TRAFFIC ACCIDENTS IN SOUTH AFRICA

When considering the relevant road accident data items to be collected in South Africa, and the comparing of data items collected in South Africa to data items collected internationally, it is necessary to understand the uniqueness of South Africa's road environment. South African traffic accident data is of particular importance in decision-making, as limited resources require that the resources be allocated to identifying the most prominent traffic accident causes and the correct subsequent remedial measures. The aim is that traffic accident data in South Africa will help obtain the maximum amount of output for the minimum resource input.

Human Factors

Surveys from the Arrive Alive Campaign have shown that human factors contribute to 75% of fatal accidents in South Africa. According to *Strategy 2000 An End to Carnage on South Africa's Roads,* human factors make up 80-90% of contributory factors to road accidents. Human factors that affect the severity and occurrence of accidents include:

- Speeding
- Pedestrians
- Alcohol and drug abuse
- Attitude
- Judgement
- Impairment
- Vision
- Physical strength
- Unskilled drivers
- Loading and off-loading point
- Disobeying existing traffic regulations
- Failure to use standard safety measures
- Insufficient headway
- Overtaking in the face of oncoming traffic or no-overtaking barrier lines
- Cargo and passenger overloading
- Red-light/stop sign violations
- Fatigue-related violations

According to Arrive Alive Surveys for the Easter holiday in 1998, the highest contributing human factors in descending order are high speeds, pedestrian jaywalking and alcohol/drugs.

Human attitude and judgement on the road may relate back to cultural aspects, estimate of the value of human life, gender, personal aggression and personal stress levels. Driver anger and aggression on the road may be driver self-created anger, or anger may be initiated by the actions of other drivers on the road. According to Statistics South Africa's 1998 traffic accident statistics, 80.6% of collisions involved male drivers. Driver fatigue may result when the driver exceeds the maximum acceptable uninterrupted driving hours. Research from 1997 indicated that fatigue plays a role in 5-10% of accidents and 25-35% of fatal accidents (Ministry of Transport, 2000). Unskilled drivers in South Africa are a result of forged or fraudulently issued licences. Human factors affecting the occurrence and severity of accidents with regards to pedestrians include playing or walking in the road, pedestrians unfamiliar with traffic behaviour and alcohol and drug abuse.

Vehicle Factors
Surveys from the Arrive Alive Campaign have shown that vehicle defects contribute to 17% of fatal accidents in South Africa, with tyres being the highest contributing vehicle factor, followed by overloading and brakes. According to *Strategy 2000 An End to Carnage on South Africa's Roads*, the vehicle make up 10-30% of contributory factors to road accidents. Contributing aspects to accidents regarding the vehicle include:

- Worn or smooth tyres
- Under-inflated tyres
- Poor brakes
- Faulty steering
- Poor lights or vehicle visibility
- Poor general vehicle maintenance
- Tyre burst prior to accident

Autonomous Factors
Autonomous factors involve independent aspects to traffic safety, which affect traffic safety. These include aspects such as population growth and experience in terms of age. An increase in adult literacy rates, life expectancy, vehicle ownership and GDP per capita should decrease fatality rates. The present adult literacy rate, persons above 15 years who can read, write and speak their home language, was estimated at 82% in 1991.

In addition to the above the road design also influences the safety on roads. South Africa is encouraging a road safety audit. This audit takes a lot of design issues into account. As this audit is not compulsory this does not avoid new bad (dangerous) designs nor 'repairs' existing dangerous designs. It was decided to not discuss road design in this paper. Firstly the amount of accidents caused human and vehicle failure is much higher. Secondly specific designs should be discussed, which is clearly outside the purpose of this paper.

THE PROSPER PROJECT

The European Commission (EC) has recognised the contribution that new technologies can make in achieving the goals of it's Common Transport Policy through a reduction in road speed. The Council (EC) resolution of June 2000 explicitly identifies "…the use of advanced assisted driving technology…which has considerable potential for improving road safety" and "…technology relating to speed limitation devices and to identify any technical, organisational, administrative and legal difficulties in introducing them…" as important measures for further investigation. Introduction of road speed management based on information technology (i.e. ISA, Intelligent Speed Adaptation) requires international co-operation to overcome technical, legal and policy barriers.

The PROSPER (**P**roject for **R**esearch **O**n **S**peed adaptation **P**olicies on **E**uropean **R**oads) proposal is responding to the Key Action "Sustainable Mobility and Intermodality", and specifically to research task 2.3.1/16 "Road Speed Management Methods Assessment" defined in the call for proposals. The PROSPER project is designed to fully comply with the task description, as regards objectives, indicated methodology and expected results.

The global project objective is to answer the following questions:

- *How efficient is the use of road speed management methods based on information technology (ISA) in comparison with traditional physical means?*
- *How will road users across Europe react to such developments?*
- *What are suitable strategies for implementation and what obstacles have to be overcome?*

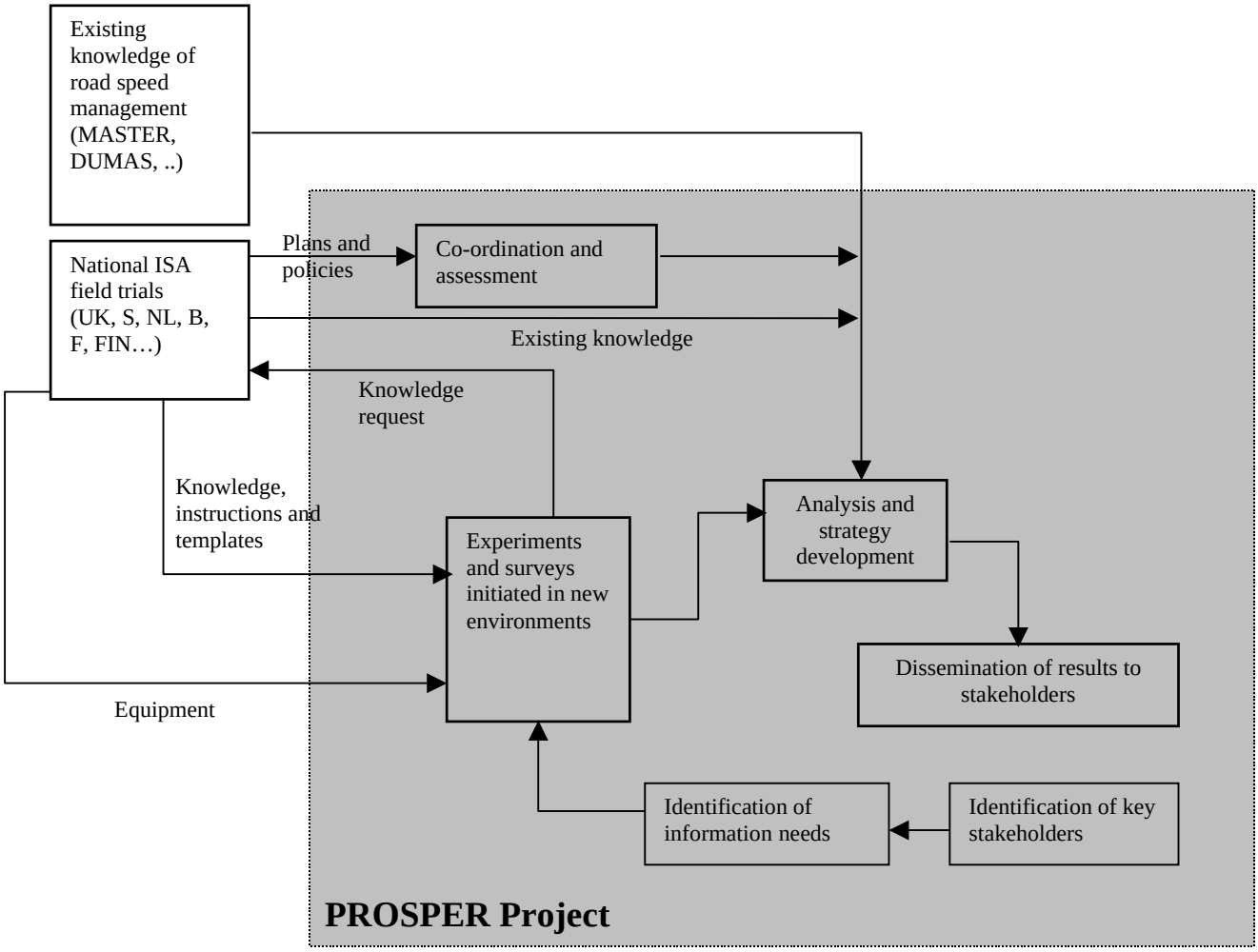

Figure 2 PROSPER Project Approach

South Africa plays a minor role in the Prosper project. Based on the knowledge available in Europe on Intelligent Speed Adaptation (ISA) the possible safety benefits for South Africa will be estimated (experiments and surveys initiated in new environments).

WHAT TRAFFIC DATA IS NEEDED?

ISA influences the actual speed of a vehicle. Modelling of ISA will therefore need information about the actual speed (=travel speed) of cars. The question is what other information is needed.

The PROSPER consortium has not yet started, carrying out the investigation on safety modelling issues in South Africa. Therefore it is not clear, what safety data is required to participate in the modelling for the PROSPER project. As an alternative it was decided to do an international comparison of road safety data. The Accident registration forms of 5 different countries were collected and compared. Table 1 gives a summary of the comparison[2].

[2] Information that is not important from a modelling point of view (i.e. identification number) is not included.

Table 1: International comparison of road safety issues

	South Africa (OAR)[3]	America	Ghana	The Netherlands	Great Britain
Identification					
Accident Locality (time, date etc.)					
Road Type					
Urban/Rural location	✓	✓	✓	✓	✓
Roadway Function Class		✓	✓	✓	✓
Exact location					
Region	✓	✓	✓	✓	✓
City/town in or between	✓	✓	✓		✓
Suburb	✓	✓	✓	✓	✓
Road name and km marking	✓	✓	✓	✓	✓
Intersection	✓	N/A	✓	✓	N/A
Metres from landmark	✓	N/A		✓	N/A
Accident Summary					
Number of persons dead	✓	✓	✓	✓	✓
Number of people seriously injured	✓		✓	✓	✓
Number of people slightly injured	✓		✓	✓	✓
Number of pedestrians involved	✓	✓	✓	✓	✓
Particulars of driver, cyclist or pedestrian					
Age	✓	✓	✓	✓	✓
Gender	✓	✓	✓	✓	✓
Personal physical impairment		✓			
Driver's licence code	✓	✓	✓	✓	
Compliance with licence endorsement/ Restrictions		✓	✓		
Severity of injury	✓	✓	✓	✓	✓
Seatbelt/helmet use	✓	✓			
Trapped/fallen out	✓	✓			
Airbag availabe/ejection		✓			
Liquor use	✓	✓	✓	✓	✓
Method of alcohol test and result	✓	✓	✓		✓
Method of drug test and result	✓	✓			
Cell-phone or other handheld instrument use	✓	✓			
Pedestrian information					
Position in terms of road	✓	✓	✓	✓	✓
Location in terms of crossing	✓	✓	✓	✓	✓
Pedestrian crossing type					✓
Manoeuvre	✓	✓			✓
Action	✓	✓			✓
Colour of clothing/visibility	✓				
Compass direction of travel					✓

[3] Officer's Accident Report. During the investigation other South African accident report forms were included as well. The paper only summarises the results for the OAR.

	South Africa (OAR)[3]	America	Ghana	The Netherlands	Great Britain
Vehicle details					
Colour, make and model	✓	✓	✓		
Loading conditions		✓	✓		
Defects prior to accident		✓	✓		
Usage of vehicle at time of accident	✓	✓	✓		✓
Manoeuvre prior to critical event	✓	✓	✓		✓
Travel speed		✓	✓		
Critical event		✓			
Corrective action attempt		✓			
Vehicle control		✓			
Compass direction of travel	✓	✓	✓		✓
Post-accident damage	✓	✓	✓	✓	✓
Tyre burst	✓		✓		
Skid marks	✓				✓
Lights	✓		✓		
Dangerous goods carried	✓	✓			
Fire occurrence		✓			
Dangerous materials released		✓			
Jack-knifed		✓			✓
Overturned		✓			✓
Particulars of passengers killed or injured					
Severity of injury	✓	✓	✓	✓	✓
Passenger location	✓	✓			✓
Trapped/fallen out	✓	✓			
Seatbelt use	✓	✓			
Airbag availability		✓			
Environment and the road					
Weather conditions and visibility	✓	✓	✓	✓	✓
Light conditions	✓	✓	✓	✓	✓
Road surface conditions and type	✓	✓	✓	✓	✓
Traffic flow	✓	✓	✓	✓	✓
Circumstances	✓	✓	✓	✓	✓
Witnesses					

Note:
✓ = Included in the survey
N/A = Not applicable[4]
Blank = Not included in the database

[4] The American information and the Great Britain information is taken from the capturing data elements used in the Motor Crash Data Statistics Document and not from the Police Accident Report. The personal identification is therefore not applicable, as this information is not captured in these systems for the sake of privacy

Table 1 clearly shows that there are a lot of issues, which could be included in a modelling exercise. The table also shows that road safety issues differ in the developing and the developed world. Tyre burst for example is only an issue in the developing world. Tyres used in the developed world are from a better quality (not old and worn) and therefore not a safety threat.

It is not possible to pre-select any road safety issues. Different models will require the inclusion of different issues. Nevertheless, based on the fact that these countries do not include the travel speed of a vehicle, it can be concluded modelling of Intelligent Speed Adaptation is not possible in South Africa, the Netherlands nor Great Britain without adding other sources.

IS SOUTH AFRICA READY TO PARTICIPATE IN THE PROSPER PROJECT?

From the investigation into road safety issues in South Africa, it is possible to analyse South Africa's road safety in terms of strengths, weaknesses, opportunities and treats (SWOT). Table 2 presents a summary of the SWOT analyses carried out during the investigation.

Table 2 SWOT analysis of road safety in South Africa[5]

Strength	Weaknesses
• **The arrive alive campaign and routinely collected speeding data** • Implementation of compulsory road safety education programmes at schools • Comprehensive road safety data	• Poor pedestrian infrastructure provision • Legislation regarding seatbelts, minibus taxis, speed limits and alcohol blood concentration sampling • Low detection of traffic violation • High number of unroadworthy and unlicensed vehicles • High rate of unskilled drivers • High vehicle overloading • High speeding • Poor road maintenance • Poor usage of safety features • Poor incident management • **Road safety responsibility of more than one stakeholder** • **Workload SAPS**
Opportunities	**Threats**
• Implementation of ISA would decrease speeding • Investment into improving quality of infrastructure • Implementation of electronic licensing • Central Computer Management Systems with GIS to improve incident management • **One responsible stakeholder for road safety (including data collection)**	• **Lack of recourses** • Fraud and corruption • **Unreliable road safety data** • Low alcohol and drug abuse detection due to poor methods of testing • Poor traffic enforcement • South African road-user attitude • Road safety audit is not compulsory • Lack of qualified personal to conduct road safety audits • High pedestrian movement and a lack of knowledge about their patterns; no barriers on freeways

[5] Sources: CMC, 2000; Department of Transport Republic of South Africa, 2001; Ministry of Transport, 2000; National Road Safety Council, 1991; Sole, 2001; Transportation and Traffic Directorate, 2001

Table 2 includes a lot of suggestions to improve road safety in South Africa. From a data point of view the following two findings are most important:

- The Arrive Alive campaign and routinely collected data on speeding, which is a good substitute for travel speed. Combining those data with the accident data available from the OAR, provides opportunities to participate in the PROSPER (i.e. carry out ISA modelling).
- The workload of the SAPS and lack of other resources results in a poor quality of road safety data. Centralising the responsibility for road safety data should improve this situation[6].

CONCLUSIONS AND RECOMMENDATIONS

South Africa has a huge road safety problem. A comparison showed that South African cities are 1.5 to 2 times as unsafe as American cities and 2 to 3 times as unsafe as European and Australian cities. Bloemfontein is even worse than other investigated South African cities. As this paper focuses on modelling and road safety data, the measures found in the investigation to improve the road safety situation, are therefore not discussed any further.

Travel speed is not included in the OAR. To be able to participate in the PROSPER project other sources have to be added to be able to do the modelling of Intelligent Speed Adaptation. The Arrive Alive campaign and routinely collected data on speeding provide the required travel speed information. Integration of the OAR data and these sources needs further investigation.

It is noted that a modelling programme is only as good as the data used in it. Modelling programmes are used to establish the applicability of safety measures through the use of traffic accident data. The extent to which modelling is possible will depend on the accuracy of the traffic safety data and the reliability and validity of the analytical method chosen to do the analysis. South African road safety data is of poor quality[7]. Even though new collection forms and procedures are introduced in South Africa the situation has not improved (yet). Moreover new forms and procedures mean discontinuity, which affects the usability for models.

For modelling purposes a way has to found to deal with missing data. An additional investigation will look into this matter.

The first step in achieving the goal of increased accuracy, comprehensiveness, and timely capture of South African traffic accident data lies in commitment, management and leadership. It was found that it is more likely to achieve this by centralising responsibilities.

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6 During the investigation it was already found that some South African provinces are improving the road safety data collection situation.

7 Data is also often only available after a couple of years. The data for 1999 was not complete during the investigation.

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M J W A VANDERSCHUREN and **C C IRVINE**

Civil Engineering, Faculty of Engineering & the Built Environment,
University of Cape Town, Private Bag, 7701 Rondebosch

Ms Marianne Vanderschuren obtained her Bachelor's degree in Transport in 1989 at the National College for Tourism and Traffic (NL). She worked as a researcher in the Civil Engineering section at the University of Delft for a year. Between 1990 and 2000, she was a researcher at TNO Inro (Institute for Infrastructure, Transport and Regional Development) of the Netherlands; Organisation for Applied Scientific Research. She was involved in a wide range of topics including transport models, dynamic traffic management, a wide range of (economic) evaluation studies, policy analysis and the impact of new technologies and tourism. She was the project leader of various large national (Dutch) and international (European Union) projects from 1995. In 1999, she obtained her Master's degree in System Engineering, Policy Analysis and Management at the Technical University of Delft. She was appointed a Senior Lecturer, with responsibility for developing the teaching of transport studies, in the Department of Civil Engineering at UCT in 2000.