

# GAUTRANS GUIDELINES FOR THE PROVISION OF PEDESTRIAN AND BICYCLE FACILITIES ON PROVINCIAL ROADS IN GAUTENG

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## ABSTRACT

Provincial roads mostly provide strategic links between different regions and are characterised by a reasonable level of mobility and dispersed accesses – facilities for non-motorised traffic are sparse and generally not provided for. These characteristics as well as the need to plan towards alternative modes of transport as a component of a congestion management strategy, led Gautrans to initiate an investigation for the development of provincial guidelines to cater for non-motorised transport.

The urban sprawl characterising the majority of South Africa's centres of economic activity, has resulted in some of these provincial roads changing their functionality and level in the overall road hierarchy. Urban areas filled in available land along former rural-type roads and thereby changed their functionality and road hierarchy. Many examples exist where provincial roads now operate as normal urban collector arterials or even as local distributor roads. This fundamental change brought about the need to incorporate planning and revised standards that cater for other modes of transport and in particular, non-motorised transport (cyclists and pedestrians).<sup>∇</sup>

The guideline document currently under development by the Department of Transport (National Department of Transport, 2002. Pedestrian and Bicycle Facility Guidelines: Manual to Plan, Design and Maintain Safe Pedestrian Facilities) will serve as overall manual for the detail design and specification of non-motorised facilities.

The focus of the provincial guideline document on cycles and pedestrians, however, will be on guidelines and measures to promote safe, reliable and efficient infrastructure for pedestrians and cyclists moving along provincial roadways within the South African roads context, with particular focus on rural and regional roads incorporated into the urban environs as a result of urbanisation. The focus of the provincial document concerns current on-street realities and how to deal with these. The presence of cyclists and pedestrians is not preferred on higher order mobility roads, and by developing this document Gautrans by no means intend to promote this. The presence of these modes, however, is a reality on many provincial roadways, and guidelines are presented to deal with these.

## 1. INTRODUCTION

Gautrans has, over the past two years, initiated various projects towards addressing congestion on their overburdened road network. This initiative is called the Gauteng Congestion Management Strategy. The objectives of this strategy include the optimisation of existing facilities and the investigation of new strategies towards addressing congestion.

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<sup>∇</sup> *The contents of this study was still under review by Gautrans at the time this paper went to press, and some of it may be subject to change. It is therefore not yet deemed to be official provincial policy.*

One of these strategies was to explore and promote alternative modes of transportation, which includes cyclists and pedestrians (non-motorised transport). Cyclists and pedestrians are prevalent on most of our roadways, whether their presence there was planned for or not. From freeways to minor sub-urban access roads, their presence is an established fact, and is one of the major national road safety concerns.

Furthermore, by formalising and planning for these alternative modes of transport, their use may be encouraged, thereby alleviating the burden on our motorways, improving traffic safety and adding to environmental benefits.

The urban sprawl characterising the majority of South Africa's centres of economic activity, has resulted in changes in the functionality and in the level of overall road hierarchy of some of the provincial roads. Urban areas have filled available land along rural-type roads, resulting in changes of this functionality and the levels in road hierarchy of these roads. Many examples exist where provincial roads now operate as normal urban collector arterials, or even as local distributor roads, contributing towards the congestion problems.

Developing a combined use of (cycle and pedestrian) measures to promote both walking and cycling, expresses a philosophy that emphasises the minimising of the use of measures that negatively affect the "other group", the ongoing consideration of each groups interests, and the serving of each groups interests where possible. (A. Dijkstra, P. Levelt, J. Thomsen et al, 1998: P.1.)

The guidelines that have been developed for Gautrans, as well as those in the national document, strive to be as comprehensive and exhaustive as possible; however, its contents will never be all-encompassing. It should provide qualified engineers, planners and traffic practitioners with the necessary insight and background to plan new facilities and assess existing facilities with a full inventory of quintessential considerations that impact on meaningful and safe outcomes.

The Gautrans Guideline Document was developed with a distinct focus on provincial roads. It does not address conditions on all levels of roadways, as in the National document. The focus of the provincial document concerns current on-street realities and how to deal with these. The presence of cyclists and pedestrians is not preferred on higher order mobility roads, and by developing this document Gautrans by no means intend to promote this. The presence of these modes, however, is a reality on many provincial roadways, and guidelines are presented to deal with these.

## **2. PROBLEM STATEMENT**

### 2.1 Change in Road Functionality

The Gauteng Department of Public Transport, Roads and Works (Gautrans), is responsible for the implementation, expansion, maintenance and management of the provincial road network, as well as co-ordinating standards and activities of the Local Metropolitan Authorities. The provincial road network is intended to fulfil a specific role in the overall hierarchy of roads. The provincial road network was logically assumed to fall in between the role of municipal and national roads.

However, urban areas have expanded onto available land along rural roads resulting in a change to their functionality and road hierarchy. Many examples exist where provincial roads now operate as normal urban collector arterials or even as local distributor roads.

### 2.2 Congestion Management

The provision of non-motorised transport infrastructure and the promotion of these forms of alternative transport form an integral part of congestion management policies in the province.

Funding for the construction of new roads is scarce, and the emphasis has shifted from the building of additional capacity to the management and optimisation of existing roads. One method of managing congestion on existing roads is to encourage its users to change their mode of transport, e.g. to public transport or to non-motorised modes.

### 2.3 Safety

Pedestrian and bicycle safety in urban and rural areas is a serious problem worldwide. Pedestrian and bicycle problems are more prevalent in developing nations owing to the large number of captive users of these modes (especially walking). In South Africa, pedestrian accidents are responsible for up to 40% of roadway fatalities. It is well documented that cyclists and pedestrians (non-motorised transport) are the most vulnerable on our roads. Therefore, serious attention must be given to their safety on all roadways.

### 2.4 Continuity

One of the major factors contributing to the unsatisfactory state of urban mobility, in South Africa and many other third-world nations, is that most attempts to improve mobility were isolated projects with little or no follow-up. This patchwork form of network improvement does not pose a major threat to motorised transport. However, for pedestrians and even more so for bicycle trips, the possibility of making a trip depends largely on the quality of the road network over the entire route. (Marius de Langen and Rustica Tembele, 2001: P.32.)

### 2.5 Availability of applicable guidelines

Numerous documents have been published worldwide focusing on promoting walking and cycling as substitutes or alternatives to motorised vehicle trips. However, the majority of these documents have been focused on first-world nations. The third-world, and more particularly the South African, road environment is different from these scenarios, in the sense that many walking and cycling individuals are a captive road-user group, and therefore have no affordable alternative options for transportation.

Similarly, the majority of international and domestic literature focuses on the implementation of pedestrian and bicycle safety measures and infrastructure in urban areas. There is less information on measures and guidelines to address the effect of urbanisation on previously rural or peri-urban roads and the retrofitting requirements of these roads for the safe and effective accommodation of pedestrian and bicycle traffic.

## **3. OBJECTIVES**

The focus of the Gautrans guidelines document will be on guidelines and measures to promote safe and efficient infrastructure for pedestrians and cyclists moving along major provincial roadways within the South African roads context, with particular focus on rural and regional roads incorporated into the urban environs as a result of urbanisation.

The document specifically provides guidelines for the following:

- The type, location and layout of pedestrian and cyclist crossing facilities to be provided within the provincial road environment.
- The type, location and layout of pedestrian and cyclist movement facilities or walkways / pathways to be provided within the provincial road environment.
- The safeguarding of pedestrians at different places such as public transport termini, construction sites and other pedestrian orientated areas within the provincial road environment.
- The accommodation of persons with special needs, such as the disabled, elderly and children within the provincial road environment.

- Updating existing Gauteng Provincial Government standard and typical road design plans with the abovementioned information.

This document takes existing information regarding the accommodation of pedestrians and bicycles within the urban environment and applies it more specifically to the provincial road environment. The document does not replace nor deviate from the content of the current draft National Guideline on Cycle and Pedestrian Facilities. This document is supplementary to the aforementioned, and provides specific and applicable focus to the realities and challenges facing provincial roads authorities, in terms of planning non-motorised transport and retrofitting of existing roads.

#### 4. QUANTIFICATION OF THE PEDESTRIAN AND BICYCLE SAFETY PROBLEM

The road traffic accident picture is typical of the scenario in developing countries, particularly African countries, where the fatality rates per licensed vehicle can be 20-30 times higher than in European countries. Whereas the situation in industrialised nations is improving, many developing countries face a worsening situation (COLTO, 1998: P.1-3). Figure 1 shows the percentage of fatalities of cyclists and pedestrians on South African roads in comparison with other, developed countries.

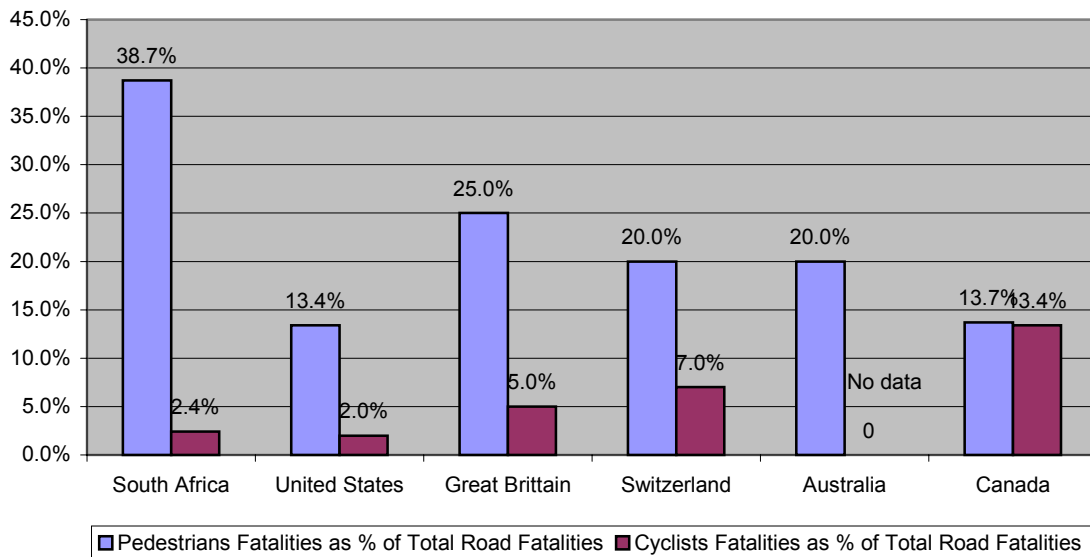


Figure 1. Pedestrian and bicycle fatalities.

During 1996, 9,848 persons were killed in road accidents in South Africa, of which 3,718 (or 37,8%) were pedestrians. A total of 236 (2,4%) pedal cyclists were killed and 3,871 injured on our roads during 1996. Cyclists and pedestrians represent the vulnerable group of road users (COLTO, 1998: P.1-3).

#### 5. NON-MOTORISED ROAD-USER DESIGN CONTEXT

The target group of pedestrians most at risk within the provincial road network scenario is as diverse as the surrounding land-use environment, and vary from location to location. A common denominator for most non-motorised traffic on South African roadways is the *captivity* or *lack of mode-choice* of the grouping.

As far as *cyclists* are concerned, there are three general categories of cyclists that have been identified according to their approximate degree of expertise (NDoT, 2002: P. A.2.3.).

They are:

- the child cyclist
- the “inexperienced” cyclist
- the “experienced” cyclist

Any attempt to plan and design pedestrian and bicycle facilities effectively, requires a thorough understanding of the needs and user requirements of the population being planned for.

Similarly, pedestrian and bicycle modes are relatively similar:

- they are both self-propelled, (prefer flat topography)
- their focus is on relatively short distance trips, (origins and destinations close except for “captive” users)
- they are both vulnerable to the nature’s elements (shelter),
- they are both threatened by motorised vehicles (protection/separation), and;
- their propensity to travel is heavily affected by the extent and quality of specialised infrastructure provided (route choice preference).

The newly revised National Guidelines for Pedestrian and Bicycle Facilities, identifies numerous user requirements and needs, (NDoT, 2002: p. A.3.1 – A.3.7.):

- Security
- Safety
- Speed Differential
- Legal Requirements and Uniformity
- Law Enforcement
- Accessibility
- Convenience
- Comfort

The special user group is expanded in the Gautrans Guidelines to include other equally vulnerable groups such as young children and older persons, no matter how sparsely they are represented on the provincial road network.

## **6. PEDESTRIAN AND BICYCLE DESIGN PARAMETERS**

In order to design a roadway, which safely accommodates all modes of transport competing for the same road space, practitioners should identify these competing transport modes, as well as gain an understanding of their individual operational parameters. The scope of the Gautrans Guidelines under development relates purely to the design and best practice application of pedestrian and cycle facilities, and therefore the design parameters of the following three groups are regarded as important:

- pedestrians
- cyclists, and;
- disabled persons (i.e. blind people, wheelchair users, etc.).

The following topics are covered:

- speed and distance parameters;
- user dimensions;
- sight distances;

The speed differential between the pedestrians (walking at 4 to 5 km/h) and cyclists (travelling at 20 to 25 km/h) is too high (factor four) to be mixing at high intensities.

Similarly, along provincial routes the relative speed difference between motorised transport (travelling at 70 to 100 km/h) and cyclists (travelling at 20 to 25km/h is less (factor 3 or more).

Therefore, pedestrians should be protected to some degree from bicycles, and pedestrians and bicycles should be especially protected against motor vehicles, particularly along provincial routes where vehicle speeds are predictably higher than urban areas.

## **7. CYCLE AND PEDESTRIAN FACILITIES**

Some chapters are dedicated towards different types of cycle and pedestrian facilities and promoting its use through the expansion of facilities. The types of facilities that are covered includes:

- pedestrian sidewalks and walkways;
- bicycle lanes and ways;
- shared pedestrian and bicycle roads;
- pedestrian crossing facilities (grade separated and at-grade)
- supplementary measures (e.g. lighting, road markings, road signs, kerb ramps and tapers, refuge areas and protective devices).

The level of detail is too exhaustive to cover in this paper. As stated earlier, the content thereof was carefully integrated and crosschecked not to contradict that which is stated in the NDoT guideline document.

## **8. PEDESTRIAN AND BICYCLE INTEGRATION WITH OTHER MODES OF TRANSPORT**

The correlation between provincial road-based pedestrians and public transport movements highlights three key focus areas, namely:

- Provision of pedestrian facilities to facilitate the movement of pedestrians to public transport interchanges or public transport stops,
- Provision of pedestrian facilities to facilitate the interaction between the pedestrians and public transport vehicles at modal-interchanges or public transport stops,
- Addressing unregulated crossing of roads within the influence area of public transport interchanges or public transport stops.

Pedestrian trips are integral to a public transport system. Therefore priority should be given to providing facilities that allow pedestrians (and bicycles) access to public transport. It is important to note that the scope of the Gautrans Guideline document underdevelopment is not concerned with the design of these public transport facilities, but rather with the provision of appropriate pedestrian and bicycle infrastructure at these facilities.

The following public transport facility types are discussed:

- Minibus taxi or bus lay-bys (on street) or stops.
- Bus or minibus ranks, termini or holiday areas (off-street) (Gauteng Province BB7; 2002: p.i).

## **9. EVENT MANAGEMENT**

The safe planning and management of special events such as cycle races, marathons and special conferences, based on a predetermined and structured methodology on provincial roads is becoming very important.

Events such as these impact on the roadway's capacity and safety. There is an increasing demand for such activities, and although these events are usually hosted by the private sector, the roads authority providing the infrastructure may be liable for incidents that may occur on the roadway.

Since the Gautrans Guidelines focus on pedestrians and cyclists, the requirements described will focus on events that introduce pedestrians or cyclists onto the roadway. Many of the principles may, however, be applied to other special events such as conferences as well.

Topics that are covered include:

- Event Management Plans
- Command Centres and
- Lanes Closures
- Road Signage

This chapter does not encourage the use of provincial roads for diverse, non-core activities. It does, however, provide guidelines and good practice in the event of it occurring. Figure 2 shows a typical example of some of this chapter's recommended applications.

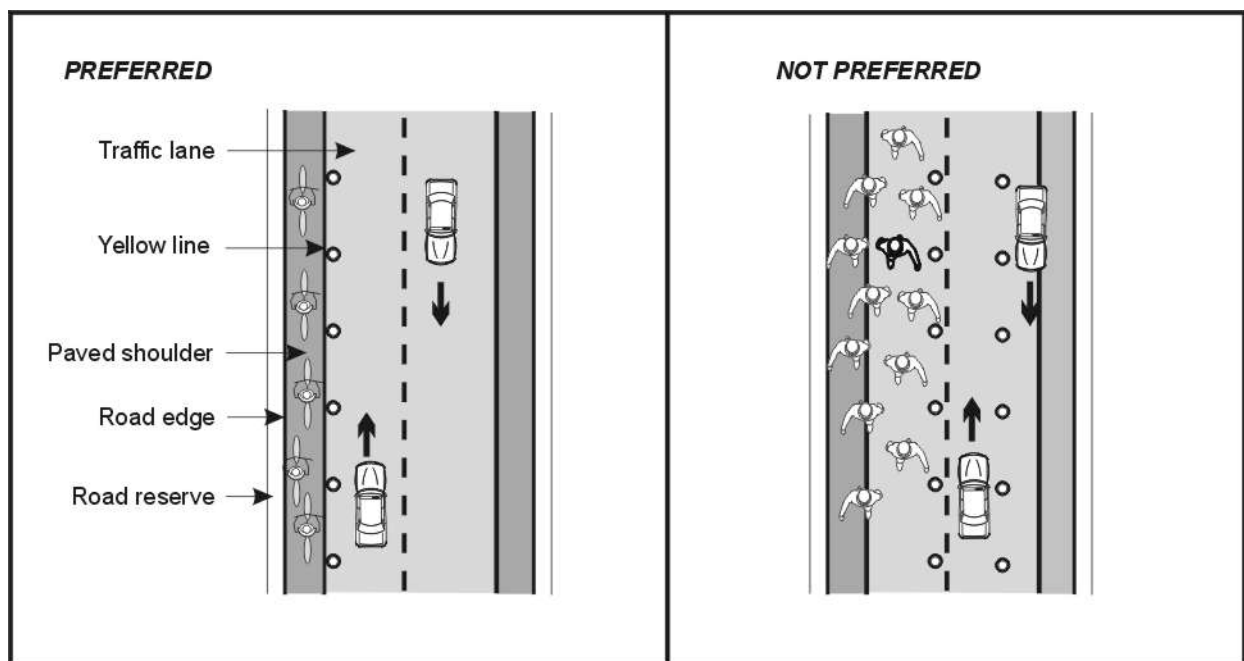


Figure 2. Typical example of event management applications.

## 10. PRIORITISATION OF PEDESTRIAN SIDEWALKS AND WALKWAYS (NDOT, 2002: C.3.21 - C.3.23.)

Since very few provincial roads currently have formal pedestrian and/or cycle facilities, a methodology was required to assist the planner to identify and prioritise roads that are in need of such facilities. A method was devised, based on the same principles as the National Department of Transport's proposed methodology of prioritising sidewalks. (NDoT C3.21 – C 3.23). As with the NDoT methodology, the method has the advantage that, although traffic data can be used if available, it can be also be used with minimal traffic information and based on the practitioners' observations of a particular facility.

A field-observation form was designed and tested to assist practitioners in the execution of this prioritisation procedure. A quick reference summary to the methodology is shown in Figure 3.

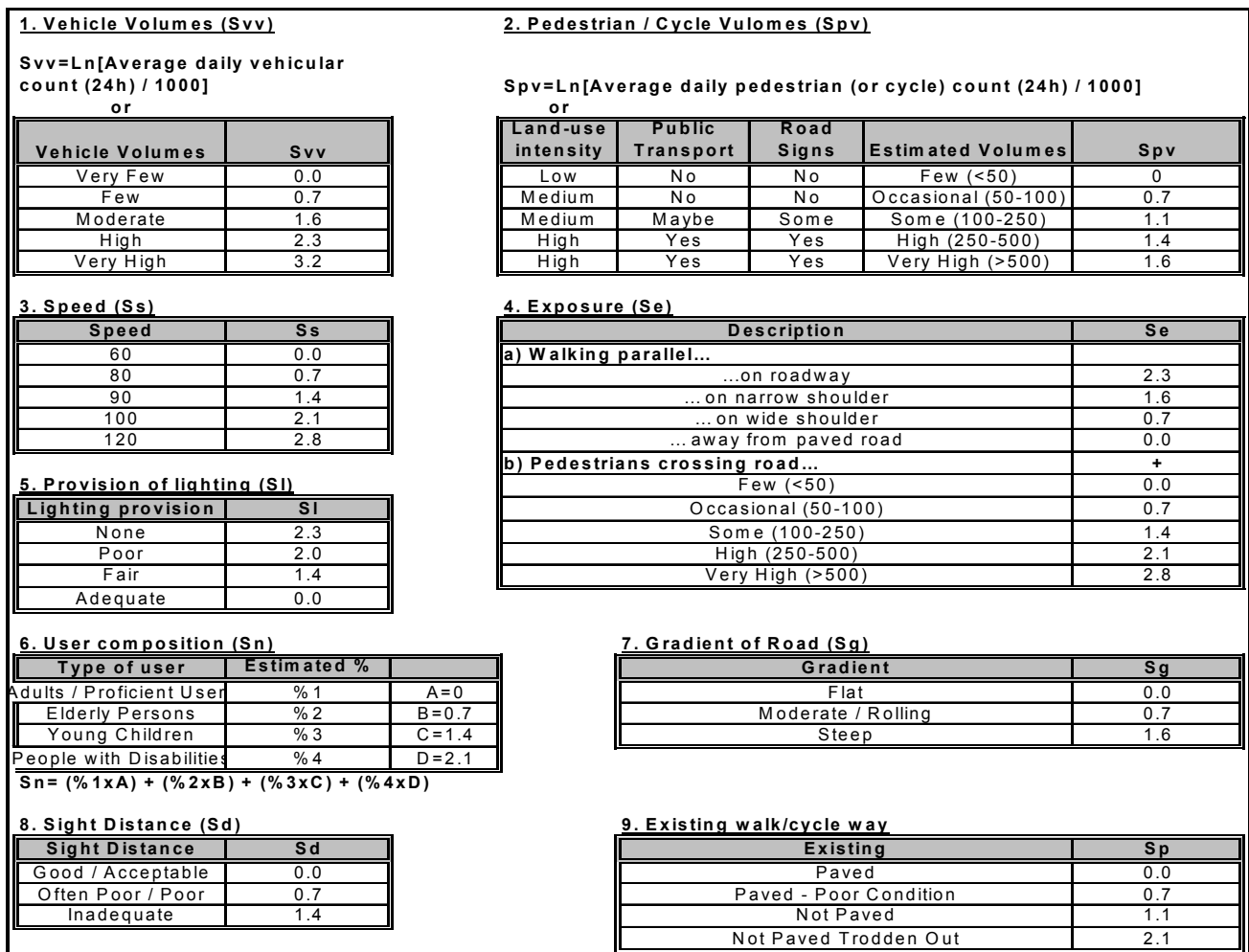


Figure 3. Diagrammatic representation of proposed prioritisation methodology.

Practitioners should refer to all the sections in the guideline document headed “Location and Quantity of Facility Provision” as background to assist with the proposed decision-making process. The first problem that was encountered with the formulation of an appropriate methodology was that different criteria should apply to the assessment of facilities adjacent to the roadway and to facilities crossing a roadway. The probability of pedestrians crossing a roadway increases as the volume of pedestrians increases.

To keep methodology fairly simple, a view was taken not to split the priorities for the provision of crossing facilities and those for parallel facilities, since the objective of this methodology is to identify sections on a road network level, in need of pedestrian or cycle facilities. Once such a list has been distilled for an entire network, a more detailed assessment of these priority areas should be undertaken to provide the planner or practitioner with further information on where, and what type of facilities are required.

Three key motivations for the provision of pedestrian and cycle facilities were identified. They are:

- *Safety*

Traffic safety is considered one of the most fundamental parameters when deciding on the feasibility of providing facilities for pedestrians and/or cycles. Sections 2.3 and 4.1 of the Gautrans Guideline Document provide insight into the magnitude of the traffic safety problems related to non-motorised traffic. A consideration of various factors that directly or indirectly influences the safety of these users are evaluated and taken into account as part of the prioritisation process.



- *Security*  
The provision of facilities, especially in the South African context, should take due cognisance of the relative or perceived security of such a facility. Even though a particular facility may appear to be a very elegant solution to a problem, its utility may significantly be affected by social security issues, for instance at a pedestrian under-pass crossing a roadway.
- *Comfort*  
The attractiveness and hence its ultimate use will depend on the level of comfort derived from a particular facility. Non-motorised traffic, such as cycles and pedestrians, tend to favour areas with a relatively flat topography. Surely this is not always relevant, since a large element of the South African pedestrian population is captive. However, given that there is a choice, pedestrian and cycles will tend to seek the path of the least resistance or the shortest path, providing the best level of comfort.

A points rating system was devised using the above-mentioned key motivations. It was assumed that the cost of providing sidewalks does not vary significantly from location to location (network level evaluation). The methodology scores and evaluates various key parameters and calculates an index that provides a relative rating of prospective projects' potential economic benefits in terms of the three key motivations listed above.

These economic benefits are derived from the cost savings that will be realised by improved safety (decrease in accidents and fatalities), improved security (decrease in crime and personal injury) and improved and disciplined utilisation of formal facilities (possible mode shift and increased utilisation of facilities). Economic feasibility is easily related directly to the improvement of traffic safety. The feasibility of improving security and comfort is, however, more difficult to relate directly to financial feasibility and the relationship is often indirect or closely related to that of improving traffic safety.

The main motivation for the key indicators, therefore focused directly on benefits that may be derived directly from improving traffic safety per se, however, traffic safety and comfort is often implicated as well.

## **11. RECOMMENDATIONS**

Based on the analysis and findings of this report, the following conclusions may be drawn:

- As a result of the large speed differential between pedestrians/bicycles and motorised transport along the provincial road network (factor 3 or more for bicycles and factor 14 – 20 for pedestrians), it is recommended that only pedestrian and bicycle paths, which separate pedestrian and bicycle traffic from the roadway, be implemented along provincial routes.
- A Provincial Cycle and Pedestrian Path Master Plan should be prepared for provincial roads that fall within urbanised areas using the prioritisation methodology described in this document. A program for the implementation of pedestrian and/or cycle facilities along provincial routes should be added to Gautrans' annual capital projects program.
- People require good facilities to encourage them to use other means than a car trip. However, good facilities are not enough; people have other reasons for taking a car instead of walking and cycling. Therefore, it is necessary to accompany a document such as the Gautrans Guideline Document with another project focused on developing a marketing strategy on promoting walking and cycling to replace short vehicle trips. (A. Dijkstra, P. Levelt, J. Thomsen et al, 1998: P.1.)

## 12. REFERENCES

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## Condensed CV Bernard van Biljon

- Born: 1971-06-28 (Pretoria)
- BEng (Civil): 1995 University of Pretoria
- BHons (Traffic and Transportation): 1998 University of Pretoria
- Registered Professional Engineer at the Engineering Council of South Africa
- Corporate Member, South African Institution for Civil Engineering
- Employment Record:

Employee	Duration	Position
National Department of Transport: Directorate Roads	1995-1996	Engineer in Training
Stanway Edwards Ngomane Associates (SENA)	1997-1999	Associate
Booz Allen Hamilton Associates	2000	Associate
Arup	2001	Associate
Karabo Consulting	2002- Current	Managing Director

- Mr. Van Biljon has 7 Years of applicable experience in the field of traffic engineering, transportation planning and traffic safety.
- Delivered a paper on “The Responsibilities of Authorities: Key Technical Requirements and Specifications.” (Transportation Legislation Workshop 2001);
- Officially recognised and credited for reviewing the SADC Road Traffic Signs Manual Volume 3 on Traffic signals.
- Mr. Van Biljon has done extensive work on bicycle and pedestrian facilities for the former Centurion Town Council which included the development of new warrants for these facilities as well as advising on the annual implementation of these facilities.
- Mr. Van Biljon undertook a number of traffic safety studies and recently completed a series of road safety audits for Gautrans.