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The Development of a Road Safety Classification System for South Africa

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ABSTRACT

The importance of roads which serve as the literal link to access economic development necessitates the existence of an effective road classification system. While functional classification systems implicitly address road safety requirements, there is a need for a more focused road safety-based classification system for South Africa as a developing country. Leading international standards describe 20 possible road classification categories in comparison with South African standards which describes two context classes namely “urban” and “rural” offering 12 possible road classification categories. This study is based on the statistical analysis of 83 intersections in the eThekwini Metropolitan Municipality road network. The data analysis of accident reports, traffic counts and Geographic Information System data has produced results that show a strong correlation of crash risk with road classification. The results of the data analysis indicate that the implied hierarchal structure of functional, road classification systems does not correspond with the hierarchy of road safety risks. The research methodology incorporated correlation and regression analysis with an Akaike Information Criterion (AIC) model comparison. The development of a standalone or appended road safety classification system would empower road authorities with adequate tools to attract funding of road safety projects.

1. Introduction

The South African functional road classification system is described by the Technical Recommendations for Highways (TRH) document titled “TRH26: The South African Road Classification and Access Management Manual” (COTO, 2012). This document enables road authorities to fulfil their obligations for the planning, design, development and management of the South African road network. The practical application of road classification and access management in the South African road safety context is however affected by limited budgets.

While transportation engineering standards and best practice standards are “on paper”, theoretically effective, the reality is that budget allocation across complex, differing transportation engineering needs is often the deciding allocation factor. Road authorities such as municipalities typically develop road management plans according to best practice guidelines. These plans may then be used as motivation for the annual capital budget and operational budget allocation, which is then apportioned based on aspects such as new road construction, upgrades or maintenance. Limited budgets, however, require focused management systems to ensure the highest return on investment. This is supported by NDOT (2004:15) as cited in Ross & Townshend (2018) which states that the functional classification system was not intended to suggest how to allocate priorities and funding allocation. A study by Paraphantakul (2014) of worldwide road classification themes reveals that developing countries have less road classification categories than more developed countries such as those of Europe and America.

It may therefore be suggested that the need for economic development or the development of road networks often supersedes other road classification priorities. The recommendation is for a Road Safety Classification system to be developed for South Africa which would ensure that road authorities are able to motivate for, and manage additional budgets specifically targeted at road safety needs.

2. Road Classification Concepts

The Netherlands provides the concept of sustainably safe traffic as described by Wegman & Aarts (2006, as cited by Dijkstra, 2011). The three primary principles described are:

- ***Functionality***

Functionality should ensure that the planned use of the road is aligned to actual use with minimal conflict between the functions of mobility and access.

- ***Homogeneity***

Homogeneity is required to limit speed differentials, reduce directional conflicts, and to separate different road users, especially vulnerable road users such as pedestrians and cyclists from motorized vehicles.

- ***Predictability/Expectancy***

Road user expectancy or predictability increased by consistent; road characteristics, design, familiar traffic systems and behavior.

Research on the risk of crashes between different road classes is described by Janssen (2005, as cited by Dijkstra, 2011) in terms of crash rates or crashes per million vehicle kilometers. The research indicates significantly higher crash risk on urban main roads which would in the South African context be largely equivalent to the TRH26, Class 2 and Class 3 roads. The statistical analysis of variables affecting crashes is described by Dijkstra (2011) as models designed to predict or prioritize the risk of crashes. These crash prediction models have revealed intersection density and road length as significant variables.

A study on vehicle speed and road crash risk by Aarts & Van Schagen, (2006) found that crash rate or risk increases faster with an increase in speed on minor roads compared to major roads. In addition, roads with larger intersection densities have higher crash frequencies. The increased crash risk due to speed variance is related to heterogeneity in traffic composition and road users. A greater mix of vehicle types such as heavy vehicles in addition to increased volumes of vulnerable users such as pedestrians increases crash risk.

Vehicle speed is highly significant in terms of crash risk and is an often-underestimated variable. “Survivable speeds” are described by the RTMC (2022) with the publication of the guideline document titled “South African Road Safety Assessment Methods” (SARSAM). Crash types when combined with vehicle speed leads to the concept termed “Survivable Speeds” which is described by RTMC (2022) as the speed threshold corresponding to a fatality risk of 10%, and above which threshold the risk of fatal or serious injury rapidly increases. The non-linear relationship between impact speed and injury indicates that the risk of injury doubles by every 5% increase in speed. The guideline document highlights a 10% or lower fatality risk as the “tolerable” level of risk in terms of crash impact speed for various crash types.

The relatively low impact speed as described in Table 1 below places vulnerable road users such as pedestrians and cyclists at the highest risk of fatal or serious injuries and is a factor that is further amplified in the context of developing countries.

Table 1. Relationship between vehicle speed and fatality risk.

SURVIVABLE SPEEDS FOR CRASHES (RTMC, 2022)	
Highest Risk Crash Types	"Survivable impact Speed" (+- 10% fatality risk)
Car* with pedestrian or cyclist	30 km/h
Car* with motorcyclist	30 km/h
Car* with tree/pole (run-off road)	40 km/h
Car* with Car* (side impact)	50 km/h
Car* with Car* (head-on impact)	70 km/h
* Car represents any medium/large size motorized vehicles but excluding small vehicles such as motorcycles	

Source: (RTMC, 2022)

3. South African Road Classification Systems

There are various road classification systems in use in South Africa, developed for specific purposes. This includes road classification systems for functional classification, administrative classification, route number classification, road traffic signs manual classification and classification for pavement management systems. The most prominent classification system in South Africa is the functional classification system as described by Technical Recommendations for Highways (TRH) document titled “TRH26: The South African Road Classification and Access Management Manual” (COTO, 2012)

COTO (2012) describes the following benefits for road classification and access management:

- Enables the efficient flow of traffic with reduced travel time and road user costs. Examples as to how the mobility function may be enhanced include the installation of non-traversable medians which enables capacity improvements of arterials by approximately 50%.
- Improved traffic safety. The majority of road accidents and collisions occur on accesses and intersections. Access management has shown to reduce accidents by up to 50%.
- Reduction in road construction costs and efficient use of resources. This effect is a benefit of efficient traffic flow as the capacity of existing roads are improved, negating the need for additional road construction or road widening.
- The provision of clear guidelines ensures that all development is subject to the same standards ensuring equality, equity and thereby preventing preferential treatment.

- Land use and transport integration. Roads must be provided to support the land use. Access management will enable the optimum use of funds which may promote the upgrading of existing roads rather than the costly construction of new roads.
- Improve social benefits of access roads in residential areas by safeguarding communities from the negative effects of higher traffic speeds and through traffic.
- Environmental quality is improved by an improved traffic flow, a reduction in vehicle emissions and the need for new road construction.
- Numerous economic benefits, such as reduced travel cost and an increase in the market area value due to reduced travel times.

The road management system provided by COTO (2012) is based on the concept of accessibility which is a combination of mobility and access. It is unfortunately not possible to achieve a high level of both mobility and access for the same road space. It is of particular importance to road safety that COTO (2012) makes allowance for the retrofitting of access management measures. This is applicable to existing roads that may be built to standards that do not match the road function. This conflict between mobility and access is very apparent at the function changeover or boundary which occurs at Class 3 and Class 4 roads. The problem is further exacerbated over time by road authorities relaxing access requirements for new developments often under significant pressure by developers. This occurs often as a process of attrition ascribed to the shorter-term needs of a developing country. The risk of crashes is unfortunately obstinately higher on Class 3 arterial roads which now accommodate a greater mix of access and mobility (Sarjoo & Allopi, 2020). The need for retrofitting is also due to many roads constructed decades prior when access management principles were not fully developed and practiced. The retrofitting techniques as proposed by COTO (2012) are aligned to well-known road safety countermeasures such as the installation of median barriers, intersection upgrades, parking control and traffic calming.

4. International Road Classification Systems

An historically early report of road classification was provided by Buchanan (1963, as cited in COTO, 2012), which describes roads consisting of only two types, namely distributors designed for movement (mobility) and access roads to serve buildings or properties. This road classification concept of mobility and access is a globally common theme and further expanded in modern-day standards. A worldwide review of road classification standards as described by Marshall (2002, as cited by Paraphantakul, 2014) describes four primary classification categories, namely; form, use, relation and designation. “Form” describes the physical characteristics of the road as the supply side, while “use” refers to the function or usage of the road as the demand side. “Relation” describes the relative structure of the road and road network, while “designation” means the allocation or allowance of roads for specific road users, for example, pedestrians only, buses only or special speed limits. An analysis of international road classification systems revealed that functional themes are the predominant themes with the categories of link role, access control and functions used by 100%, 54% and 79% of all countries respectively. The least used themes include road surface type and administration. The worldwide review of 28 countries across the continents of Asia, Australia, Europe, North America and Africa have highlighted the commonly used road classification categories. However, the most striking aspect of the review was unfortunately the absence of any clearly defined road safety categories. While many classification systems may refer to road safety aspects within existing systems, a need exists especially for developing countries to create a stand-alone or clearly defined road safety classification system.

The road design policy of the United States of America is led by the AASHTO document titled “A Policy on Geometric Design of Highways and Streets” published in 2018 and is also known as “The Green Book”. The South African guideline documents however are partly based on significantly older versions of the AASHTO standards as described by Jones (2002). Guideline manuals published by South African government entities range from the “Urban Transport Guidelines” (UTG1) published by the Council for Scientific and Industrial Research in 1996 to the “Geometric Design Guidelines” (G2) published by the South African National Roads Agency in 2002. While there have been recent documents such as “South African Road Safety Assessment Methods” published by the RTMC in 2022, there are unfortunately no updated documents that incorporate road safety into the planning and geometric design process with the most recent publication being more than 20 years old.

The notable, novel framework proposed by AASHTO (2018) is a road classification system that is expanded to include both functional classes and context classes. The greater detail provided for road classifications allows for further homogeneity of road classes and greater statistical accuracy of any required data analysis. The South African standards described by “The South African Road Classification and Access Management Manual” (COTO, 2012) describe in comparison only two context classes namely “urban” and “rural”, which results in the South African road classification system offering 12 possible road classification categories in comparison with the AASHTO (2018) classification framework with 20 possible road classification categories. The road classification system serves as an integral starting point for road design and maintenance as well as budget allocation across the extensive South African road network.

The South African public road network is managed by governmental road authorities broadly defined as either local municipal government, provincial government or national government. The comparison and benchmarking of the AASHTO (2018) road classification framework and the South African (COTO, 2012) guidelines are shown in Table 2 below:

Table 2. Road Classification: Benchmarking of AASHTO and COTO standards

ROAD CLASSIFICATION FRAMEWORK								
"THE GREEN BOOK" (AASHTO, 2018)						TRH26 (COTO, 2012)		
Functional Class	Context Class					Functional Class	Distinction/Context	
	Rural	Rural Town	Suburban	Urban	Urban Core		Urban	Rural
Freeway						Principal Arterial (Class 1)		
Arterial Road or Street						Major Arterials (Class 2)		
						Minor Arterial (Class 3)		
Collector Road or Street						Collector Street (Class 4)		
Local Road or Street						Local Street (Class 5)		
						Walkway (Class 6)		

The necessity of the new additional context classes of “rural town”, “suburban” and “urban core” are described by AASHTO (2018) and based on the following factors:

- Development density or the presence of buildings and other structures.
- Land use types such as residential, commercial, industrial and agricultural.
- Building setbacks described as the distance of buildings to adjacent roads.

The context classes may also be determined by means of site visits or the use of aerial photographs without the need for detail analysis. This methodology is favorable to developing countries due to the more cost-effective data analysis, much of which can be obtained from freely available GIS software such as Google Earth. AASHTO (2018) also describes that while demand flows for motorised transport have been the basis of road design for many years, greater attention should be paid to demand flows for pedestrians and cyclists.

The importance of access control is emphasized by AASHTO (2018) which states that roads with full access control show reduced crash rates of up to 50% when compared to roads with no access control. In addition, each additional access point per kilometer increases the crash rate by approximately 5%. Access control is regarded as the most important road design criteria that reduces crashes by means of reducing the number, frequency and variety of events that road users come across. Road designs should reduce the number of driver decisions and improve driver expectancy. Another key aspect advocated for is a forgiving roadside design that acknowledges that mistakes are possible by even the most skilled driver or cautious road user. Typically, there is a loss of vehicle control when drivers stray or depart from the travel lane. A forgiving approach to roadside design allows for a recovery area where space permits or in more restricted environments the removal of hazardous roadside objects and safeguarding by means crash attenuation devices such as guardrails. In summary, road design decisions should be reviewed in terms of a performance-based design approach where an estimate of crash frequency and crash severity may be obtained from available methodology and resources such as the Highway Safety Manual (HSM) (2010).

5. Status Quo of Road Classification and Road Safety Initiatives in South Africa

The benefits of an updated functional road classification system for the eThekwini Metropolitan Municipality (EMM) are described by Mckune & Dookhi (2013) as improved functionality of the road network by means of the correct classification and partitioning of mobility and access functions. The revised classification of the EMM road network as according to the Road Infrastructure Strategic Framework for South Africa (RISFSA) aims to achieve road user equality and to resolve past imbalances. The re-classification of the road network in the South African road safety context requires the retrofitting of infrastructure for busy routes with both high traffic volumes and greater density of accesses. The retrofitting interventions to reduce speed limits and improve safety may include traffic calming measures such as speed humps and Non-Motorized Transport (NMT) facilities such as sidewalks. The retrofitting of road safety measures highlights the need for more flexible road classification systems.

Road classification methodologies, whether functional based or road safety based allows for the effective allocation of resources. The Department of Transport (2016) as part of its National Road Safety Strategy (NRSS) (2016 – 2030) describes South Africa as a developing country with limited monetary and human resources. Existing resources are therefore inevitably channeled towards activities that directly enable economic growth and development. Resources for road safety initiatives are consequently very limited. The NRSS provides a prioritization matrix for the planning of interventions and the allocation of resources.

The matrix graphically prioritizes road safety interventions in terms of two variables, namely “ease of implementation” and “impact”. The most favorable activities are defined by easy implementation or “quick wins” combined with high impact. The most favorable primary activities focus on human factors, such as road user behavior, law enforcement and elimination of fraud and corruption. High ranking matrix activities also include the identification and treatment of high-risk crash locations, the protection of vulnerable road users (VRU’s) and the ensuring of adequate funding and capacity. The South African Institution of Civil Engineering (SAICE) report of road infrastructure as described by Slabbert et al. (2023) indicates that many key risks to the state of road infrastructure can be mitigated by improving and maintaining the capacity of skilled professional staff.

The NRSS strategic objective titled "Improve coordination and management" offers alternative opportunities for resources in the form of private public partnerships. This form of risk allocation assigns risk to those parties best suited to manage the risk and consequently with mutually beneficial results. A successful industry initiative in collaboration with government support is the self-regulation of the heavy vehicle sector by means of the SANS 1395-1:2012 Road Transport Management Systems (RTMS) (Nordengen & Naidoo, 2016). The RTMS system aims to address issues of overloading, deficient vehicle maintenance and driver fatigue which all contribute to poor road safety outcomes. RTMS certified companies have recorded numerous benefits which include improved supply chain efficiency, reduced crash rates, improved fuel consumption and reduced damage to road infrastructure due to overloading. RTMS certified companies have achieved substantial reduction in crash rates, with companies such as Barloworld Logistics and Timber Logistics Services achieving 66% and 50% reduction of annual crashes respectively (Nordengen & Naidoo, 2016).

The eThekwini Road Safety Plan (eThekwini Municipality, 2022) has developed an action plan targeting areas with the highest fatal and serious injuries. The data analysis is based on data for a 5-year period, from 2015 to 2019. Data for the period 2020 to 2021 was analyzed separately to account for the effects of the Covid-19 pandemic. The results reveal that pedestrians accounted for 65% of all fatalities for the period 2015 to 2019. The Durban Central Business District (CBD) is identified as the area with the highest number of fatal and serious injuries at 11.5% followed by Umlazi and Pinetown. The results, align with similar research conducted for the City of Tshwane Metropolitan Municipality (CTMM) where the highest accident rates were measured in the Pretoria CBD and previously disadvantaged areas (Sarjoo & Allopi, 2020). Accident rates are dependent on existing traffic count data which often do not include pedestrian counts and therefore does not provide a true reflection of pedestrian crash risk exposure.

Crash risks are in addition not aligned to the TRH26 functional classification system where data indicates that the majority of fatal and serious injuries are on Class 2 and Class 3 major and minor arterial roads as shown in Figure 1.

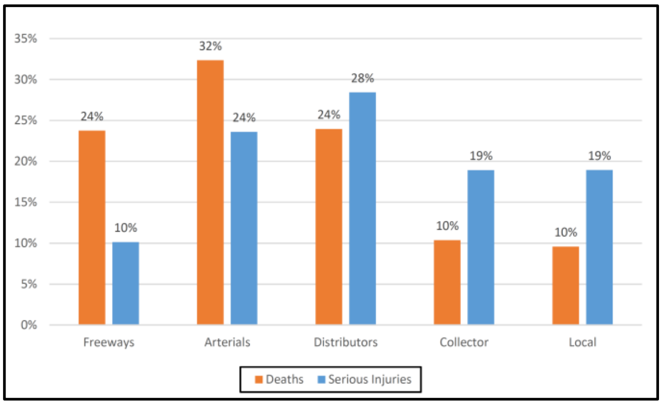

Figure 1. Death and serious injuries per road type (2015 – 2019)
Source: (eThekwini Municipality, 2022)

The TRH26 classification system is largely categorized according to design speed and traffic volumes, however crash rates appear to follow a ranking based on the number of traffic conflicts per vehicle kilometer. This may be supported by the greater number of accesses and pedestrians on Class 2 and Class 3 roads. This often-unintended mix of access and mobility is indicative of a developing country continuously aiming to improve economic development. In order to account for the changing functions of road classification systems it is proposed that a road safety classification system or ranking is appended to the existing functional classification system in order to account for equitable resource allocation to high-risk areas. High risk areas are defined by high crash rates and high pedestrian volumes which often include CBDs and previously disadvantaged areas. It is proposed that the road safety classification system includes additional context classes such as "Urban (CBD)" and "Previously Disadvantaged Areas".

6. Research Methodology

This study is based on the statistical analysis of a pilot set of data comprising 83 intersections in the eThekwini Metropolitan Municipality (EMM) road network which were sampled by means of a stratified random sampling method based on road classification. The data was then analysed in terms of accident frequencies and accident rates according to well established formula. The Crash or Accident Frequency made use of 10 consecutive years of accident data (2014 to 2023) and is represented by the formulae below in Equation 1 and Equation 2:

$$Crash\ Frequency = \frac{\sum Crashes\ over\ 10\ years}{10\ years} \qquad (1)$$

Crash rates are determined on the basis of exposure data, such as traffic volumes and the length of road section being considered. Commonly used rates are Rate per Million of Entering Vehicles (RMEVs) for intersections and Rate per 100 Million Vehicle Kilometres (RMVK) for road segments (Garber & Hoel 2015: 190).

$$Crash\ Rate\ (RMEV) = \frac{Crashes\ per\ year \times 1\ 000\ 000}{Annual\ Average\ Daily\ Traffic} \qquad (2)$$

The research study followed a quantitative paradigm, making use of primary and secondary data. The primary data was obtained from Geographic Information System (GIS) software in order to determine intersection control types and to confirm functional and context based road classification. Secondary data was obtained from the eThekwini Transport Authority's (ETA) Accident Database. The data is fortunately captured and nationally standardized in terms of the South African Police Service (SAPS) Accident Report (AR) form. Accident Severity Rates were calculated making use of the Safety Priority Index System (SPIS), which provides weighted values for fatal, serious injury, slight injury and damage only accidents (RTMC, 2022).

The study analyzed data in terms of the methodology described by Accident Prediction Models (APM). An Accident Prediction Models (APM) is defined by Eenink et al, (2008) as a mathematical formula describing the risk level of existing roads and the variables that explain this level. Explanatory variables may include lane width, curve radii, traffic volume, etc., with research indicating that APM's for different countries will not be comparable thereby requiring that separate APM's be developed per country or region. Models were tested in terms of gaussian, poisson, and negative binomial distributions in order to select the best fit making use of an Akaike information criterion (AIC) model.

7. Data Analysis and Findings

The Akaike information criterion (AIC) model analysed data in terms of differing distribution criteria in order to select the most appropriate model. The AIC comparisons included gaussian distributions, Poisson distributions and negative binomial distributions. The results indicate that the crash data follow non-linear distributions and that the negative binomial distribution was the preferred model, with poisson distribution the second ranked model and the gaussian distribution as the least suitable model. The results match the expected nature of crash data as described by Yannis et al (2017) where a review of 85 regression equation APM's, reveal the three most commonly used APM's being; the generalised linear model (GLM) using a negative binomial distribution; poisson regression model; and artificial intelligence techniques such as artificial neural networks (ANN's).

The "nonlinear" relationship described by the negative binomial distribution of crash data indicates that comparing crash rates or crash frequency with the more linear, hierarchal, functional road classification system reveals that the highest crash risk is not found in the highest road class (Class 1) but actually located in the lower hierarchy Class 2 and Class 3 roads. Funding for road safety projects therefore cannot be allocated in a linear manner based on road class or traffic volumes but should be based on accident risk. The results of the Pearson and Spearman correlation analysis as described by Table 3 below indicate that the variable accident frequency shows a very strong correlation with the variable Average Daily Traffic (ADT). In comparison the variable road classification shows a moderate Pearson correlation strength of -0.48 to Accident Rate. The categorical nature of road classification describes a negative correlation which indicates that as road classification increases (Class 1 to Class 6) accident frequency is expected to decrease.

Table 3. Pearson and Spearman correlation coefficients.

eThekwini Metropolitan Municipality - Intersection Analysis					
Variable 1	Variable 2	Pearson correlation	Pearson p-value	Spearman correlation	Spearman p-value
Average Daily Traffic	Crash Frequency	0,85	<0,01	0,81	<0,01
Average Daily Traffic	Crash Rate	0,64	<0,01	0,57	<0,01
Average Daily Traffic	Crash Severity Rate	0,62	<0,01	0,56	<0,01
Intersection Class	Crash Rate	-0,48	<0,01	-0,55	<0,01
Intersection Class	Crash Severity Rate	-0,47	<0,01	-0,56	<0,01

The results suggest that Accident Frequency is not strongly related to road functional classification or traffic volumes. The correlation coefficients suggest a stronger relationship as the number of potential conflicts increase which is present in road types that combine both access and mobility functions. This study therefore proposes two additional context road classes defined as "Urban CBD", and "Previously Disadvantaged Areas" which require separate analysis due to crash rates that deviate significantly from other road classes. A proposed risk matrix based on the revised road classification classes is provided as shown in Table 4.

Table 4. Proposed Road Classification System

Road Class	Function	Context Class - Relative Crash Risk Rating			
		Urban	Rural	Urban (CBD)	Previously Disadvantaged Areas
1	Mobility	Category C: (Medium Risk)	Category C: (Medium Risk)	Category B: (High Risk)	Category B: (High Risk)
2		Category B: (High Risk)	Category B: (High Risk)	Category A: (Very High Risk)	Category A: (Very High Risk)
3		Category B: (High Risk)	Category B: (High Risk)	Category A: (Very High Risk)	Category A: (Very High Risk)
4	Access	Category C: (Medium Risk)	Category C: (Medium Risk)	Category A: (Very High Risk)	Category B: (High Risk)
5		Category D: (Low Risk)	Category D: (Low Risk)	Category B: (High Risk)	Category C: (Medium Risk)
6		Category E: (Very Low Risk)	Category E: (Very Low Risk)	Category D: (Low Risk)	Category E: (Very Low Risk)

The proposed Road Safety Based Classification system due to the pilot dataset is both quantitively and qualitatively based; however additional data would likely only produce minor changes to the proposed risk matrix concept. The results indicate that the TRH26 functional classification system which is based on AASHTO standards may be more suitable for developed countries. The undesirable mix of mobility and access which prioritizes economic development as typical of developing countries creates a road network with conflicting functions that requires additional road safety classification systems.

8. Conclusions

The research study has revealed that accident rates and accident frequencies follow a distinctive pattern in terms of two key variables, namely Average Daily Traffic (ADT) and Road Classification Context. The matrix pattern in terms of high-risk context variables for the eThekwini Metropolitan Municipality are corroborated by a similar study conducted for the City of Tshwane Metropolitan Municipality. The structure of the risk matrix may be generalized to the South African road network and to many other developing countries. The new road classification categories and crash risk matrix as proposed would be beneficial to road authorities, consulting engineers, and other engineering professionals.

The benefits include the ability to motivate and attract the resources for road safety projects as well as routine road maintenance projects. In addition, design standards, either national, provincial or local, may be revised to account for high-risk roads. Initiatives such as the “eThekwini Complete Streets Guideline” document may be advanced to move away from soft guidelines towards creating minimum standards aimed at improving road safety. An example of human resource initiatives would be for municipal road safety personnel to form part of the team responsible to review and approve wayleave applications. This would ensure that public and private developers are adequately mandated to “design for safety” and would increase road safety infrastructure such as the construction of sidewalks for all new road projects on Class 2, Class 3 and Class 4 roads.

It is recommended that further research is conducted by national, provincial and other local road authorities to ensure that data for all road classes are adequately analyzed to develop a new road safety classification system. Research results indicate that pedestrian and other NMT traffic volumes are typically not accounted for during traffic count activities. This missing NMT data is crucial to adequately assess risk where the highest risk of injuries and fatalities are accidents involving pedestrians. The proposed road safety classification system may be adopted by road authorities as a standalone classification system or a system that may be appended to the existing TRH26 functional road classification system.

References

[1] Aarts, L., & Van Schagen, I. (2006). Driving speed and the risk of road crashes: A review. Accident Analysis & Prevention, 38(2), 215-224.

[2] AASHTO, (2018). A Policy on Geometric Design of Highways and Streets. 7th Edition, The American Association of State Highway and Transportation Officials, Washington DC, USA.

[3] Committee of Transport Officials. (2012). South African road classification and access management manual (TRH26). Pretoria: SANRAL.

[4] Dijkstra, A. (2011). En route to safer roads. How road structure and road classification can affect road safety.

[5] Department of Transport. (2016). National road safety strategy 2016-2030. Pretoria: Department of Transport.

[6] Dumbaugh, E., & Gattis, J. L. (2005). Safe streets, livable streets. Journal of the American Planning Association, 71(3), 283-300.

[7] Eenink, R., Reurings, M., Elvik, R., Cardoso, J., Wichert, S., & Stefan, C. (2008). Accident prediction models and road safety impact assessment: recommendations for using these tools. Institute for Road Safety Research, Leidschendam.

[8] eThekwini Municipality. (2022). eThekwini Road Safety Plan (2022-2026). Durban: eThekwini Municipality.

[9] Garber, N.J. & Hoel, L.A. (2015). Traffic and highway engineering. 5th ed. Boston, MA: Cengage Learning.

[10] Jones, D. (2002). The development of SATCC standard specifications and design guides for roads and bridges. SATC 2002.

[11] McKune, A., & Dookhi, R. (2013). Functional classification of roads in the eThekwini Municipal area. Civil Engineering= Siviele Ingenieurswese, 2013(8), 42-43.

[12] Nordengen, P., & Naidoo, O. (2016). Evaluation of the Road Transport Management System: A Self-Regulation Initiative in Heavy Vehicle Transport in South Africa. Towards Innovative Freight and Logistics, 2, 15-27.

[13] Paraphantakul, C. (2014, November). Review of worldwide road classification systems. In Proceedings of the 9th National Transportation Conference, Bangkok, Thailand (pp. 20-21).

[14] Road Traffic Management Corporation. (2022). South African Road Safety Assessment Methods. Pretoria. Road Traffic Management Corporation.

[15] Ross, D., & Townshend, M. (2018). An economics-based road classification system for South Africa.

[16] Sarjoo, A., & Allopi, D. (2020). Non-motorised transport and intersection crash prediction models. IMIESA, 45(7), 14-16.

[17] Slabbert, F., Newlands, A., & Vanderschuren, M. (2023). Road infrastructure report: A deep dive into SA’s roads–Part 6. Civil Engineering= Siviele Ingenieurswese, 31(11), 36-43.

[18] Yannis, G., Dragomanovits, A., Laiou, A., La Torre, F., Domenichini, L., Richter, T., Ruhl, S., Graham, D. & Karathodorou, N., (2017), October. Road traffic accident prediction modelling: a literature review. In Proceedings of the institution of civil engineers-transport (Vol. 170, No. 5, pp. 245-254). Thomas Telford Ltd