

MEASURING ROAD TRAFFIC SAFETY PERFORMANCE

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ABSTRACT

What is road traffic safety? Traditionally, road traffic safety has been seen as a measure of the number of road traffic crashes and casualties resulting from crashes per time period, usually during peak traffic weekends such as Easter, or a month or a year. The number of crashes and casualties are also expressed in terms of rates, such as the number of fatalities per vehicle kilometres travelled, the number of registered vehicles and the human population. These rates are used to determine trends over time. An increase in trends generally indicates a decrease in “safety”, while a decrease in trends indicates an improvement.

The purpose of this paper is to provide some information on the measures that are used to determine the *level or degree of road traffic safety*. The current measures are mainly based on un-planned random incidents: crashes and casualties. A recommendation is made for the development and adoption of a **Road Safety Index (RSI)**, which should be used in future as the main indicator of the level of safety on the road and street network. The proposed **RSI** is not only based on crash and casualty information, but also the *level of lawlessness* and the level or degree of *effort put into curbing the level of lawlessness* or, alternatively – to improve the level of law compliance.

There would be a variety of elements and sub-elements included within the *Law Compliance* and *Traffic Management Indicators*, each of which will be able to be monitored individually. The relationship between the Law Compliance and Traffic Management Indicators will be referred to as the **Traffic Performance Index (TPI)**, similar to, for example the Consumer Price Index (CPI).

The relationship between the Traffic Performance Index and the Road Crash Indicator, termed the **Road Safety Index (RSI)** will be monitored on a monthly basis to determine the optimum and most cost-effective utilisation of traffic management resources to achieve an acceptable level of safety in relation to the Road Crash Indicator. An “*acceptable level of safety*” amongst others, depends to a large extent on the availability of resources; the effectiveness of traffic interventions; willingness of drivers to change their behaviour; etc and still needs to be determined once the indicator and index system is developed and operational.

1. INTRODUCTION

Traditionally road traffic safety has been seen as a measure of the number of road traffic crashes and casualties resulting from crashes per time period, usually during peak traffic weekends such as Easter, or a month or a year. The number of crashes and casualties

are also expressed in terms of rates, such as the number of fatalities per vehicle kilometres travelled, the number of registered vehicles and the human population. These rates are used to determine trends over time. An increase in trends generally indicates a decrease in “safety”, while a decrease in trends indicates an improvement.

The Road Traffic Management System is a complex one, consisting of many stakeholders and role-players that need to be interactively involved on a continuous basis to ensure that optimisation of quality in road traffic is obtained. Various functional areas are involved in traffic management, which is the daily responsibility of many Road Traffic Management Authorities at the various levels of Government across the country.

Measures currently in place to measure road safety or, alternatively to measure the performance of the various traffic authorities and other role-players in achieving their goals, are mainly based on un-planned random incidents: the number of road traffic crashes and casualties. A recommendation is made for the development and adoption of a *Road Safety Index (RSI)*, which should be used in future as the main indicator of the level of safety on the road and street network. The proposed *RSI* is based not only on crash and casualty information, but also the level of lawlessness and the level or degree of effort put into curbing the level of lawlessness or, alternatively – to improve the level of law compliance. A simplified schematic presentation of the proposed *RSI*, indicating links with a Road Crash indicator and a Traffic Performance Index is shown in Figure 1 below. The Traffic Performance Index is based on a Law Compliance Indicator and a Traffic Management Indicator.

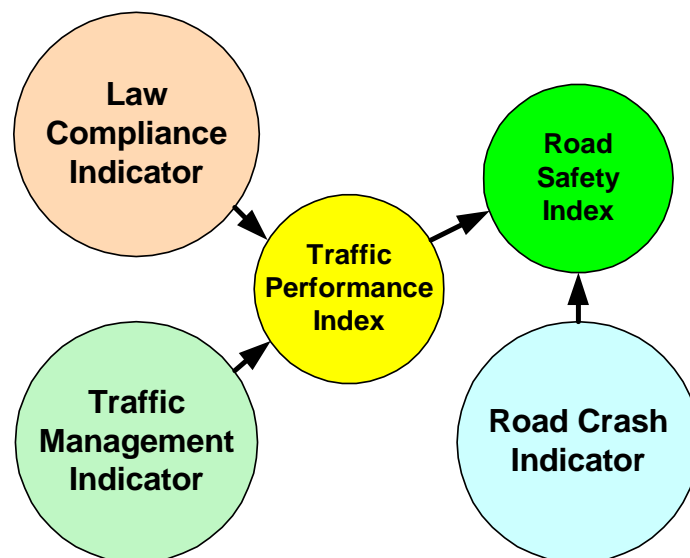


Figure 1: Simplified representation of elements contributing to the proposed Road Safety Index (RSI)

There would be a variety of elements and sub-elements included within the Law Compliance and Traffic Management Indicators, each of which will be able to be monitored individually. The relationship between the Law Compliance and Traffic Management Indicators is meant to determine the effect of the level of traffic management in general on the level of law compliance, measured by the Law Compliance Indicator, and will be referred to as the ***Traffic Performance Index (TPI)***, similar to, for example the Consumer Price Index (CPI).

Before discussion of the various factors that need to be considered for the calculation of the Road Safety Index in more detail, some elements within the total traffic management system are briefly discussed below.

2. ELEMENTS OF ROAD TRAFFIC MANAGEMENT

Road traffic safety is, amongst others, a measure of the **Quality** of the various elements within the total road traffic environment. This quality reflects the overall risk associated with participation in road traffic. The road traffic environment consists of a great variety of interactive elements, which affects the quality of road traffic to a greater or lesser degree. The main functional areas, from a management point of view, are grouped and briefly described under three basic overall categories, “**Before**”, “**During**” and “**After**” below. However, these elements actually form a circle with some of the “After” elements providing an input for decisions and changes in the “Before” category. The various elements within the three categories are given in Table 1 below.

Table 1: Elements of Road Traffic Management

Main Category	Elements within Category
“Before”	Traffic legislation, standards, policies, strategies, manuals
	Road user group education, training & testing of driving abilities
	Vehicle registration, licencing and testing for fitness
“During”	Road safety communication: Arrive Alive & Traffic Call Centre
	Traffic law enforcement
	Incident management & emergency services
	Roadway quality & safety audits
“After”	Adjudication of traffic offences
	Care of traffic crash victims & Road Accident Fund
	Monitoring, evaluation, research, remedial measures, development, implementation

2.1 The “Before” Category

These elements are required to be complied with before venturing into the road traffic environment and must be revised, updated and amended in accordance with continuous identified needs and changing circumstances:

2.1.1 Road traffic legislation, standards, policies and strategies

Which set and generally prescribe the standards and conditions according to which the various elements within the road traffic environment must operate;

2.1.2 Road User Groups

Consisting of drivers, pedestrians and passengers in vehicles, which have to be educated and trained. Drivers must obtain categorised driving licences which qualify them to drive specific types of vehicles in accordance with conditions prescribed in legislation. Education can be formal or non-formal and include adult education programmes. In the process the Department of Education is also involved in the education of school children. Drivers need

to be trained, tested and licenced. Driving licence testing centres are involved in the process.

2.1.3 Road Vehicles

Consisting of motorcars, trucks, bicycles, etc. which have to comply with prescribed requirements regarding registration, licencing and standard minimum fitness aspects. All road vehicles need to be registered and licenced with annual licence renewals and compulsory fitness inspections for certain vehicle types on an annual basis. Vehicle testing stations are involved in the process.

The above elements are put in place to ensure that road users are adequately trained, skilled and medically fit and that vehicles comply with all identification documentation and fitness requirements before the human-vehicle combination start participating in road traffic.

2.2 The “During” category

These elements are put in place to ensure that all the “before” requirements are complied with during participation in the road traffic environment and, if not, to have measures in place to deal with such non-compliance or to provide assistance in case of unplanned events and incidents:

2.2.1 Road Safety Communication

Continuous and effective road safety communication with all road user groups through a variety of communication media such as radio, TV, posters, pamphlets, flyers, newspapers, magazines, personal letters from the Traffic Call Centre, media events, etc is essential to remind drivers and owners and other road users of the requirements for safe traffic participation; as well as to inform them of new requirements.

2.2.2 Traffic Law Enforcement

To monitor, control and inspect driver and vehicle compliance with traffic legislation. To be effective, enforcement plans and operations must be harmonised with road safety communications – Arrive Alive.

2.2.3 Incident Management

To ensure that adequate and effective incident management plans, rescue measures and a variety of resources are in place and available to, as swiftly and efficiently as possible, attend to any unplanned event, incident or crash in the road environment. Although there are many other organisations and role-players involved (SAPS, ambulance, fire-brigade, tow-in service, hospitals, etc), it is the responsibility of the road traffic management function to ensure that these services are adequately geared towards delivering an efficient and effective service in the road traffic environment.

2.2.4 Road and Street Environment

These must at all times comply with the required minimum design, maintenance and operational standards, with particular emphasis on: riding quality of the pavement, the relevance, adequacy and condition of road signs and markings and the presence of animals and pedestrians. It is the responsibility of the road traffic management function to ensure that these requirements are met through the undertaking of regular road safety audits. (Note: the road and street environment also forms part of the other categories).

2.3 The “After” category

The main objective of road traffic management is to reduce the risk in road traffic and to get road users safely to their destinations. This is, however, not always achievable. These “after” elements are put in place as measures to penalise non-compliance with traffic legislation, standards, requirements or procedures that increase the risk and the attendance to road traffic victims who were involved in incidents, or to identify and effect reactive remedies to unsafe elements in the road traffic environment.

2.3.1 Adjudication

The admission of guilt by erring drivers, vehicle owners or transport operators through the payment of fines in terms of notices issued through the law enforcement process, or the suspension of driving licences, awarding of demerit points in terms of AARTO, or handing out of jail sentences to severe offenders through the adjudication process.

2.3.2 Care of road traffic crash victims

Which include health care and rehabilitation for injured persons or the burial of persons who lost their lives in fatal crashes. Although the main responsibility in this area lies with the Department of Health and other organisations, the burden on the Health sector in this regard will be reduced to a large extent through a reduction in road traffic crashes and resulting casualties. This also includes payment of compensation to road crash victims by the Road Accident Fund and the setting-up and management of trauma centres for victims.

2.3.3 Monitoring, identification, development and implementation of remedial measures

This must be a continuous process to identify and analyse all possible elements and aspects within the road traffic environment with the view to effect improvements to the quality thereof for safer participation. This involves, amongst others, the continuous collection and analysis of road and traffic information, identification of elements that reduce the quality in road traffic, evaluate alternative remedial measures, make recommendations for the implementation of improvements, monitor the effect thereof, etc. This aspect also involves research into all the elements that are encompassed within the road traffic environment. Timely information and research applications contribute in reducing the risk in road safety through effecting pro-active measures within all the functional areas or individual elements within traffic management.

Until a few years ago, the active role of traffic management was mainly seen in the “Before” and “During” elements. It was only recently that initiatives such as, for example the Administrative Adjudication of Road Traffic Offences (AARTO) in the “After” adjudication group was developed. It is foreseen that, in order to provide an overall improved service to road users, more initiatives will have to be identified and developed in the latter group.

3. CONTRIBUTING FACTORS TO ROAD TRAFFIC CRASHES

Traffic crashes do not just happen – they happen because of certain real contributory factors. These contributory factors are circumstantial elements that are present at the time of the crash and are generally classified under four main categories, namely: **human, vehicle, roadway and the environment**. The first three factors reflect human and authority behaviour, attitude and performance, while the fourth factor, the environment

could, to a certain extent, be regarded as being beyond the control of the driver or the authorities.

It is further accepted that 95% or more road traffic crashes happen as a direct result of traffic offences or non-compliance with prescribed norms and standards. In this regard the human element plays a major role. For example, should a crash result from a tyre burst, generally classified under *vehicle factors*, it still is the responsibility of the driver or owner of the vehicle to see that the worn or damaged tyre is replaced timeously.

Major traffic offences and contraventions that mostly contribute to traffic crashes or the severity of crashes, have been identified and to some extent monitored during the past few years through independent Annual Traffic Offence Surveys. These include:

- **Driver offences:** driving while under the influence of alcohol; unsafe and illegal overtaking across barrier lines or in the face of oncoming traffic; ignoring red traffic signals and stop signs; non-wearing of seatbelts and excessive speed. Other driver offences reflect reckless, negligent, inconsiderate and aggressive behaviour and include inadequate proof of their ability to drive through failure to produce a valid driving licence or professional driving permit.
- **Vehicle contraventions:** poor tyres and brakes; faulty steering and defective lights. Other “vehicle” offences include non-submission of vehicles for compulsory vehicle fitness testing (trucks, buses and minibus taxis and other vehicles on change of ownership); fitting of false vehicle licence plates, etc. Overloaded vehicles that damage the road network and contribute towards unsafe driving conditions can also be added to the above.

Amongst others, these offences and contraventions need to be curbed by introducing effective traffic management measures.

4. MEASURING ROAD TRAFFIC SAFETY: INDICATORS AND INDEXES

As indicated under section 1 above, it is proposed that three main indicators be developed, with the inter-relationship between the three being termed the **Traffic Performance Index** and the **Road Safety Index** respectively. Each of the proposed main indicators, namely the “**Law Compliance Indicator**” (**LCI**), the “**Traffic Management Indicator**” (**TMI**) and the “**Road Crash Indicator**” (**RCI**), are discussed in more detail below, after a brief discussion of the information needs, availability and other requirements for this purpose.

4.1 Information Needs and Requirements

There are a great variety of bits and pieces of data and information available from various sources which could be used for this purpose. However, in order to “measure” the various elements and sub-elements within each indicator in order to determine the level or degree of road safety, *continuous, adequate, reliable and relevant data and other information* is required. It is further required that only those elements that are *measurable* and will serve as a *meaningful indicator*, should be used.

It is a further prerequisite that the data and information to be used for this purpose must be *easy to collect and analyse* and the relationship between various sets of data and information must provide a *true as possible reflection of the level of road safety*. Some of the required data and information is only available from other role-players and not readily obtainable.

All these issues were taken into consideration in the development of the proposed indicators discussed below.

4.2 Law Compliance Indicator (LCI)

The proposed Law Compliance Indicator (LCI) will reflect the general level of lawlessness of road users, or put in a positive way, the degree or level to which road users comply with the law. It is proposed that the term law compliance rather be used for this purpose. This indicator will reflect the issues briefly discussed under section 3 above.

There are various types of information that could be used for the determination of the LCI, however, considering the issues discussed under 4.1 above, it is recommended that the Law Compliance Indicator (LCI) should consist only of the elements and sub-elements from four categories given in the table under **Annexure A** and briefly discussed below.

- Contributory factors to crashes: traffic offences and contraventions, as obtained from accident reports;
- Unfit drivers and vehicles: drivers that failed to renew their licences or public driving permits; as well as un-licenced and un-roadworthy vehicles, based on information contained in the National Traffic Information System (NaTIS);
- Traffic offences: the number of notices issued for traffic violations, based on weekly traffic authority reports and the Card Verification Device (CVD);
- Traffic offence rates: number of drivers and vehicles committing offences or not complying with legislative requirements, as obtained through regular independent traffic offence surveys.

All the above sub-elements will be weighted according to the nominal group technique before inclusion in the individual element groups. Similarly the groups of elements will be weighted before inclusion in the individual categories. In turn, the four categories will be weighted before processing into an overall **Law Compliance Indicator (LCI)**, which should be calculated on a monthly basis. The information obtained from the *Annual Traffic Offence Surveys* will be added on an annual basis.

4.3 Traffic Management Indicator (TMI)

The proposed Traffic Management Indicator (TMI) will reflect the degree or level of performance of the various functional areas, stakeholders and role-players within the traffic management system towards improving law compliance, discussed under section 2 above. Although it would have been ideal if sub-indicators could be developed for each of the 11 listed sub-categories and the other issues within the system, this would not be practically possible. The direct contribution of some issues towards influencing traffic safety, would also not be easy to quantify. Issues in this regard, for example include, amongst others and because of various reasons, the following:

- Traffic legislation: although it might be known that certain amendments to traffic legislation are required, there is no easy and simplistic manner to incorporate such a need in a sensible manner in an indicator.
- Traffic education at schools: although this would be a useful sub-element to include in the “before” category, the obtaining of the annual number of learners that received road safety education at all the various primary and secondary schools would be virtually impossible.

Again, considering the issues discussed under 4.1 above, it is recommended that the Traffic Management Indicator (TMI) should consist only of the elements and sub-elements selected from five “***During***” and “***After***” main categories from section 2 above, details of which are given in the table under **Annexure B** and briefly discussed below.

- Road safety communication: the number of TV and radio advertisements broadcast for the promotion of road safety and the number of persons reached;
- Traffic law enforcement: the number of traffic roadblocks conducted per location per time period, the number of drivers and vehicles stopped and checked, as well as the number of law enforcement hours;
- Incident management: the percentage of roads covered by adequate and effective incident detection and response plans and systems, including the availability of emergency services;
- Road conditions: the percentage of the different categories of roads (national, main, minor and tertiary) that are in a poor, good and excellent condition; and
- Adjudication: the percentage of successful traffic prosecutions and traffic notices paid by offenders within the prescribed time limits; as well as the number of drivers and operators to whom 8 or more demerit are allocated, once the AARTO system is operational.

As in the case of the LCI, all the above sub-elements will be weighted according to the nominal group technique before inclusion in the individual element groups. Similarly the groups of elements will be weighted before inclusion in the individual categories. In turn, the five categories will be weighted before processing into an overall ***Traffic Management Indicator (TMI)***, which will be calculated on a monthly basis. The information obtained for *Incident Management* and *Road Conditions* will be added only on an annual basis.

4.4 The Traffic Performance Index (TPI)

The Traffic Performance Index (TPI) should be determined on a monthly basis through the relationship between the Law Compliance Indicator (LCI) and the Traffic Management Indicator (TMI). The LCI should increase on an increase of the TMI. This relationship will not be a simple straight line. The initial monthly increases in the LCI is expected to be slow to follow an increase in the TMI, but should show significant increases, for example on the introduction of AARTO and a continuous and effective increase in the level of traffic enforcement. Once the first monthly TPI has been determined, this will be used as a benchmark for all other monthly TPI’s to follow. The expected theoretical line of the TPI, following desired increases in both the LCI and the TMI, is shown in Figure 2 below.

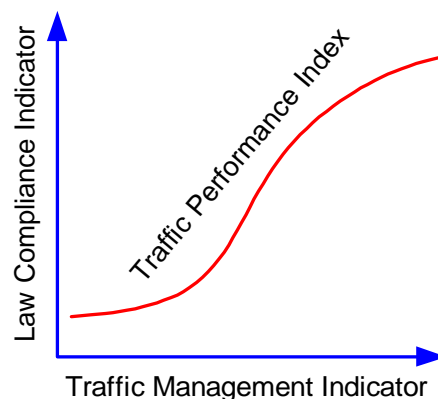


Figure 2: The proposed Traffic Performance Index (TPI)

The total methodology to be developed will allow for the trace-ability of all individual sub-elements in both the LCI and the TMI that could be responsible for positive and negative changes, resulting in the TPI to improve or alternatively, to deteriorate.

4.5 The Road Crash Indicator (RCI)

In order to measure changes in the occurrence in road traffic crashes it is proposed that a Road Crash Indicator (RCI) be introduced. The RCI will take into account certain issues related to crashes that should be effected by changes in the Traffic Performance Index (TPI). It is recommended that the elements within the fatal traffic crash information system, shown in the table below, be utilised for the calculation of the RCI.

Table 2: Road Crash Indicator (RCI)			
Source	Availability	Elements	Sub-elements
National Fatal Crash Information Centre	Monthly	Crashes	Fatal crashes per crash type
			Fatal crashes per time of day
			Fatal crashes per day of week
		Fatalities	Fatalities per crash type
			Fatalities per vehicle population
			Fatalities per User Group
		Vehicles	Vehicles per type in fatal crashes

As in the case with the LCI and TMI explained above, the sub-elements will be weighted according to the nominal group technique before inclusion in the individual element groups. Similarly will the groups of elements be weighted before inclusion in an overall **Road Crash Indicator (RCI)**, which will be calculated on a monthly basis. This RCI will reflect positive and negative changes in both the Law Compliance and the Traffic Management Indicators through the Traffic Performance Index (TPI).

Once a reliable National Crash Bureau has been established of which the information can be trusted, information on other categories of crashes must be included in this indicator.

4.6 The Road Safety Index (RSI)

In order to reflect the safety status of the overall road traffic environment, it is recommended that the Road Crash Indicator (RCI) be linked to the Traffic Performance Index (TPI) through a **Road Safety Index (RSI)**.

The RSI will be only one figure that will reflect the overall status of basically most of the elements within the road traffic management scene: the level of lawlessness; the efforts to promote law compliance; as well as the effect thereof on the number of crashes. The relationship between the Traffic Performance Index (TPI) and the Road Crash Indicator (RCI) should be such that an increase in the TPI and an expected corresponding decrease in the RCI, should result in an increase in the Road Safety Index (RSI), thus indicating an overall improvement in the level of traffic safety. The RSI would be calculated and compared on a monthly basis. Should the efforts to improve traffic safety be successful, the expected relationship between the TPI and RCI to provide the RSI is indicated in Figure 3 below.

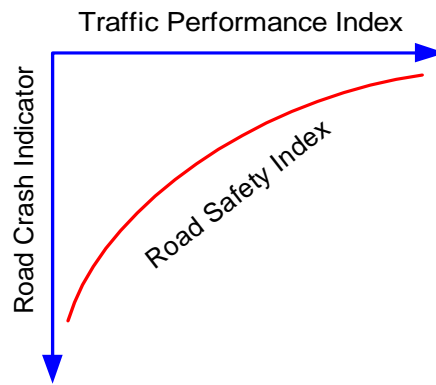


Figure 3: The proposed Road Safety Index (RSI)

5. SUMMARY

The development and introduction of indicators and indices are important tools with which to manage a great variety of sub-elements and elements simultaneously within the various categories of issues contained in the overall traffic management system. Such indicators and indices provide collective information about changes in performance, inputs, results and outcomes at a glance, while allowing back-tracing to view possible reasons within individual sub-elements that contributed to such changes.

The inter-relationships between the various sub-elements, elements and categories have to be simplified, weighted and grouped to provide simplified and meaningful overall indicators. It is essential that these indicators and their inter-relationships must measure quantifiable, meaningful elements that can be changed through the setting of targets.

The three indicators and two indices discussed above, will be calculated on a monthly basis per Province in order to allow for comparisons between the various Provinces; as well as to obtain a wider spread of information to determine reasons for variations in trends, i.e. changes. The Provincial figures will be combined to obtain national figures.

All the indicators and indices discussed under section 4 above are summarised and their inter-relationships shown in the schematic presentation in **Figure 4** below.

Road Safety Index

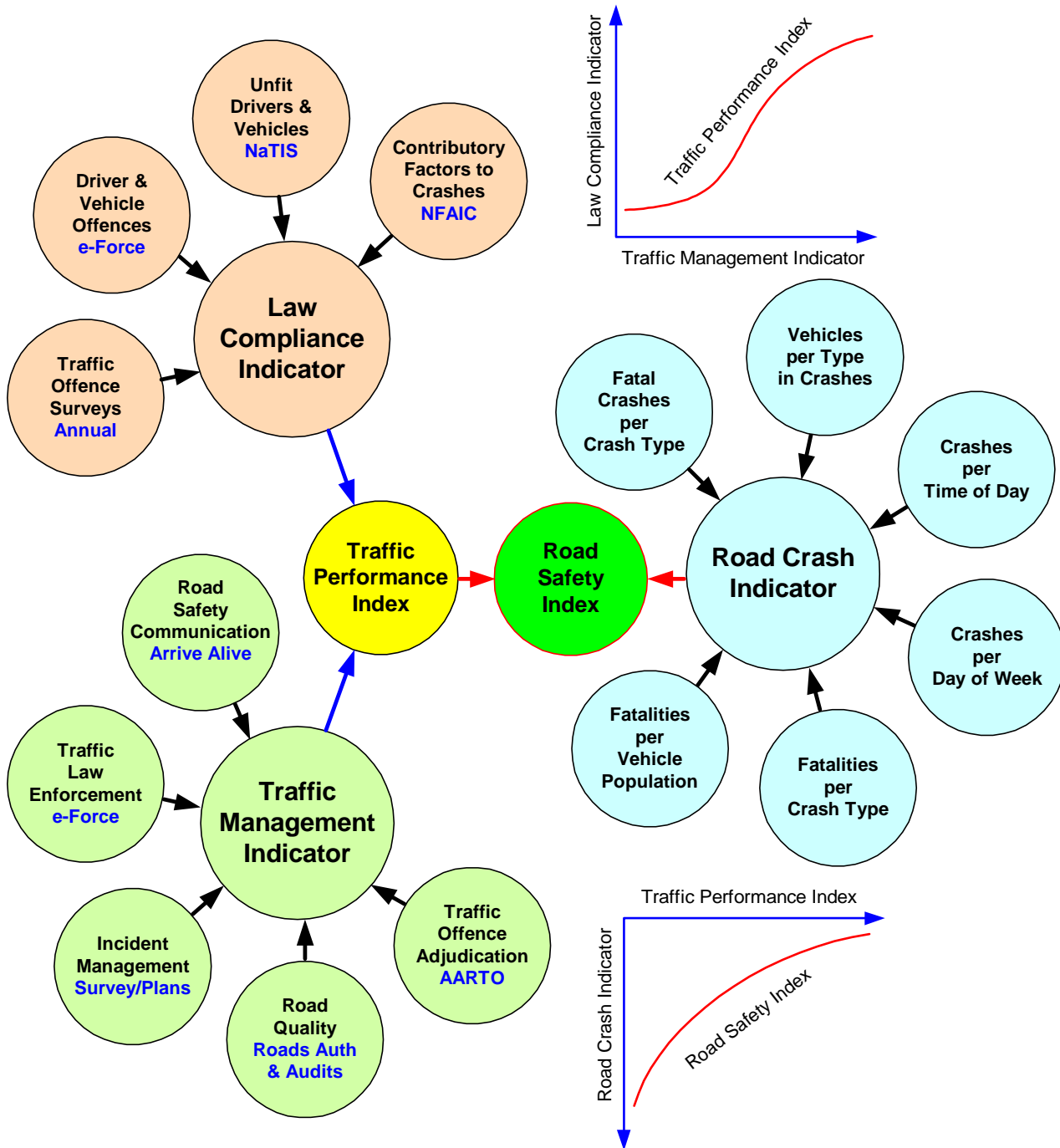


Figure 4: Summary of all the elements involved in the calculation of the proposed overall Road Safety Index (RSI)

6. DISCUSSION

It should be the objective of any Road Traffic Management Authority, regardless if such an authority operates at National, Provincial or Local levels of Government, to enhance the **overall quality of road traffic service provision** and, in particular, to **ensure safety, security, order, discipline and mobility on the road and street network**.

Although there are many other areas in which such authorities have to achieve their stated objectives, the main objectives are essentially summarised above. It is therefore important

for continuous performance measuring procedures to be developed and incorporated in the operational plans of each authority in order to prove the achievement of these objectives.

The proposed procedure contained in this paper will provide the Traffic Management Authorities with such a performance measurement tool, amongst others to:

- Measure the overall, general quality of road traffic service provision, road safety, order and discipline;
- Measure the efficiency, effectiveness and quality of performance of the specific functional areas included in the proposed performance measuring procedures;
- Enable the setting of realistic, attainable performance targets within the limits set by available human resources, budgets, equipment, etc, (business **not** as usual);
- The identification of problem areas and at least the issues that have a direct influence on the level of safety; etc
- Give direction towards improvements to be made in certain areas; the investigation, research and evaluation of alternative measures to be implemented; as well as monitoring of the changes effected; and
- Provide information for the preparation and submission of monthly and annual performance reports to Management.

This paper, amongst others, refers to **order** and **discipline** – a direct reflection on road user lawlessness. Currently too much emphasis is placed on the high, absolute number of road crashes and resulting fatalities. The media promotes this emphasis, particularly during certain times of the year. Somehow high crash statistics and traffic volumes, etc tend to point a finger at the authorities for not doing their jobs properly. It is strongly recommended that the emphasis on road safety should be steered much more towards the **contributing factors** to road crashes. Much more blame for the unsafe traffic situation should be apportioned in the media to the lawlessness of drivers, owners and operators. Such a step should result in these road user groups more readily accepting their share and co-responsibility for improving road safety.

In this regard it is recommended that, in particular, the Law Compliance Indicator (LCI), the Road Crash Indicator (RCI) and Road Safety Index (RSI), once developed and operational, should be published widely on a regular monthly basis in the media. Particular detail of certain critical elements and sub-elements within the LCI should also be highlighted.

7. RECOMMENDATION

In view of the above it is recommended that:

- The proposed system of indicators and indices be developed and introduced to serve as a performance management system which will also reflect the overall level of performance of each Road Traffic Management authority towards achieving its goals; and
- That every effort be made to re-direct the emphasis on crashes and fatalities through the media to law compliance to effect improved co-responsibility of road users in traffic safety.

8. REFERENCES

- [1] Van der Walt, J.P. and Barnard, S.J. (1997), Manual on the management model for traffic authorities, Department of Transport, Pretoria (Report WA 11/15/8 H)
- [2] Arrive Alive Monitoring and Reporting, Report on a Selection of Road Traffic Offences : 2003, ITP Consortium on behalf of the Department of Transport, 30 September 2003.
- [3] Road Transport Research (1997a), Performance indicators for the road sector, Prepared by OECD Scientific Expert Group, OECD, Paris (IRRD No.: 887580)
- [4] Road Transport Research (1997b), Road safety principles and models, OECD, Paris (IRRD No.: 888815)
- [5] Road safety diagnostic system for South Africa. Master's Thesis carried out at the Linköping Institute of Technology, Linköping University. Sweden, Stefan Lötter, February 2000.
- [6] Macro-Level Evaluation of Road Safety Improvement Interventions : An Evaluation of the Arrive Alive Phase 1 Road Safety Campaign. Master's Thesis carried out at the Faculty of Engineering, University of Pretoria, South Africa, Ida van Schalkwyk, February 2000.
- [7] China Society of Traffic Engineering, Proceedings : The second conference on Asian Road Safety, Beijing, China, October 1996
- [8] Road Transport Research, Targeted road safety programmes, Prepared by OECD Scientific Expert Group, OECD, Paris (IRRD No.: 864087), 1994
- [9] Van Tonder, H. and Botha, G, The Road Traffic Management Corporation (RTMC), Paper presented at South African Transport Conference – Session B: traffic management and safety, CSIR, Pretoria, July 1999.
- [10] Commission of the European Communities. European Road Safety Action Programme :
- [11] Halving the number of road accident victims in the European Union by 2010: A shared responsibility. COM (2003) 311, Brussels, 2 June 2003.
- [12] Unpublished document for the Road Traffic Management Corporation, Measuring Road Traffic Safety, A Performance Management Model, August 2004.

ANNEXURE A

Law Compliance Indicator (LCI)				
Category	Source	Availability	Elements	Sub-elements
Contributory Factors to Crashes	Fatal Crash Information Centre	Monthly	Drivers	Alcohol, overtaking, skipping red robot, etc
			Vehicles	Tyres, brakes, lights, steering, etc
			Road	Potholes, slipperyness, poor road signs, etc
			Environment	Rain, fog, mist, cattle, animals, etc
Unfit Drivers & Vehicles	NaTIS	Monthly	Drivers	% expired driving licences and PrDP's
			Vehicles	% un-licenced & un-roadworthy vehicles
Traffic Offences	e-Force Juggernaut	Monthly	Drivers	% drivers issued with notices for alcohol, driving licences, etc
			Vehicles	% vehicles issued with notices for brakes, steering, lights, etc
Traffic Offence Surveys	Special Surveys	Annually	Drivers	% drivers committing offences w.r.t alcohol, driving licence, etc
			Vehicles	% vehicles with contraventions w.r.t brakes, steering, lights, etc

ANNEXURE B

Traffic Management Indicator (TMI)				
Category	Source	Availability	Elements	Sub-elements
Road Safety Communication	RTMC Communication functional area & Traffic Call Centre	Monthly	Television	Number of TV adverts
				Total TV time (minutes)
				Number of persons reached
			Radio	Number of Radio adverts
				Total Radio time (minutes)
				Number of persons reached
Pamphlets	Number of pamphlets distributed			
Personal letters	Number of letters posted			
Traffic Law Enforcement	e-Force Register & Juggernaut reports	Monthly	Roadblocks and other operations	Number of roadblocks conducted
				No. of vehicles stopped at roadblocks per officer-hour
				Total no. of officer-hours law enforcement
Incident Management	Roads authorities	Annually	National roads	% of roads covered by adequate incident plans
			Other major roads	% of roads covered by adequate incident plans
			All other roads	% of roads covered by adequate incident plans
Road Condition	Roads authorities	Annually	National roads	% of roads in poor, good and excellent condition
			Other major roads	% of roads in poor, good and excellent condition
			All other roads	% of roads in poor, good and excellent condition
Adjudication	e-Force Register & AARTO	Monthly	Offence notices	% successful prosecutions
				% notices paid in time
			AARTO	No. of drivers & operators allocated more than 8 points