Interim

Hazardous Locations

in South Africa

July 2017
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1. PURPOSE

The Goal of defining Hazardous Locations in South (HazLocs) is to provide an evidence-based approach of identifying areas where road safety efforts such as traffic law enforcement, road safety engineering and road safety education should be focussed to reduce road related trauma due to road crashes on South African Roads.

2. TARGET AUDIENCE

The HazLocs is relevant to all government agencies, national, provincial and local road authorities and any individual or organisation aspiring to execute road safety related activities to reduce road related trauma on South African roads.

The HazLocs will be reviewed and updated on an annual basis as and when new road crash statistics are published by the RTMC.

3. ALIGNMENT WITH EXISTING INITIATIVES AND STRATEGIES

The HazLocs complements and supports existing international and national road safety initiatives and strategies. These include inter alia:

3.1. The National Road Safety Strategy 2016-2030 (NRSS)

The vision of the NRSS is to ensure “Safe and secure roads”. This will be achieved by delivering on the strategic mission to attain a reduction in the number of fatal crashes, promoting responsible road user behaviour and providing safe road infrastructure on South African roads and delivering quality road safety management with results focussed approach

The NRSS guides the national strategy towards concentrating road safety efforts across various functional areas pertaining to hazardous locations inter alia:

- To improve spatial development planning and ensure regular assessment of roads in hazardous/high risk locations to address road safety”
• To continuously identify hazardous/high risk road locations and remedy with focused interventions
• To identify top Vulnerable Road Users (VRU) hazardous/high risk locations on a continuous basis and address them.
• To improve enforcement effectiveness and start regular national traffic patrols along hazardous/high risk locations.
• To develop a list of its highest priority hazardous locations specifically for VRU’s, for systematic attention
• To implement traffic management plans for education institutions and suggested that the most hazardous locations be identified first and that the action start there immediately

3.2. The United Nations Decade of Action for Road Safety 2011-2020

The UN Road Safety Collaboration developed a Global Plan for the Decade of Action for Road Safety 2011-2020 with input from many partners through an extensive consultation process through meetings and the Internet. The Plan provides an overall framework for activities which may take place in the context of the Decade. The categories or "pillars" of activities are: building road safety management capacity; improving the safety of road infrastructure and broader transport networks; further developing the safety of vehicles; enhancing the behaviour of road users; and improving post-crash response. Indicators have been developed to measure progress in each of these areas. Governments, international agencies, civil society organizations, the private sector and other stakeholders are invited to make use of the Plan as a guiding document for the events and activities they will support as part of the Decade.

In May 2010, the UN General Assembly proclaimed the period 2011–2020 as the Decade of Action for Road Safety, with a goal to stabilise and then reduce the forecast level of road traffic fatalities around the world by increasing activities conducted at the national, regional and global levels. The United Nations Decade of Action for Road Safety 2011-2020 underpins the National Road Safety Strategy 2016-2030 (NRSS).
South Africa is an active member of the United Nations and the advent of the Decade of Action (DoA) initiative necessitated the realignment of the National Road Safety Strategy so as to allow synchronization of activities, resource optimization and to eliminate the possibility of running parallel programmes.

The identification of HazLocs is in line with the ‘Safe System’ approach to achieve a vision of zero road fatalities and serious injuries and requires that the road system be designed to expect and accommodate human error. Safe System principles require a holistic view of the road system and the interactions between roads and roadsides, travel speeds, vehicles and road users.

This is an inclusive approach that caters for all groups using the road system, including drivers, motorcyclists, passengers, pedestrians, bicycle users, commercial and heavy vehicle drivers. Consistent with the NRSS long-term road safety vision, it recognises that people will always make mistakes and may get involved in road crashes, the system however, should be forgiving and in the occurrence of a crash, should not result in death or serious injury.

The Safe System approach is consistent with the approaches adopted by the safest countries in the world, many of whom also adopted principles of the UNDA plan. There are several guiding assumptions and principles to this approach:

- People make mistakes: Humans will continue to make mistakes, and the road transport system must accommodate these. The road transport system should not result in death or serious injury as a consequence of road error.

- Human physical frailty: There are known physical limits to the amount of force our bodies can take before we are injured.

- A ‘forgiving’ road system: A Safe System ensures that the forces in collisions do not exceed the limits of human tolerance. Speeds must be managed so that humans are not exposed to impact forces beyond their physical tolerance. System designers and operators need to take into account the limits of the human body in designing and maintaining roads, vehicles and speeds.
The UNDA five pillars, together with the Safe Systems Approach, formed the basis for the situational and problem analysis which was an important precursor to the development of the NRSS.

4. BACKGROUND

4.1 RTMC as Custodian of Road Safety in the Country

4.1.1 Legislative mandate

4.1.1.1 Constitution of The Republic of South Africa, 1996

The Constitution is the supreme law of the Republic of South Africa. The RTMC abides by the obligations imposed by the Constitution. The table below reflects the RTMC’s constitutional mandate in relation to other spheres of government in the execution of its responsibilities.

<table>
<thead>
<tr>
<th>Section</th>
<th>Implication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schedule 4</td>
<td>Sets out the areas of provincial legislative competence. Schedule 4 Part A lists the functional areas of concurrent national and provincial competence as follows:</td>
</tr>
<tr>
<td></td>
<td>• Public Transport</td>
</tr>
<tr>
<td></td>
<td>• Road Traffic Regulation</td>
</tr>
<tr>
<td></td>
<td>• Vehicle Licensing</td>
</tr>
<tr>
<td>Schedule 5</td>
<td>Provides for traffic as a schedule 5 functional area, however the Constitution also provides for the national legislative authority over schedule 5 matters under section 44 (2) and the provision of section 76 (1) legislation, all the legislative mandates of the RTMC are enacted in terms of section 76 (5) of the Constitution.</td>
</tr>
</tbody>
</table>
4.1.1.2 National Road Traffic Act 93 of 1996 (NRTA)

The NRTA provides for road traffic matters that apply uniformly throughout the republic and for matters connected therewith. It prescribes national principles, requirements, guidelines, frameworks and national norms and standards that must be applied uniformly in the provinces and other matters contemplated in section 146 (2) of the Constitution; and to consolidate land transport functions and locate them in the appropriate sphere of government.

The NRTA provides for specific powers in order to execute the functions of the RTMC. Chapter VII of the NRTA addresses the management of Road Safety. Powers of the Chief Executive Officer as per section 52 of the Act are as follows:

The Chief Executive Officer may -

a) Prepare a comprehensive research programme to effect road safety in the Republic, carry it out systematically and assign research projects to persons who, in his or her opinion, are best equipped to carry them out;

b) Give guidance regarding road safety in the Republic by means of the organising of national congresses, symposiums, summer schools and study weeks, by means of mass communication media and in any other manner deemed fit by the Chief Executive Officer.

In order to perform his or her functions properly the Chief Executive Officer may

a) Finance research in connection with road safety in the Republic;

b) Publish a periodical to promote road safety in the Republic, and pay fees for matters inserted therein;

c) Give guidance to associations or bodies working towards the promotion of road safety in the Republic;

d) Organise national congresses, symposiums, summer schools and study weeks and, if necessary, pay the costs thereof, and remunerate persons performing thereat;
e) With a view to promoting road safety in the national sphere, publish advertisements in the mass communication media.

The Chief Executive Officer shall exercise his or her powers and perform his or her functions subject to the control and direction of the Board of the RTMC, subject to the delegation to the Board by the Shareholders Committee.

4.1.1.4 Road Traffic Management Corporation Act No 20 Of 1999 (RTMCA)

Parliament approved the RTMCA in 1999 in line with the provisions of section 44(2) of the Constitution. In terms of the Act, the RTMC was established to pool powers and resources and to eliminate the fragmentation of responsibilities for all aspects of road traffic management across the various levels of government. The Act provides, in the public interest, for cooperative and coordinated strategic planning, regulation, facilitation and law enforcement in respect of road traffic matters by the national, provincial and local spheres of government.

The Act’s Objectives are:

- To establish the RTMC as a partnership between national, provincial and local spheres of government;
- To enhance the overall quality of road traffic service provision, in particular, to ensure safety, security, order, discipline and mobility on the roads;
- To protect road infrastructure and the environment through the adoption of innovative practices and implementation of innovative technology;
- To phase out, where appropriate, public funding and phase in private sector investment in road traffic on a competitive basis;
- To introduce commercial management principles to inform and guide road traffic governance and decision-making in the interest of enhanced service provision;
To optimise the utilisation of public funds by—

- Limiting investment of public funds to road traffic services which meet a social or non-commercial strategic objective and which have poor potential to generate a reasonable rate of return; and
- Securing, where appropriate, full cost recovery on the basis of the user-pays principle;

- To regulate, strengthen and monitor intergovernmental contact and co-operation in road traffic matters;

- To improve the exchange and dissemination of information on road traffic matters;

- To stimulate research in road traffic matters and effectively utilise the resources of existing institutes and research bodies; and

- To develop human resources in the public and private sectors that are involved in road traffic.

4.2 Road Safety Situation in South Africa

The Global status report on road safety 2015, reflecting information from 180 countries, indicates that worldwide the total number of road traffic deaths has plateaued at 1.25 million per year, with the highest road traffic fatality rates in low-income countries (WHO 2015).

South Africa is one of the countries globally with the worst fatality rates recorded and analysed by the World Health Organisation (WHO) of 180 countries, with a recorded 11,676 fatal crashes in 2016 with 14,071 fatalities.

Even though the target set under the United Nations Decade of Action initiative was to halve road related fatalities from 2010 to 2020, road related fatalities in South Africa has steadily increased over recent years as illustrated in the following graph:
Through a sound National Road Safety Strategy informed by this National Road Safety Research Framework based on a ‘Result Focus’ approach, concentrating road safety efforts at HazLocs it is envisaged that road related fatalities and serious injuries will be decreased dramatically.

5. HAZARDOUS LOLATIONS METHODOLOGY

4.3 Introduction

The RTMC is mandated to manage and report on road crashes in South Africa. Part of this reporting includes the identification of hazardous roads or road sections in South Africa for Law Enforcement, Education and Engineering efforts to be focussed on the most hazardous locations to reduce crashes, fatalities and injuries due to road related crashes in South Africa.

The RTMC mandate stipulates the coordination of the following key road safety functions in South Africa:

- Traffic Law Enforcement
- Road Safety Education
- Road Safety Engineering

The conventional method in identifying hazardous locations, entails Personal Injury Crashes (PIA) per Million Vehicle Kilometres for a specific road section.
and ranking the calculated ratios to provide a list of high priority road sections of HazLocs. The PIA formula takes into account various specific variables for each identified road section and is calculated as follows:

\[
\text{PIA} = \frac{[ (#\text{Fatalities} \times 12) + (#\text{Serious Injuries} \times 8) + (#\text{Slight Injuries} \times 4) + (#\text{No Injuries}) ]}{[ \text{Annual Million vehicle kilometres travelled on section of road} ]}
\]

With not all variables available for all roads and/or more specifically road sections on the approximately 154,000 km of surfaced roads in south Africa, a more effective approach will be to direct the three key road safety functions of the RTMC, not to specific road locations but, rather to areas in which the hazardous roads are located to address all road safety needs within such a defined area.

4.4 HazLocs Methodology

The RTMC developed an Interim Methodology to define hazardous locations in South Africa. The Methodology was ‘Peer-Reviewed’ with recognized Road Safety Academics viz.:

- Prof. Marion Sinclair (University of Stellenbosch);
- Mr. K Labuschagne (ex CSIR/Gauteng Provincial Government)

The methodology of identifying HazLocs is simple but effective in that it identifies that the most reliable aspect of fatal crash reporting i.e. in which SAPS Jurisdictional area the crash occurred.

There are 1,143 SAPS Stations or SAPS Jurisdictional Areas in South Africa where fatal crashes are reported to which provides for the identification of the SAPS jurisdictions where the most fatal crashes occurred for any given time period.
The base data analysed to determine the HazLocs 2017 methodology is based on published RTMC statistics for the 2015 and 2016 calendar years whereas the HazLocs modal provides the user to rank SAPS jurisdictions according to:

- Combined Weighted Ratio (2015 & 2016)
- Weighted Ratio (2015 or 2016)
- Most Fatal Crashes (2015 or 2017)
- Most Fatalities (2015 or 2016)
- Most Pedestrian Fatalities (2015 or 2016)

The modal also allows the user to rank any of the above parameters on a provincial level.

In line with the UNDA and NRSS towards prioritising VRUs, the modal allows the user to, for when the weighted ratio parameters are selected, to add weights to different parameters to:

- Add weight to pedestrian fatalities during the ranking process;
- Provide a normal distribution of data in that outliers are not taken into account during the ranking process.

The user may add different percentage weight for the following parameters:

<table>
<thead>
<tr>
<th>Fatal Crashes</th>
<th>Fatalities</th>
<th>Pedestrian Fatalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>15%</td>
<td>15%</td>
<td>70%</td>
</tr>
</tbody>
</table>

During the process of establishing the HazLocs prioritisation modal, various weight percentages were used during the iteration process and it was found that the ‘15%/15%/70%’ ratio respectively for ‘Fatal Crashes/Fatalities/Pedestrian Fatalities’ provided a well-balanced output. The user may, if so desired, use different percentage ratio’s during the prioritisation process.

4.5 Discussion

The following is a screenshot of the main output of the HazLocs Modal whereas the top 10 hazardous locations are ranked on the combined weighted ratio
(2015&2016) with a ‘15%/15%/70%’ ratio respectively for ‘Fatal Crashes/Fatalities/Pedestrian Fatalities’ taking into account all provinces:

From the screenshot the above, the Umlazi SAPS Jurisdiction is ranked no.1, Durban Central ranked no. 2 and Inanda ranked no. 3 in South Africa. The respective number of fatal crashes, number of fatalities, number of pedestrian fatalities and % pedestrian fatalities are also shown for each of the ranked SAPS jurisdictional areas for 2015 and 2016.

In addition, the Modal also provides for analysis of the selected parameters of the totals. From Screenshot 1 above, the Top 10 SAPS Stations constitutes 0,9% of all 1,143 SAPS Stations but an average of 4,8% of main parameters (No. of Crashes, No. of Fatalities and No. of Pedestrian Fatalities). This is useful in that if the Top 10 SAPS Stations (or 0,9% of all SAPS Stations) were targeted with focused road safety activities, 4,8% of the main parameters will be addressed.

The Top 50 ranked stations can also be selected in the Modal depicted in Screenshot 2 below:
# Interim Hazardous Locations Ranking (2015 & 2016)

All Provinces Top 50

<table>
<thead>
<tr>
<th>Province</th>
<th>Combined Weighted Ratio</th>
<th>Weighted Ratio</th>
<th>Fatal Crashes</th>
<th>Pedestrian Fatalities</th>
<th>% Pedestrian Fatalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC</td>
<td>44%</td>
<td>32%</td>
<td>39%</td>
<td>5%</td>
<td>85%</td>
</tr>
<tr>
<td>FS</td>
<td>43%</td>
<td>25%</td>
<td>38%</td>
<td>6%</td>
<td>78%</td>
</tr>
<tr>
<td>GP</td>
<td>29%</td>
<td>24%</td>
<td>33%</td>
<td>4%</td>
<td>92%</td>
</tr>
<tr>
<td>KZN</td>
<td>25%</td>
<td>40%</td>
<td>36%</td>
<td>8%</td>
<td>60%</td>
</tr>
<tr>
<td>LIM</td>
<td>24%</td>
<td>37%</td>
<td>38%</td>
<td>7%</td>
<td>72%</td>
</tr>
<tr>
<td>MP</td>
<td>17%</td>
<td>24%</td>
<td>31%</td>
<td>5%</td>
<td>79%</td>
</tr>
<tr>
<td>NC</td>
<td>10%</td>
<td>18%</td>
<td>32%</td>
<td>9%</td>
<td>93%</td>
</tr>
<tr>
<td>NW</td>
<td>9%</td>
<td>16%</td>
<td>34%</td>
<td>10%</td>
<td>105%</td>
</tr>
</tbody>
</table>

## Screenshot 1: Top 50 Hazardous Locations (SAPS Jurisdictions) in SA ranked by Combined Weighted Ratio for 2015 & 2016

**National Road Safety Research & Development Framework July 2017**
The Modal also indicates the number of and percentage of SAPS stations per province that occurs in the top 50 for the selected parameters as shown in the following screenshot:

![Screenshot 2: Number of and Percentage of SAPS Stations per Province that Occurs in The Top 50](image)

From Screenshot 2 above it is clear that the province with the most SAPS Jurisdictions in the Top 50 is KZN with 40% in the top 10; 35% in the top 20; 33% in the top 30; 27.5% in the top 40 and 28% in the top 50.

Thus, based on combined weighted ratio weighted ratio ranking, KZN is the province with the most hazardous locations in the country where road safety activities need to be directed.

The same exercise can be done by selecting any of the provinces whereas the same analysis will be conducted for all parameters in that specific province.

### 4.5.1 Maps

The following maps provides a visual illustration of SAPS Jurisdictional Areas as well as two of the top ranked weighted ratio areas or most hazardous areas in South Africa in 2015 & 2016:
Map of all SAPS Jurisdictions / Areas in South Africa

Inanda and Umlazi SAPS Jurisdictional Areas
Umlazi SAPS Jurisdictional Area – Ranked No.1 most hazardous Area

Inanda SAPS Jurisdictional Area – Ranked No.3 most hazardous Area
6. CONCLUSIONS

The RTMC developed an Interim Methodology to define hazardous locations in South Africa. A Modal was developed from the methodology to rank the most hazardous SAPS Jurisdictional Areas where the most fatal crashes, fatalities and pedestrian fatalities occur. The methodology defines ranking calculations per combined weighted ratio or weighted ratio from 2015 and 2016 crash data to ultimately rank the top 10 or top 50 most hazardous locations in the country.

The aim of the HazLocs Modal is to provide a list of most hazardous areas to direct the efforts of the functional units of the RTMC and to coordinate efforts of the authorities in which the areas fall to put in place measures to reduce the carnage on our roads in the short, medium and long term should enable the RTMC to be more effective in its efforts.

Through concentrating on areas rather than roads it is believed that a higher impact can be made, especially through road safety education within the community/communities within a hazardous area.

More direct efforts such as traffic law enforcement and road safety engineering can then also be focussed on not just localized hazardous roads but, applying road safety intervention in the total area towards reducing road trauma.

7. REFERENCES

- RTMC Calendar Reports 2015 & 2016
- National Road Safety Strategy 2016-2030 (NRSS)
- World Health Organisation (WHO); Global Status Report on Road Safety 2015