Review:

South African Road Safety Audit Manual, 2012

March 2018

Review of the South African Road Safety Audit Manual (SARSAM) published by:

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ACRONYMS

ADBG	African Development Bank Group
COTO	Committee of Transport Officials
CPD	Continuing Professional Development
DoT	Department of Transport
ECSA	Engineering Council of South Africa
FHWA	Federal Highway Administration (USA)
IRF	International Road Federation
IRSR	In-service Road Safety Reviews
JTRC	Joint Transport Research Committee
NRSS	National Road Safety Strategy (2016-2030)
NRSSC	National Road Safety Steering Committee
NRTETC	National Traffic Engineering Technical Committee
OECD	Organisation for Economic Co-operation and Development
RCB	Roads Coordinating Body
RSA	Road Safety Audit
RSATL	Road Safety Audit Team Leader
RTC	Road Traffic Crash
RTMC	Road Traffic Management Corporation
SANRAL	South African National Roads Agency SOC Limited
SAPS	South African Police Service
SARF	South African Road Federation
SARSAM	South African Road Safety Audit Manual
TMH	Technical Methods for Highways
TRH	Technical Recommendations for Highways
UNDA	United Nations Decade of Action
VLU	Vulnerable Road User
WB	World Bank
WHO	World Health Organisation

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Attendees of the 5 March 2018 Workshop - Review of the SARSAM (Working Document)

1 PURPOSE

To review the South African Road Safety Audit Manual (SARSAM – 2012) and provide recommendations to be incorporated during the updating the Manual.

The updating the Manual will include inter alia experience gained in context, address possible deficiencies and repackage the SARSAM–2012 to provide a pragmatic guide for the Road Safety Practitioner to conduct safety audits, appraisals and assessments in South Africa.

2 INTRODUCTION

The SARSAM-2012 was developed over a period of more than two years and published by the RTMC in 2012 as a comprehensive guide that describes the formal road safety audit process of road designs before they are constructed, upgraded or rehabilitated as well as the road safety appraisal process of existing roads with practical guidance to Road Safety Engineering Practitioners.

During the development of SARSAM-2012, it was envisaged to be a living document that would be updated periodically in order for it to remain current and provide guidance to Road Safety Engineering Practitioners to conduct road safety audits, appraisals and assessments.

The RTMC through the National Traffic Engineering Technical Committee (NRTETC) identified the need to review the SARSM-2012 formally with the intention to update the Manual in 2017/18 to include experience gained, to address possible deficiencies and/or to repackage the document to provide a pragmatic approach for road safety audits, appraisals and assessments in South Africa.

3 BACKGROUND

3.1 Road Safety in South Africa

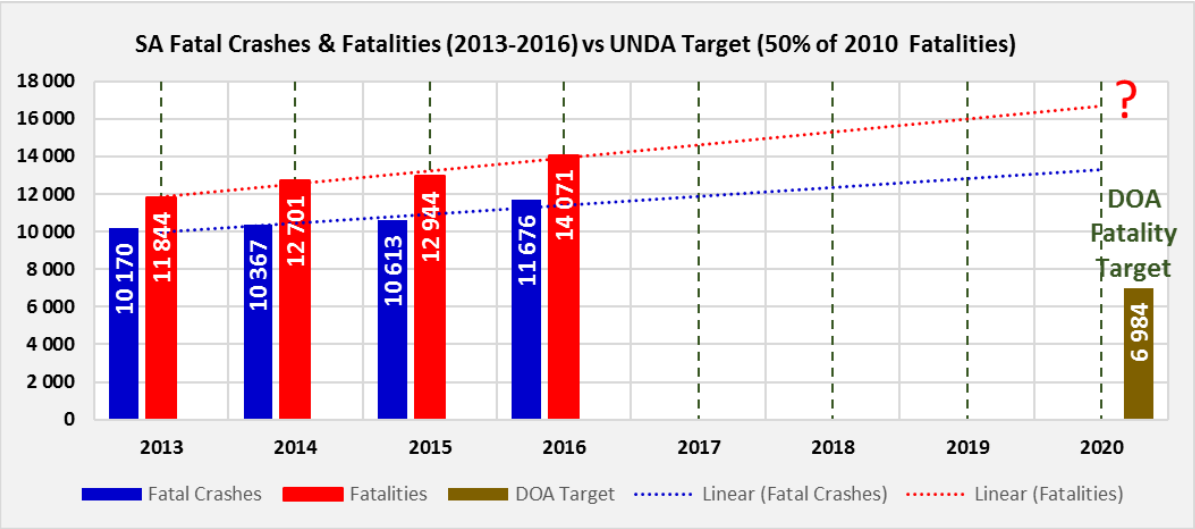
The high number of Road Traffic Crashes[1] (RTCs) and their associated consequences have a significant impact on the South African society which continues to hamper socio-economic development and impact on the well-being of all South Africans. This impact is measured in terms of human lives lost, 'pain, grief and suffering', as well as an increasing cost to the economy. The total cost of RTCs on South Africa's road network for 2015 amounted to an estimated R142.95 billion - equating 3.4% of the South African Gross Domestic Product (GDP-2015). [2]

The target of the 2010 UNDA initiative of which South Africa is a signatory, to halve road fatalities by 2020, will not be reached with fatal road related crashes and fatalities in South Africa increasing drastically since 2013. For the purposes of this document, analysis of fatal crash data recorded by the RTMC from 2013 – 2016 perceived as most reliable were analysed and trends calculated.

It is estimated that road related fatalities increased by 18.8% or 2,227 fatalities from 2013 to 2016 with 14,071 fatalities recorded in 2016 (Chart 1). It is evident that notwithstanding road safety efforts over recent years by the RYMC, road authorities and other stakeholders, the desired reduction in road crashes and fatalities on South African roads have not been achieved.

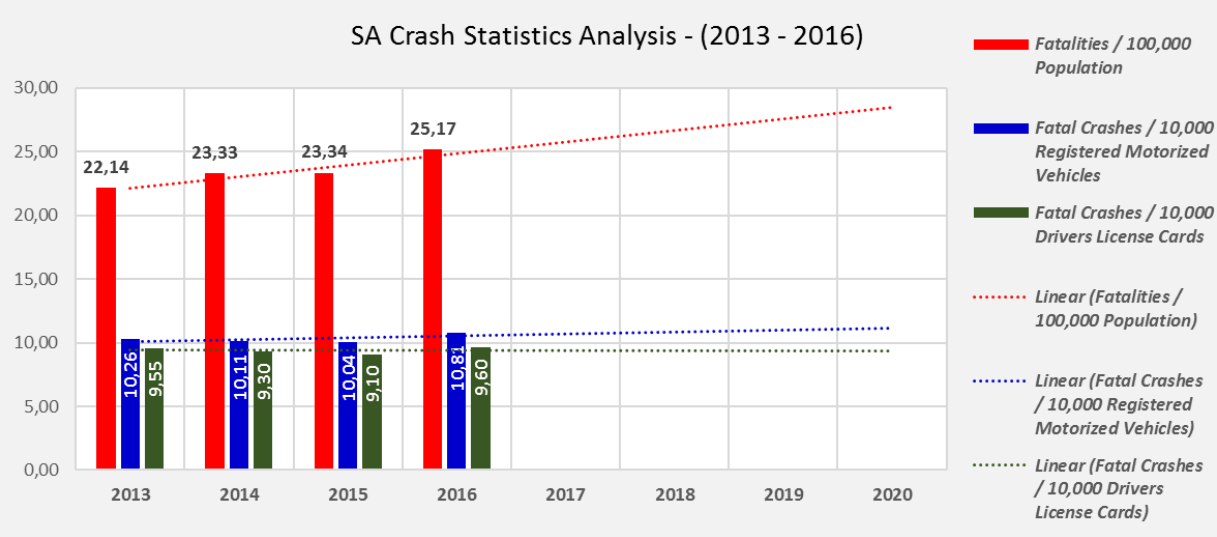
[1] The term 'crash' imparts the same meaning as "accident" noted in the National Road Traffic Act, 93 of 1996.
[2] RTMC - Cost of Crashes in South Africa, 2016

Chart 1: SA Fatal Crashes & Fatalities (2013-2016) vs UNDA Target:



In line with the increase in fatalities since 2013 as depicted in Chart 1 above, the fatalities per 100,000 population have increased from 22.14 to 25.17 from 2013 to 2016 respectively (Chart 2 below).[3]

Chart 2: SA Crash Statistics (2013-2016):



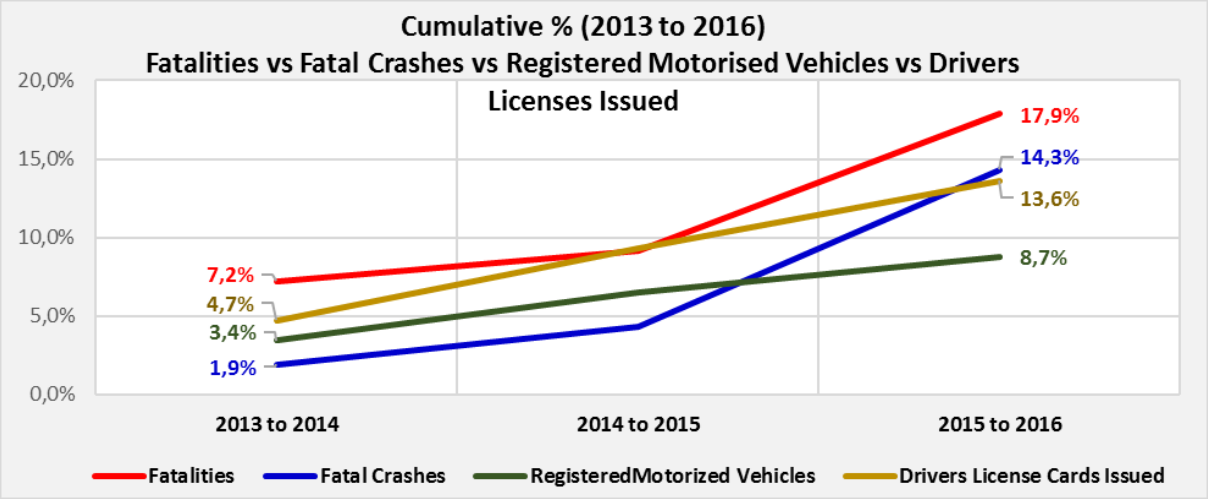
Taking into account that the number of driver's licenses issued and registered motorised vehicles on the South African road network are ever increasing, an increase in conflict on roads will most probably result in more crashes. The calculated fatalities per 100,000 human population shows a drastic increase since 2013 whereas, the fatal crashes per 10,000 motorised vehicles and the fatal crashes per 10,000 driver's licenses issued depict a more conservative increase from 10.26 to 10.81 and 9.55 to 9.60 respectively from 2013 to 2016 (Chart 2 above).

The cumulative increase in fatal crashes, fatalities, driver's licenses issued and registered motorised vehicles from 2013 to 2016 is illustrated in Table 1 and Chart 3 below.

Table 1: Year on Year Increase in Road Safety related Characteristics (2013-2016):

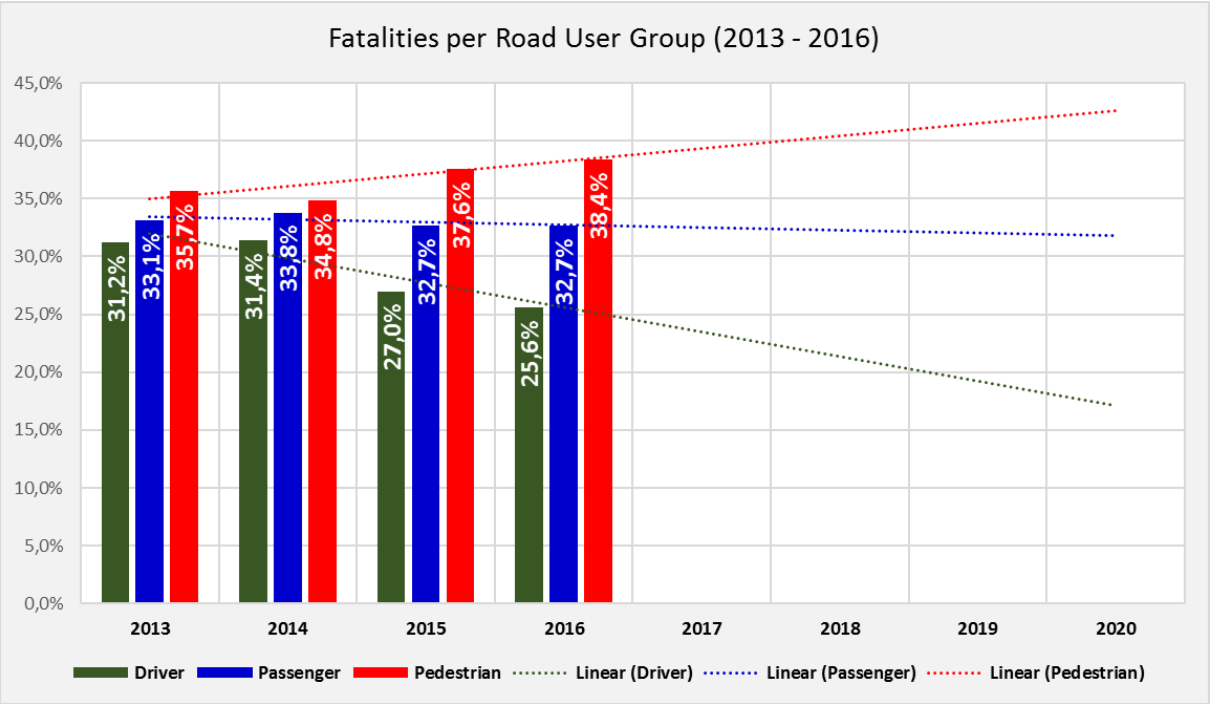
Year on Year Increase	Fatalities	Fatal Crashes	Registered Motorized Vehicles	Drivers License Cards Issued
2013 to 2014	7,2%	1,9%	3,4%	4,7%
2014 to 2015	9,1%	4,3%	6,5%	9,3%
2015 to 2016	17,9%	14,3%	8,7%	13,6%

Chart 3: Year on Year Increase in Road Safety related Characteristics (2013-2016):



Fatalities per road user group shows very high pedestrian fatalities with an increase from 35.7% in 2013 to 38.4% in 2016. Driver and passenger fatalities have decreased significantly from 2013 to 2016 from 31, 2% to 25.6% and 33.1% to 25.6% respectively as illustrated in Chart 4 below. [3]

Chart 4: Fatalities per Road User Group (2013-2016):



Cyclist fatalities were analysed separately as a road user group due to reliable data only being available from 2015. Cyclist fatalities only contributed to 2.5% and 3.2% of all fatalities recorded in 2015 and 2016 respectively (Table 2 below). There is a 29.6% increase in cyclist fatalities 2015 to 2016.

Table 2: Cumulative % Cyclist Fatalities (2015-2016):

Year	Total Fatalities	Fatalities Cyclists	% of Total Fatalities	2015 to 2016 Increase
2015	12944	320	2,5%	
2016	14071	451	3,2%	29,6%

3.2 History of RSAs - International

The benefits of RSAs were recognised in the early 1990's around the world and many countries have since established their own similar systems.

In-service Road Safety Reviews (IRSRs) were first introduced in Europe in the early 1980's, and were formally adopted in the United Kingdom by the late 1980's. The first IRSRs came about as a result of common concerns among highway

management officials that newly upgraded roadways often experienced high collision frequencies and severities where measures could have been taken during the design and reconstruction phases to improve the future safety of these facilities. The following timelines are also important to consider in the history of IRSRs and RSAs throughout the world (Lougheed, 2016)[3]

- 1991: The United Kingdom made IRSRs mandatory for all national trunk roads and freeways with reconstruction costs over a specified threshold.
- Early 1990's: IRSRs were being used in Australia and New Zealand.
- Late 1990's: IRSRs and RSAs had been introduced in Australia and New Zealand as well as countries such as Canada, the United States, Denmark, Netherlands, Singapore, and South Africa.
- In India, in 2012, the World Bank and Asian Development Bank funded road safety initiatives including IRSRs at the design and construction stages for several upgrades of national highways (in Punjab, Madhya Pradesh, Maharashtra, Orissa, and Rajasthan states) for the National Highways Authority of India (NHAI).
- Other countries which now employ IRSRs and RSAs include Norway, Ireland, Italy, Thailand, China, Malaysia, and several counties in the Middle East

3.3 RSAs in South Africa

The Road Traffic Management Corporation (RTMC) was established in terms of Section 3 of the Road Traffic Management Corporation Act, No. 20 of 1999, for co-operative and coordinated strategic planning, regulation, facilitation and law enforcement in respect of road traffic matters by the national, provincial and local spheres of government. One of the functional areas of responsibility allocated to the RTMC is that of, "*Infrastructure Safety Audits*". This corresponds with the subject

[3] Peter J. Lougheed, 2016; Road Safety Audits: Quantifying and Comparing the Benefits and Costs for Freeway Projects (Doctor of Philosophy Dissertation)

matter contained in the SARSM and (by implication) therefore, also sets the RTMC as the custodian of the SARSM.[4]

As part of the commitment towards safer roads, The Department of Transport (DoT) published the Road Safety Manual (SARSM-1999) as a “best practice tool” for road authorities to evaluate traffic operations, assess road safety aspects and road networks.

Various South African authorities used the principles embodied in the SARSM-1999 to assess the safety conditions on particular sections of roads within their jurisdictions. Since the publication of the SARSM-1999, developments took place worldwide that impacted significantly on road safety in general, and particularly road safety in South Africa. Due to these developments, and the time since the publication of SARSM-1999, it was considered to be in need for review and updating.[4]

The WHO (2004) recommended that states should implement specific actions to prevent road traffic crashes, minimise injuries and their consequences and evaluate the impact of these actions. The WHO discussed road safety interventions and in particular, their effects on reducing the frequency and severity of crashes as well as, their cost-effectiveness, recognising that relevant data should be available. It recognised that no standard package of interventions was suitable for all countries but stressed that countries can follow several good practices, including requiring new road projects to be subject to a road safety audit by a road safety specialist independent of the road designer.[4]

Road Safety Audits form an important role in diagnosing the safety of the road network both as far as existing roads and upgrading projects on the road and transport network are concerned. The review of SARSM Volume 4: Road Safety Audits was considered to be particularly important. This ensured that South African practice remained in line with International Best Practice and that the experience of South African road safety engineering practitioners is utilised in revising and contextualising Guidelines for Road Safety Audits.[4]

In 2007, the Ministers of Transport and of Health of African States adopted the Accra Declaration that noted the deteriorating condition of transport infrastructure

encouraging member states to use the World Health Organisation (WHO)/World Bank (WB) World Report on Road Traffic Injury Prevention as a framework for road safety; and implement its recommendations to substantially reduce the causes and risk factors associated with road crashes. [4]

The Road Traffic Management Corporation (RTMC) reviewed and updated the SARSAM-1999 and published the SARSAM-2012 (2nd Edition). The SARSAM-2012 was a revision of the SA Road Safety Manual, Volume 4: Road Safety Audits and was presented to road authorities in South Africa to be used as part of their approach towards the reduction in the number of road crashes and the reduction in the severity of crashes.[4]

Various road authorities use the SARSAM-2012 as a guide to conduct road safety audits on new, upgrading and rehabilitation road construction projects and; for road safety appraisals on existing roads.

As part of a national effort to give effect to the use of the SARSAM-2012 guidelines and to establish capacity within the road safety audit environment, the South African Road Federation (SARF) introduced a 5-day Road Safety Audit Course in 2014 aimed at Road Safety Practitioners with a civil engineering background and provides a robust, fundamental basis for those who want to become auditors or take up roles in an Audit Team.

The Road Safety Audit course is also beneficial to officials who are responsible for commissioning, reviewing or assessing Road Safety Audit Reports. The course amongst others, intends to ensure awareness of the Road Safety Audit requirements as per the SARSAM-2012 and is accredited with the Engineering Council of South Africa (ECSA) and provides Continuing Professional Development (CPD) points for professional registration with ECSA.

SARF also introduced a 2-day Road Safety Audit course aimed at non-technical Managers and Practitioners to sensitise the needs and benefits of Road Safety Audits and appraisals.

Since 2014, 351 delegates have attended the 5-day Road Safety Audit course

[4] South African Road Safety Audit Manual (SARSAM-2012)

(86.3% with an engineering qualification) and 199 delegates attended the 2-day course. The government / private sector attendance split of the 5-day course was 53.6% / 46.4% respectively which included 25 delegates from the Southern African Development Community (SADC) viz. Botswana, Malawi, Mozambique, Namibia, Swaziland, Zambia and Zimbabwe.[5]

The South African National Roads Agency Limited (SANRAL) adopted a draft Road Safety Audit Policy in 2016 that inter alia defines which SANRAL projects need to undergo Road Safety Audits. It includes the minimum requirements for Road Safety Audit teams to conduct road safety audits in line with the SARSAM-2012 guidelines. This is in line with the South African Road Safety Strategy (NRSS 2016-2030) which propose amongst others that Road Safety Audits should be made compulsory by all road authorities.

Although the RTMC is in favour of the mandatory application of the principles of Road Safety Audits on all road projects in South Africa, as proposed in the NRSS (2016-2030), it remains the prerogative of individual road authorities to embrace these principles and include them in the policies of that road authority. It is prudent to also point out that the non-acceptance of the SARSAM guidelines may expose a road authority to increased risk of culpable liability, as these guidelines serve to set out the process which; a *diligens paterfamilias* in the position of the road authority should review road environment conditions in establishing the possible foreseeability of hazardous conditions developing on a road and taking reasonable steps to guard against such conditions.[4]

3.4 RSAs and the 'Safe System'

The SARSAM-2012 introduced three approaches to road safety namely - the traditional 3E model, the Haddon Matrix and the Safe System approach. The Safe System approach has been further developed and is currently considered global best practice. The Safe System approach focuses on the human tolerance to the forces during a crash, rather than focusing more on possible poor roadway

[5] Basil Jonsson, SARF Operations Director

conditions. This may have a particular influence on the assessment of risk and the identification of road safety concerns during an audit.

Key Messages of the Safe System approach as contained in the Road Safety Manual System[6] published in 2015 by the World Road Association are summarised below:

- The Safe System approach is the most effective way of considering and responding to fatal and serious casualty crash risks on a network.
- This approach is based on an ethical position where it can never be acceptable that people are seriously injured or killed on the network. It provides a set of design and operating principles to guide action on the journey to the long term elimination goal.
- The long-term Safe System goal is the elimination of death and serious injuries on a country's roads.
- The Safe System is being adopted by an increasing number of countries and forms the basis for the UNDA for Road Safety.
- The Safe System requires strong governmental leadership as well as the engagement of a wide range of sectors.
- The primary responsibility of a road authority and other agencies is to support road users to reach the end of their trips safely.
- The Safe System is based on well-established safety principles — of known tolerance of the human body to crash forces, speed thresholds for managing crash impact energies to survivable levels, and the capacities of vehicles and forgiving infrastructure to reduce crash impact energy transfers to humans.
- A focus on key crash types occurring on a network helps to identify the role and intervention options for each Safe System element. The emphasis is on

[6] Road Safety Manual - a Manual for Practitioners and Decision Makers on Implementing Safe System Infrastructure, The World Road Association (PIARC) / Association mondiale de la Route (AIPCR), 2015

reducing fatalities and serious injuries rather than the number of overall crashes.

- System-wide intervention strategies are required to avoid fatal and serious injury crash outcomes including emergency medical care for crash victims.
- There is a shared responsibility between system designers (who design and operate the roads) and road users for safe travel outcomes on the road network.
- The Safe System approach compels system designers to provide a safe environment and; to consider the combined system as the major factor in crashes rather than the traditional approach that placed most responsibility for safety on the road user.
- The system design and operation must become forgiving of routine human (road user) error.

The Safe System approach as described in the Road Safety Manuals for Africa[7], "New Roads and Schemes: Road Safety Audit" which was published in July 2014 by the African Development Bank Group:

The Joint Transport Research Committee (JTRC) of the OECD (Organisation for Economic Co-operation and Development) produced a report in 2008 titled: 'Towards Zero: Ambitious Road Safety Targets and the Safe System Approach'. This describes the Safe System approach as one that re-frames the way in which road safety is managed and viewed, emphasising the importance of a 'shared responsibility' among stakeholders. It means addressing all elements of the transport system in an integrated manner to ensure that the occupant is protected in the event of a crash. Importantly, the OECD (2008) report suggests that Safe System working is suitable for all countries at differing levels of road safety performance but that slight variations in the interventions might be appropriate. The aim is to develop a road transport system that is able to accommodate human error and takes into consideration the vulnerability of the human body. It recognises that

[7] Road Safety Manuals for Africa, "New Roads and Schemes: Road Safety Audit", African Development Bank Group, July 2014

even the most law-abiding and careful humans will make errors. The challenge under a Safe System is to manage the interaction between vehicles, travel speeds and roads to not only reduce the number of crashes but more importantly, to ensure that any crashes that occur do not result in death or serious injury.

The Safe System needs to ensure that road users that enter the 'system' (in an overall sense) are competent, alert and compliant with traffic laws. This is achieved through road user education, managing the licensing of drivers and taking action against those who break the rules.

Once drivers enter the Safe System, there are three core elements that need to work together to protect human life:

- Safe vehicles: Vehicles that have technology that can help prevent crashes (for example electronic stability control and Anti-Lock Braking System (ABS) brakes) and safety features that protect road users in the event of a crash (for example airbags and seatbelts). This requires the promotion of safety features to encourage consumers and fleet operators to purchase safer vehicles.

- Safe roads: Roads that are self-explaining and forgiving of mistakes to reduce the risk of crashes occurring and to protect road users from fatal or serious injury. This requires roads and road-sides to be designed and maintained to reduce the risk and severity of crashes.

- Safe speeds: Vehicles travel at speeds that suit the function and the level of safety of the road to ensure that crash forces are kept below the limits where fatal or serious injury results. This requires the setting of appropriate speed limits supplemented by enforcement and education.

The Safe System approach is also supported by effective road safety management and post-crash response.

The Safe System philosophy requires a shift in thinking away from blaming the driver for the mistakes they make. The Safe System challenges those responsible for designing the road transport system to share the responsibility so as to manage the interaction between road users, vehicles, travel speeds and roads.

3.5 Costs and Benefits of RSAs

An integral part of the review of the SARSAM-2012 and ultimately for updating the Manual, would be to address a growing concern if RSAs are cost effective. Since the inception of RSAs, various reports suggest that the RSA process is cost-effective although most reference qualitative rather than quantitative benefits.

In a study conducted to Quantify and Comparing the Benefits of RSAs, (Lougheed, 2016)[3] it was indicated that the general assumption of highway researchers, planners, and designers who have pondered the relation between the benefits and costs of safety audits is that the benefits outweigh the costs however; there is little supporting research that has been published in the past 20-years to confirm this assumption quantitatively.

Lougheed noted that most studies to date related to assessing the benefits and costs of highway "safety audits" involved In-service Road Safety Reviews where existing facilities were being audited rather than true RSAs which; relate to new or "greenfield" projects, where no facilities previously existed. As a result, very little research data is available specifically pertaining to RSAs.

The primary finding of this study was that RSAs can have a significant, economically efficient impact on the safety performance of highway facilities gives hope that these audit programs will continue to gain momentum and have an ever-increasing impact on the transportation network that surrounds us.

Government entities, highway designers and contractors, and safety experts each continue to play a significant role in improving the safety features and performance of the constantly evolving highway systems throughout the world. In this evolving, safety-first environment, Road Safety Auditors play an important role in the design and construction of highway facilities, adding another layer of inspection as highway facilities continue to be initiated and accomplished.

The African Development Bank Group (ADBG) [8] suggested that there is often a concern that RSA will increase the cost of a project though this is rarely the case. In particular, adoption of a RSA at the early phases of road design means that the design can be adjusted with minimal cost implications. Furthermore, many

recommendations involve small adjustments to the signing, marking and layout of the road. These have minimal cost implications at early stages.

The ADBG further states that there may be occasions when the RSA recommendations save costs by suggesting the removal of unnecessary design components. In addition to material costs, inclusion of RSA may result in additional lapsed time within a project: firstly, to undertake the RSA and then to accommodate the recommendations. The cost of an RSA and the consequent cost of changing a design are significantly less than the cost of remedial treatments after works have been constructed, or the social cost of road crashes (for a whole country these are estimated to be 1-3% of GDP).

It is easier to change design plans than to make changes after the road is constructed however; it is still worth undertaking Post-Construction RSAs since the cost of remedial work is often less than the cost of crashes that might result.

4 SARSAM-2012 REVIEW

4.1 Current Status and Application of SARSAM-2012

Various road authorities use the SARSAM-2012 as a guide to conduct Road Safety Audits on new, upgrading and rehabilitation road construction projects and road safety appraisals on existing roads. The use of the SARSAM-2012 is however not compulsory.

The South African National Roads Agency Limited (SANRAL) adopted a draft Road Safety Audit Policy in 2016 which inter alia defines which SANRAL projects need to undergo road safety audits and minimum requirements for road safety audit teams to conduct road safety audits in line with the SARSAM-2012 guidelines. This is in line with the South African Road Safety Strategy (NRSS 2016-2030) which propose amongst others that road safety audits should be made compulsory by all road authorities.

The SARSAM-2012 is structured in four parts as follows:[4]

- **Part A** provides a background to Road Safety Audits and the process of road safety auditing.
    - Chapter 1 (Road Traffic Safety Management) provides an overview of reactive and proactive approaches to road safety improvement.
    - Chapter 2 (The Road Safety Audit concept) discusses the concept of road safety audits as well as, the purpose and value of undertaking road safety audits. It also introduces the different role players in the Road Safety Audit process and their responsibilities. This chapter specifically addresses the role that checklists or prompt lists play in the Road Safety Audit.
    - Chapter 3 (The Road Safety Audit Process) explains the process of a typical Road Safety Audit and identifies the responsibilities for each step in the process.

- **Part B** provides the detail description on conducting Road Safety Audits.
    - Chapter 4 (Road Safety Audits on New Projects) describes the Road Safety Audits that may be conducted on road projects during the planning, design and construction process. It describes Stages 1 to 5 Road Safety Audits ranging from Feasibility/ Preliminary design audits up to Pre-opening stage audits.
    - Chapter 5 (Road Safety Audits on Existing Roads – Road Safety Appraisals) describes the Road Safety Audit process as applied to existing roads. It explains some deviations to the normal road safety process allowing for crash history and other sources of information and providing for an alternative Road Safety Audit reporting structure.
    - Chapter 6 (Other Road Safety Audits) discusses the conditions that may lead to conducting other road safety audits that may be focused on addressing specific problems or areas.
- **Part C** describes the legal environment within which Road Safety Audits have to be conducted.
    - Chapter 7 (Legal implications of Road Safety Audits) introduces the legal environment pertaining to the law of delict and negligence on the part of the road authority and the risk of liability on the grounds that the road authority did not comply with a legal duty (or duty to care) to provide or; maintain safe road facilities.
- The **Appendices** to the Manual provide references, prompt lists, examples and templates to aid road authorities, design organisations and Road Safety Auditors.

4.2 Industry Consultation

The need to review the SARSAM-2012 was established through a resolution taken by the NRTETC in 2016. The RTMC as custodian of the SARSAM-2012 so mandated by the RTMC Act, Act 20 of 1999 initiated the 'review' of the SARSAM to be concluded in 2017/18.

The general feedback from the public and private road safety engineering sector indicates that the SARSAM-2012 is mostly applicable and in line with international best practices and guidelines with various suggested considerations to be taken into account in the Manual that needs updating in line with experience gained since the Manual was published in 2012.

Consultation with government stakeholders regarding the review of the SARSAM-2012 was conducted on related forums viz. the NRTETC, Road Safety Auditor Registration with ECSA Workshop and the Working Group established during the Road Safety Auditor Registration Workshop in 2016 and 2017.

High level input on the SARSAM (2012) were requested from road safety engineering and a working document was compiled and the recommendations made was scrutinised during a workshop which was held on 5 March 2018 and resolutions were made which is contained in Table 3 of this document.

4.3 International Benchmarking

Road safety auditing is a developing discipline in the road safety engineering environment. Extensive development has taken place since the original publication of SARSAM, 2012. It is therefore prudent that SARSAM, 2012 should be compared with road safety manuals of other prominent role-playing countries or organizations, especially if these authorities have updated their Road safety manuals in the recent past.

For the purposes of this review, a comparison of high level principles forming a prominent form-giving role in road safety audit manuals has been done to compare SARSAM, 2012 with the following three Road Safety Manuals:

- UK Road Safety Audit Manual, HD19/15, (2015)
- AUSTROADS Guide to Road Safety; Part 6 Road Safety Audit (2009)
- African Development Bank (AfDB), Road Safety Manuals for Africa (2014)

The comparison is indicated in Table 3 hereafter.

4.4 Recommendations for Updating the SARSAM

The following Table 3 provides recommendations on different Elements/Principles which was resolved on at the 5 March 2018 workshop that must form the basis of the updating of the SARSAM.

Table 3: High Level Principles - Recommendations

#	Element/ Principle	SARSAM (2012)	UK Road Safety Audit HD19/15 (2015)	AUSTROADS Guide to Road Safety; Part 6 Road Safety Audit (2009)	African Development Bank (AfDB) Road Safety Manuals for Africa (2014)	Recommendations for SARSAM Update
1	Format	Stand-alone document	Part of the UK Design Manual for Roads and Bridges; Volume 5: Assessment and Preparation of Road Schemes; Section 2: Preparation and Implementation	Forms part of the broader AUSTROADS Guide to Road Safety	Part of a 3-Volume Series: Vol 1: New Roads and Schemes: Road Safety Audit Vol 2: Existing Roads – Proactive Approaches: Vol 3: Existing Roads – Reactive Approaches	SARSAM to become part of the National series of TMH documents for Road Safety Audit of new roads and upgrades and a parallel and supporting guidelines document in the TRH series to address safety assessments on existing roads.
2	Applicability	Guidelines document recommending mandatory implementation at particular stages	National Standard forming part of the Design Standards for Roads in the UK providing the requirements for the mandatory application of RSA on highway schemes including freeways.	Guidelines document subject to mandatory application in different states, each setting own policy for extent and nature of mandatory implementation.	Guidelines document that has been developed to provide a consistent framework for RSA across the member countries of the (AfDB).	Best Practice application of the principles with supporting advisory information; TRH and TMH documents.
3	Structure	Multi part: Part A Introduction to RSA Part B Conducting RSAs Part C Legal Environment Part D Appendices, including Illustrative RSA report, Photographic examples of typical safety concerns.	Multi-chaptered: 1 Introduction 2 Road Safety Audit 3 Road Safety Audit – Subsequent Actions 4 References Appendices, including Checklists, Illustrative RSA brief and RSA reports, Illustrative Road Safety Audit Response report, Illustrative Exception report, Road Safety Audit Team Statement, Roles and	Multi-chaptered: 1 Introduction 2 Explanation of a road safety audit 3 Legal Issues 4 The Audit Process, Step by Step 5 The Audit of Road Designs 6 Other types of RSAs 7 Case studies 8 Safety principles 9 RSA Tools 10 Notes on RSA Checklists 11 Checklists 12 References	Multi Sectioned: S-1: Introduction to the Manual S-2: Embedding RSA S-3: The RSA Concept S-4: RSA Stages S-5: Team and Personnel Requirements S-6: The RSA Process S-7: Monitoring Appendices, including Glossary, Photographic examples of typical remedial measures, Prompt lists and Illustrative Report	Multi part document: Part A: Background to RSA as part of road safety management and Safe System approach Part B: RSA process and team Part C: Post-audit process Part D: Appendices Accepted for TMH. Shall not include a “template RSA”, statistical rhetoric. Photographs and other supplementary information must be in TRH. Part B should address the close out process as a pertinent matter. Part C should address monitoring, evaluation and feedback to give account of impact of RSAs and to inform future improvements of the method(s). An appropriate structure for the TRH part (or different

Table 3: High Level Principles - Recommendations

#	Element/ Principle	SARSAM (2012)	UK Road Safety Audit HD19/15 (2015)	AUSTROADS Guide to Road Safety; Part 6 Road Safety Audit (2009)	African Development Bank (AfDB) Road Safety Manuals for Africa (2014)	Recommendations for SARSAM Update
			responsibilities Flow charts,			TRHs) needs to be developed. It can include: • Guidelines for road safety management, policies • Road network crash risk assessment and management, etc. • Can be the space the other SARSM volumes • Costs and benefits of RSAs • Photos • TOR Examples • Example of RSA • Prompt Lists
4	Style of RSA Manual	RSA is introduced within the broader context of the objectives and principles road safety management, overarching traffic safety models and pro-active and reactive approaches to identification of traffic safety deficiencies as part of broad traffic safety strategy. Process is described and examples of road safety concerns are given. The style	RSA is written as a set of instructions on the process to followed or described as a standard specification for conducting the RSA and juxtapositioning as a parallel process to the design process. Very limited clarification of the history or benefits of RSA or motivation to conduct a RSA	The RSA Manual sketches the background of RSA, places it in the Safe System environment and motivates the use of RSA in the broader design process, including its role in Quality Assurance of the design. It describes the audit process on a step by step basis with motivation as to why certain aspects should be included or excluded from the RSA. It also describes the civil law environment within which the RSA will be placed in case of possible negligence.	The RSA Manual has been written as guidance for implementation in AfDB member countries. It introduces the concept of RSA in the Safe System environment and motivates the use thereof by providing guidance on the need to establish a legal framework for road safety auditing, the benefits associated therewith and the process to be followed and concludes with the principle to monitor RSAs to adjust design standards based on RSA experience.	In line with Recommendation no 3 above, RSA Manual re-written in TMH style with due consideration of background, context, mandatory actions, supporting information and guidance and typical forms to standardize the structure of the RSA report. Develop a parallel TRH guideline document to address road safety inspections and road safety appraisals which are less formal and significantly more constrained as far as potential mitigating measures are concerned Note differentiation of road safety inspections and road safety assessments
5	Contents: Road safety basis	3-E model, Haddon Matrix and Safe System approach were touched upon; no interaction with RSA developed	No traffic safety model referenced.	RSA as a pro-active tool for road safety is advanced as an integral part of the Safe System approach.	The Safe System is presented as a framework for the safety management of traffic emphasizing the role of speed control and sharing responsibility among shareholders. RSA	RSA explained as a pro-active tool to be set within the Safe System approach to traffic safety; addressing the philosophy of the Safe System approach as well. In line with Recommendation no 3 above,

Table 3: High Level Principles - Recommendations

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					should be specifically sensitive to speed as contributory factor to severity of crashes.	
6	Contents: Costs and benefits of RSA	Touches on the subject and quotes international research results.	Does not address costs and benefits as motivation to conduct RSA	Discusses costs and benefits in motivating for RSA to be conducted.	Discusses costs and benefits in motivating for RSA to be conducted.	Not in TMH; include in TRH document.
7	Contents: Safety risk assessment	A Risk assessment matrix based on a qualitative expectation of Likelihood of a crash and the Severity thereof is included. Risk assessment is indicated for conducting by the road authority in combination with the Design team. Risk assessment by the RSA team is provided for subject to specific inclusion in the Audit Brief.	Risk assessments on Strategic road network is subject to risk assessments in accordance with GD04/12. Details of such risk assessment must be included in the Audit brief. RSA Team recommendations for mitigation on the strategic road network should be in line with the Highways Agency's level of tolerability of risk as described in GD04.	Provision is made for the risk assessment by the road authority on Likelihood of crash or Severity of a crash based on qualitative assessment of the conditions at the site of a safety finding. Levels of tolerance are indicated and are less tolerant than the risk assessment matrix provided for in SARSAM.	Risk assessment on the design of highway schemes is not provided for in the RSA Manual for new roads. A risk assessment process similar to SARSAM and AUSTROADS is included for RSA on Existing roads.	Review the current Risk Assessment matrix to ease the utilization thereof for use by the RSA Team in prioritizing the perceived level of risk associated with the audited condition of every identified safety concern. There should be clarity regarding the risks of types of crashes versus the reporting on, or prioritisation based on only those crashes with a high severity outcome
8	Definition of a RSA (New road)	A RSA is a formal examination of a new or upgrading project where interaction with road users takes place, in which an independent and qualified team identifies potential road safety problems and suggest measures to mitigate those problems.	The evaluation of Highway Improvement Schemes during design and at the end of construction (preferably before the scheme is open to traffic). The objective of RSA is to identify aspects of a Highway Improvement	A RSA is a formal examination of a future road or traffic project or an existing road, in which an independent, qualified team reports on the project's crash potential and safety performance.	A RSA is a formal systematic process for the examination of new road projects or existing roads by an independent and qualified audit team, in order to detect any defects likely to result in a crash or contribute to increased crash severity.	Expand the current definition to include the Safe System context. Include new roads, upgrades, rehabilitation and maintenance that are likely to include new design elements

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			Scheme that could give rise to road safety problems and to suggest modifications that would improve the road safety of the resultant scheme.			
9	Definition of a RSA: (Existing road)/ Different terminology in SARSAM and AfDB Manuals: Appraisal or Assessments	Road safety appraisal: A systematic examination of an existing road location, in which an independent and qualified team reviews on-site conditions and historical evidence to identify existing or potential road safety problems and suggest measures to mitigate those problems.	RSA in terms of HD19/15 does not address existing roads.	The RSA definition covers both new and existing roads.	Road Safety Assessments are expert assessments of the road environment undertaken in reaction to an identified road safety issue on the road network.	Retain the somewhat different definition for road safety auditing of existing roads. Road Safety Investigations (Old Appraisals) Road Safety Assessments (Network Level) Define in TRH (definitions for above) Also consider notes under Recommendation No 8.
10	Role of the RSA Team	RSA Team reviews the design/ works from a purely road safety perspective identifying only concerns that would have a demonstrable negative effect on road safety; seen from different perspectives of all road users. The RSA Team provides advice on possible mitigating measures and shall refrain from being judgmental in describing concerns. Road safety concerns should be framed in terms of the problems envisaged and suggest remedial measures in a feasible manner, considering the severity of the problem and the stage of design. The RSA Team does not perform a technical check	Road safety team provides independent and road safety focused advice to the Overseeing Authority. The RSA team refrains from being judgmental in its review of the design and refrain from comments on any strategic decisions. The road safety team does not approve any aspect of the design but considers the safety implications of the design being reviewed, subject to the scope as clarified in the Audit Brief. If	RSA Team provides advice to the client on aspects of a project that might be hazardous and suggests potential corrective actions. The team focuses exclusively on traffic safety as experienced by all road users.	RSA Team should review design from a safety perspective related to all road users and not just from the vehicular perspective, assess if any undue compromises on road safety had been made and assess compliance with the Safe System approach to road safety. RSA team shall refrain from being over-critical of items that are not substantive. RSA Team operates under a brief provided by the Client and provides focused advice to the client without weighing economic considerations	Clarify the role of the RSA team further to the RSA definition, explaining the fact that it is a focused role player that advises the client on aspects specifically applicable to road safety of all road users; its role being to assess the proposed scheme or existing road for safe fitness for purpose, rather than compliance with design standards task to include comments on the safety of provided measures and on possible measures that should be included to reduce the severity of crashes. Include 'Design Considerations' and the need for design consistency.

Table 3: High Level Principles - Recommendations

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		of compliance with standards.	required the Audit team may be required to advise on the risk of situations in terms of published risk assessment guidance.		higher than safety considerations. Where viewpoints conflict, the Client decides upon the appropriate implementation.	
11	RSA Team qualifications	Team leader and team members shall show skills through successful completion of road safety engineering, crash investigation and road safety audit training not less than 9 days in total; show experience in road design or road safety related fields, conducted recent road safety audits and complete 2 days CPD per year. No requirement for formal registration set in SARSAM, 2012	Team leaders and members shall complete approved training program of at least 10 days, show appropriate experience of RSA and relevant wider experience and a minimum of two days CPD per year. Work on freeway or motorway network would require at least one member of the team to hold a Certificate of Competency. No other formal registration is required in HD19/15.	Team members shall show relevant experience and skill and shall have completed a recognized road safety course of at least two days, completed a minimum number of audits over a period of which at least one would have been within the last year. AUSTROADS does not provide specific registration, although different Australian States require this in parallel policy documents.	Team members shall have a University degree in road engineering, traffic or related road safety field, or have extensive practical experience. This shall be supplemented by period of industry experience and RSA experience and shall demonstrate ongoing appropriate CPD development. No additional registration is required.	Proposed that the RSA team leader/ members be registered with ECSA in a sub-discipline for Road Safety Auditor, subject to compliance with specified qualification, experience and RSA skills and experience and retain registration with ongoing approved CPD.
12	RSA Stages	1. Preliminary design stage RSA (Also referred to as Feasibility stage RSA) 2. Draft design stage RSA (Current terminology is Concept design or Preliminary design stage RSA) 3. Detail design stage RSA 4. Work zone stage RSA	1. Completion of Preliminary design 2. Completion of Detailed design 3. Completion of Construction 4. Monitoring stage RSA (Review of 12 month and 36-month	1. Feasibility stage (including audit of the design brief) 2. Preliminary design stage 3. Detailed design stage 4. Pre-opening stage (or post-opening if done just after the project opens)	Stage 1: Feasibility Study Stage 2: Preliminary Design Stage 3: Detailed Design Stage 4: Pre-Opening Stage 5: Post-Opening (1 year) All 5 stages only required for long term major projects; smaller projects may combine appropriate stages of audit.	Retain existing RSA staging, expanding on possible other special audits and stressing the need for Interim RSAs in case of phased development of schemes. Stage 6 to TRH Document. Consider to amend in line with approval processes of SIPDM (Standards for Infrastructure Procurement and Delivery Management)

Table 3: High Level Principles - Recommendations

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		5. Pre-opening stage RSA 6. Existing road stage RSA Other RSAs Audit stages may be combined in cases of smaller projects	Personal Injury Collision data) Previously a Stage F or Stage 0 RSA was also defined for the Feasibility stage/ Master planning design stage. Other audits such as Vulnerable road user (VMU) RSA Audit stages may be combined where deemed appropriate.	Other audits, such as Audit of Roadwork Traffic Schemes, Audit of Land Use Developments, Specialist Audits for Road User Groups, RSA of Existing Roads.	Other Types of Audit: • Safety Review of Existing Roads • Traffic Management Schemes • Building Development • Temporary Traffic Management Audit	
13	RSA on Existing roads	RSA on Existing roads is included as Road Safety Appraisals, with marginally different definition compared to RSA on design projects.	RSA on existing roads is not included in HD19/15	RSA of Existing roads is included as an Other RSA.	RSA Manual refers to Safety Review of Existing roads and also dedicate two specific volumes on the pro-active and reactive review of Existing roads.	Guidelines should be provided in a TRH series document for the inspection and assessment of existing roads, combined with information that may be used to improve the quality of road safety engineering decision making. Terminology as noted under Recommendation No 8.
14	Thematic RSA or Other RSAs	Additional RSAs allowed, including RSA of Land-use developments	Applicability to Temporary Traffic Management schemes are generally excluded, but other RSAs and thematic RSAs provided for.	Other audits included and described.	Other audits are also provided for.	Better suited in TRH document Consider a possible extension on TMH16 (in TRH form) to ensure a focus on road safety.
15	Interim RSA or safety advice	Interim RSAs have been provided for, including phased opening of road construction projects or design changes during construction.	Interim stage audits are allowed and a procedure for these audits and coordination between design organization and RSA team is allowed.	No reference to Interim RSA	Single reference to Interim RSA or road safety advice to retain and improve communication with the RSA team.	The principle of Interim audits should be expanded to promote the earlier reach out to the RSA Team to retain flexibility in design prior to locking designs. Should be addressed under Recommendation No 3 to encourage appropriate interaction before formal/final audit

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16	Inclusion of recommended remedial measures in RSA report	Proposed style for reporting provides for recommendations for remedial measures appropriate to the stage of development/ design.	Recommendations to be included in the report. RSA Team shall refrain from recommending changes to possible strategic decisions such as route choice, junction type etc. as these might already have been the result of a balanced assessment of relevant information.	Recommendations should be included for each road safety finding if the audit brief required this. Recommendations should be commensurate with the level of risk of the deficiency and the stage of design/ development of the works being audited.	Recommendations should be made for all road safety findings.	Recommended remedial measures appropriate to the level of risk should be included for each safety concern and stage of design/ construction unless specifically excluded in the audit brief. Level of typical recommendations would be at most a conceptual design – make provision for conceptual design– the designer must take it further.

In addition to the above recommendations in Table 3, the following was resolved at the 5 March 2018 workshop and should be taken into account during the process of updating the SARSAM:

- No Road Safety Statistics should form part of the introduction of the updated SARSAM.
- Consider the review of the SA Road Safety Manual 1999 for review and updating in a separate process than the updating of the SARSAM.

4.5 Process - Updating of the SARSAM

4.5.1 SARSAM as TMH and TRH Documents

The Review of the SARSAM-2012 will form the basis of Updating of the Manual and it is recommended that the SARSAM is published as TMH/TRH documents published by the RTMC under auspices of the:

- National Road Safety Steering Committee (NRSSC)
- Committee of Transport Officials (COTO)

The re-written RSA Manual in TMH style should give due consideration of background, context, mandatory actions, supporting information and guidance and typical forms to standardize the structure of the RSA report.

A parallel TRH guideline document/s need to be published to address road safety investigations and road safety assessments, which are less formal and significantly more constrained as far as potential mitigating measures are concerned.

The Technical Methods for Highways (TMH) consists of a series of publications in which methods are prescribed for use on various aspects related to highway/road engineering. The documents are primarily aimed at ensuring the use of uniform methods and standardisation throughout South Africa and use thereof by road authorities are compulsory.

The Technical Recommendations for Highways consists of a series of publications that describe recommended practice for various aspects related to highway engineering. The documents are based on South African research and experience at the time of drafting. The documents are primarily aimed at ensuring uniform practice throughout South Africa, and use thereof is recommended.

4.5.2 Publishing SARSAM as TMH/TRH - Procedure[8]

The time-frame of establishing the SARSAM as TMH/TRH documents will be an estimated three years from commencement of Updating of the SARSAM.

The need to establish a new specific TMH/TRH document is usually identified by relevant RCB/COTO sub-committees however; in this case, the RTMC as custodian of the SARSAM identified the need through the NRTETC, which is a sub-committee of the NRSSC concerned with road safety in South Africa, through its mandate from the RTMC Shareholders Committee.

The following is the process for publishing the SARSAM as a TMH/TRH documents:

- A COTO sub-committee to be formed in conjunction with the NRTETC where after a Panel of Industry Experts needs to be appointed to assist with the Updating of the SARSAM-2012. Comprehensive stakeholder engagement needs to be held to establish the TOR for Updating of the SARSAM-2012 with this document as base document.

- The COTO/NRTETC Workgroup needs to draft the new TMH/SARSAM and recommended TRH guideline documents. Once the workgroup is satisfied with the draft TMH/TRH, the Working Draft Final document needs to be converted to a Committee Draft and submitted to COTO sub-committee for review and comment. When approved by the COTO sub-committee, the Committee Draft document needs to be submitted to the RCB and NRSSC for wider review and comment. All comments received needs to be reviewed and incorporated where applicable and a Committee Draft Final needs to be prepared. A COTO/RCB Workshop must be arranged to table the Committee Draft Final. All written comments received needs to be reviewed and incorporated where applicable into the Committee Draft Final.

- The Committee Draft Final then needs to be converted to a Draft Standard and submitted by RCB to COTO for approval as a Draft

[8] Louw Kannemeyer, COTO Review Process, June 2016

Standard TMH/TRH where after the Draft Standard will be released to the wider industry for implementation for a two-year period. All written comments received needs to be reviewed and incorporated where applicable into Committee Draft Final.

- At end of the two-year period all written comments received needs to be collated and reviewed by the COTO/RCB sub-committee and incorporated where applicable and, a draft Standard converted to Final Standard and submitted by RCB to COTO for approval as Final Standard TMH.

- The Final Standard TMH/TRH will then be released to the industry. Should changes between the Draft Standard and Final Standard be extensive then further industry workshops may be arranged.

- The Final Standard TMH/TRH is then used for a maximum of five years in industry before revision is considered.

5 CONCLUSIONS

The purpose of this document is to Review the South African Road Safety Audit Manual (SARSAM, 2012) towards 'Updating' of the SARSAM.

The RTMC as custodian of the SARSAM-2012 identified the need to review and update SARSAM, 2012 through the NRTETC which is a sub-committee of the NRSSC concerned with road safety in South Africa. The NRTETC resolved that the updated SARSAM should be published as a TMH document by the RTMC under auspices of the:

- National Road Safety Steering Committee (NRSSC)
- Committee of Transport Officials (COTO)

The SARSAM, 2012 is largely in line with international RSA Guidelines but that there may be benefits in further aligning SARSAM to South African practice. This includes the re-packaging of the SARSAM in the TMH and TRH-series of Standards to be used by the roads industry.

The review also identified the need to retain greater flexibility in the identification on a network level of those existing roads that would require specialist review to select road sections for more in-depth assessment. This process should be based upon guidelines to be developed and made available to the industry through the TRH-series of documents.

Recommendations that need be taken into account during the updating the SARSAM are summarised in Section 4.4 of this document, as resolved by Road Safety Engineering practitioners during a workshop that was held on 5 March 2018.