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# REVIEW OF GLOBAL ROAD SAFETY AUDIT GUIDELINES – WITH SPECIFIC CONSIDERATION FOR LOW-MIDDLE INCOME COUNTRIES

TECHNICAL COMMITTEE C2 *DESIGN AND OPERATION OF SAFER ROAD INFRASTRUCTURE*

WORLD ROAD ASSOCIATION
MONDIALE DE LA ROUTE
AIPCR PIARC

# STATEMENTS

*The World Road Association (PIARC) is a nonprofit organisation established in 1909 to improve international co-operation and to foster progress in the field of roads and road transport.*

*The study that is the subject of this report was defined in the PIARC Strategic Plan 2016– 2019and approved by the Council of the World Road Association, whose members are representatives of the member national governments. The members of the Technical Committee responsible for this report were nominated by the member national governments for their special competences.*

*Any opinions, findings, conclusions and recommendations expressed in this publication are those of the authors and do not necessarily reflect the views of their parent organisations or agencies.*

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# REVIEW OF GLOBAL ROAD SAFETY AUDIT GUIDELINES – WITH SPECIFIC CONSIDERATION FOR LOW AND MIDDLE INCOME COUNTRIES

**TECHNICAL COMMITTEE C.2 *DESIGN AND OPERATION OF SAFER ROAD INFRASTRUCTURE***

# AUTHORS/ ACKNOWLEDGEMENTS

This report has been prepared by the Working Group C2.2-4/5 of the PIARC Technical Committee C.2 Design and Operation of Safer Road Infrastructure (2016-2019). The work is based on a review of international practice in Road Safety Audit seeking relevance to Low- and Middle-Income Countries (LMIC) were considered.

This is the first edition of the document, but TC C.2 objectives are to make available key areas of audit practice which can be used to make the existing PIARC Road Safety Audit Guidelines more relevant to LMICs.

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# EXECUTIVE SUMMARY

2019R41EN

# REVIEW OF GLOBAL ROAD SAFETY AUDIT GUIDELINES – WITH SPECIFIC CONSIDERATION FOR LOW- AND MIDDLE-INCOME COUNTRIES

This report covers the work undertaken by Workgroup 4/5 of Technical Committee C2.2 - Design and Operation of Safer Road Infrastructure during the 2016-2019 work cycle of PIARC. It has involved a comprehensive review of current Road Safety Audit Manuals and Guidelines from a range of different countries to establish current practices and considers previous international reviews to determine key areas where additional guidance is required, or exemplar practice is well established.

Initial consideration was given to the core issues facing many countries regarding implementing a comprehensive audit system. These included:

- Variability of situations across LMICs
- Traffic mix and main crash types
- Vehicle condition
- Driver competency, compliance and use of infrastructure
- Increasing motorisation and modal changes
- Rapid infrastructure expansion
- Low number of experienced road safety auditors/inspectors.
- Capacity of road safety engineers and designers to deal with recommendations arising from Road Safety Audit
- Economic pressures and the need for cost benefit analyses.
- Variation in design standards
- The importance of early intervention and land use planning
- Road user behavior
- Legal environment and enforcement

Several reviews of international experience in Road Safety Audit have been undertaken over recent years and these were considered before examining a wide range of manuals and guidelines from across most continents.

Many of these documents draw upon very similar principles and content, having been developed by international road safety experts. For example, the International RSA manuals and those from countries such as Uganda, Ghana, Tanzania and Ethiopia are all very similar in layout and content. It is often only the degree of detail that varies. Similarly, whilst there are differences in approach between US and other manuals, their layout and process are all very similar.

Therefore, for the reporting of the review, best examples and those that offer some difference in approach were selected. This means that the manuals selected for detailed review provide the best representation of different approaches available that will together be most useful in the context of LMICs. These were then used to highlight areas in the current PIARC manual that could be improved to assist LMICs in developing their own comprehensive approach to RSA and RSI.

# EXECUTIVE SUMMARY

It is clear that some areas of the current PIARC *Road Safety Audit Guidelines for Safety Checks on New Road Projects (2011)* needs need to be updated and additional sections included to provide exemplar guidance to LMICs.

These need to cover areas such as responsibility, legislation, auditor independence, training and competence.

Some of these may be more relevant to be referenced to the on-line Road Safety Manual as they deal with some aspects of Road Safety policy

These additions would be relevant for all countries and, relevance to LMICs can be improved by relatively minor amendments to the existing text. These have been detailed in this review

# CONTENTS

# 1. INTRODUCTION

In the period 2016-2019 PIARC TC C.2 decided to continue to work on the topic "Operations and Maintenance Safety and Potential Countermeasures for LMICs" and included in its Work Program the preparation of a "Review of global road safety audit guidelines – including consideration for low- and middle-income countries" that could provide informed opinion for inclusion in any future revisions of PIARC document - Road Safety Audit Guidelines for Safety Checks on New Road Projects (2011) referred to as 'RSA Guidelines' within this review.

This report deals with the work carried out by WG 4/5 in approaching this topic and provides summary recommendations. The WG C2.2 4/5 addressed the topic and moved through the following stages to implement the activity:

**Stage 1** – Clarification of extent of work definition. The initial requirement of the task covered the review of road safety audit for inclusion in a future revision of the PIARC Road Safety Audit Guidelines and a clear and consistent definition of road safety audit was required. Some confusion or lack of clarity exists internationally as to what road safety audit applies to, with frequent reference to audits of existing roads and confusion between audit, inspection and assessment.

For clarity and the avoidance of doubt the definitions described by Breen, Humphreys, and Melibaeva (2013) has been adopted

*"Road safety impact assessment" is a strategic comparative analysis of the impact of a new road or a substantial modification to the existing network on the safety performance of the road network;*

*"Road safety audit" is an independent, detailed systematic and technical safety check relating to the design characteristics of a road infrastructure project and covering all stages from planning to early operation;*

*"Road safety inspection" is an assessment of the existing network; and*

*"network safety ranking," which is a key part of network safety, is a method for identifying, analysing and classifying parts of the existing road network according to their potential for safety development and crash cost savings.*

This report is only concerned with road safety audit.

**Stage 2** – Summary of the issues facing LMICs in delivering road safety generally. This involved a consideration of the wide range of institutional and operational conditions that apply across LMICs in general.

**Stage 3** – Review international RSA Practice relevant to LMICs involved consideration of previous work undertaken particularly the production of Road Safety Manuals for Africa which were agreed to be a sound base from which to work. However, several other reviews were also considered

**Stage 4** – Review of a range of international manuals to benchmark PIARC RSA Guidelines was then undertaken to identify how these key issues have been dealt with relating PIARC content to that of other international manuals.

**Stage 5** – Drafting of the Report and submission to the Technical Committee for approval.

# 2. COMMON ISSUES RELEVANT TO LMICS

To understand the road safety implications across LMICs it is necessary to consider the broader issues that face these countries.

### Issue 1: Variability of situation across LMICs

Even amongst LMICs there is a very large variation in geography, economic development, demographics, stability, culture, climate/weather and road and traffic conditions. In addition, there is significant variation in road safety culture and organisational capacity that will fundamentally affect their ability to implement road safety audit practices effectively.

### Issue 2: Traffic mix and main crash types

Across Africa alone it is estimated that 50% of fatalities are Vulnerable Road Users (VRUs). In urban areas, 50% of fatalities are pedestrians in South Africa, and 90% of fatalities are reported to be pedestrians in Addis Ababa, Ethiopia. The roads carry a much more varied range of road users than roads do in other regions. There are greater walking trips made and a greater proportion of slow-moving vehicles.

### Issue 3: Vehicle condition

Vehicle condition/maintenance standards are likely to be poor in many LMICs countries; moreover, the vehicle fleet is relatively old and unlikely to include safety features such as multiple airbags, ABS brakes and electronic stability control (ESC). These factors will have a significant impact on crash survivability.

Vehicle safety issues are broad and include poor use of restraint systems (seatbelts) and highly risky transport of passengers loose on inappropriate vehicles. Many of the design standards are based on high income country standards (i.e. US, Europe, Australasia) with little recognition of both vehicle and road user deficiencies.

### Issue 4: Driver competency, compliance and use of infrastructure

The clarity of laws, level of enforcement, driving conventions and levels of compliance will have an impact on the way in which road infrastructure is used. Account needs to be taken of a range of laws and regulations regarding the competency and compliance of drivers and other road users. There will also be very variable enforcement of these rules. This needs to be considered in the proposals for treatments (to ensure that treatments are appropriate for use in LMICs) and the most significant issues raised in audits.

### Issue 5: Increasing motorisation and modal changes

As LMICs experience increased levels of motorisation there is potential over the next decade for the population to move through different traffic modes. For example, moving from walking to using motorcycles and public transport; through to car ownership. At the same time, there are initiatives to increase the provision of formal public transport systems (such as Bus Rapid Transit) in heavily congested cities. Guidance must be able to deal with all traffic modes likely to be prevalent across LMICs in the next 10 years, together with changes in the road infrastructure to deal with these increasing demands.

### Issue 6: Rapid infrastructure expansion

Substantial investment is being made in infrastructure development across the continents. This combined with the increasing motorisation and volume of motorised traffic will substantially change the scale and quality of road infrastructure over the next ten years requiring increased knowledge and understanding of the impact on behaviour and facilities.

### Issue 7: Low number of experienced road safety auditors/inspectors.

RSA is relatively new to many LMICs, yet these need to be applied consistently. Reliance on international experts is not a reasonable or sustainable approach. Local capability needs to be developed.

### Issue 8: Capacity of road safety engineers and designers to deal with recommendations arising from Road Safety Audit

One principle of RSA particularly is that the auditors should respect the road designers and acknowledge that they are trying to achieve several (often competing) objectives. In response, the designers should welcome constructive feedback and use the RSA comments to guide any necessary re-design and as a 'steer' towards what needs to be modified. Additionally, hazardous location analysis will influence the development of improved design solutions.

### Issue 9: Economic pressures and the need for cost benefit analyses.

The lack of any business case justification for implementing audits has been raised in several discussions. This needs to be emphasised.

### Issue 10: Variation in design standards

Current design standards vary across LMICs in terms of their quality and consistency. However, appropriateness of design standards is a key element of infrastructure safety. Even adoption of ASSHTO and UK DMRB standards on adjacent schemes can create issues due to the inconsistences in design philosophy between the two approaches. Awareness of this needs to be included in any guidance applicable across different countries.

### Issue 11: The importance of early intervention and land use planning

If RSA is undertaken at an early stage in scheme development, many road safety issues that are difficult to solve once constructed can be avoided. For example, if land use planning is considered properly, then a new road should not divide communities, placing vulnerable users at greater risk.

### Issue 12: Road user behaviour

Road user behaviour and levels of compliance will vary between different LMICs. This will have an impact on how road infrastructure is used and the potential for any proposed measures.

### Issue 13: Legal environment and enforcement

The legislation in place, both for the control of driver behaviour and in terms of legal requirements on road authorities will have an impact on the content and application of RSA. In addition, the level of deterrent achieved through effective enforcement will have an impact on driver behaviour.

# 3. REVIEWS OF INTERNATIONAL ROAD SAFETY AUDIT PRACTICE

A number of reviews of international experience in Road Safety Audit have been undertaken over recent years. These include:

- National Cooperative Highway Research Programme Synthesis 336 (2004) Road Safety Audits - USA[13]
- Road Safety Audits: The Way Forward (2010) South Africa[15]
- A Comparative Review of Road Safety Audit Guidelines of Selected Countries (2013)[6]]
- Road Safety Engineering in Africa – Current Practices, Challenges and Recommendations (2104)[3]
- Implementation Status of Road Safety Audit and Inspections in Latin America (2018)[12]

Each is summarised in order below.

## 3.1. SYNTHESIS 336 (2004)

Whilst the NCHRP Synthesis does not directly affect LMICs, it is of relevance as US practice in Road Safety Audit differs significantly from that of other major countries in that it applies audit to a wider road network and it often gets confused with road safety assessment and inspection as defined by Breen, Humphreys, and Melibaeva (2013).

It identifies that Road safety audits (RSAs) and road safety audit reviews (RSARs) are two safety tools that offer promise to help reduce roadway crashes and fatalities. Globally, these tools have been used by transportation safety professionals since the 1980s and are emerging as proactive safety tools in U.S. practice.

The internationally accepted definition of an RSA as used in the synthesis comes from The Canadian Road Safety Audit Guide and is as follows: “An RSA is a formal and independent safety performance review of a road transportation project by an experienced team of safety specialists, addressing the safety of all road users.”

An RSAR is defined for use in this synthesis as “an evaluation of an existing roadway section by an independent team, again focusing solely upon safety issues” and comes from NHI Course 380069 (“Road Safety Audits and Road Safety Audit Reviews”).

Internationally, the distinction between the evaluation of a plan or a design (RSA) and the evaluation of a roadway section or intersection (RSAR) either just before opening or already open to traffic is becoming more pronounced. Terms such as RSAR, road infrastructure assessment, road review, roadway assessment, and roadway inspection have been used to differentiate an RSAR of an existing roadway from an RSA of a plan.

This synthesis was developed using a comprehensive literature review, a survey of state and provincial DOTs by means of a structured questionnaire, and the authors’ personal contacts and experiences in providing RSA team leadership and training worldwide.

The questionnaire was designed to elicit responses related to key RSA issues defining DOT practices and to clarify and identify possible DOT concerns when agencies consider implementing these proactive safety tools. The survey responses indicated that by mid-year 2003, only seven state DOTs were using both RSAs and RSARs in their safety programs. An additional 10 states indicated that

they were using one but not both tools. Most of these states indicated that their use was best described as a beginning program to determine the benefits of incorporating the tools into their safety programs. That is not surprising, for the initial exposure of most state DOTs to RSAs was relatively recent, in 1997, compared with international practices, which date from the 1980s.

The survey identified several issues that affect the use of RSA processes and the way in which they are applied, including

- Institutional issues—agency culture, staff interests, manpower, expertise availability, financial resources, liability, and management acceptance.
- Audit team composition—size of team (three to five members were recommended) and team skills—most states identified a core related to traffic operations, design, and safety, with additional skills related to construction, maintenance, law enforcement, planning emergency medical services, and human factors depending on the audit stage and scope of the project.
- In general, the benefits of conducting RSAs during an early project stage were identified as key to maximising their impact or effectiveness. The advantage of identifying the safety issues before the project's footprint has been developed was seen as an important benefit of the RSA approach.

Several states were reported as having advanced beyond the initial assessment stage. Specifically, Iowa, Pennsylvania, New York, South Carolina, and South Dakota were identified as having developed programmed approaches for including proactive safety assessments.

It is interesting to note that Iowa's Road Safety Audit Manual (2011) specifically states that:

*The RSA process is a formal, independent safety evaluation on planned or existing roadways by an experienced and multidisciplinary team of specialists. The team looks for existing and/or potential safety hazards that may affect any type of road users and identifies possible countermeasures to address those safety issues.*

*The guidelines presented in this manual utilize information from the NCHRP SYNTHESIS 336 & 321, FHWA Road Safety Audit Guidelines 2006 and from Nevada's Department of Transportation's RSA Procedures and Guidelines 2009.*

This highlights two potential differences between US practice and other International practice regarding road safety audit – its use on existing roads and the identification of possible countermeasures.

Fundamentally, road safety audit requires the presence of a design team that the audit team is independent of, and recommendations in audit reports are for designers to formulate appropriate countermeasures not the audit team. These aspects are key to maintaining the independence of the audit team to identify issues related to the safety of all road users.

It is important that this clarification is emphasised for those in LMICs wishing to develop and use an internationally recognised audit procedure

## 3.2. ROAD SAFETY AUDITS: THE WAY FORWARD (2010)

This paper assessed recent international developments pertaining to road safety auditing and reported on a review of the experience by road safety practitioners in South Africa. It concludes with recommendations on the updating of the guidelines for road safety auditing in South Africa.

The following road safety audit guidelines were reviewed as part of this study:

- Road Safety Audit, HD19/03, forming part of the UK Design Manual for Roads and Bridges, November 2003;
- FHWA Road Safety Audit Guidelines, Publication No. FHWA-SA-06-06, 2006;
- Institution of Highways and Transportation, Road Safety Audit, October 2008;
- Austroads, Guide to Road Safety Part 6: Road Safety Audit, Austroads publication No. AGRS06/09, January 2009;
- Road Directorate, Ministry of Transport, Denmark; Manual of Road Safety Audit, 2nd edition, 1997;
- Road Safety Audit for Roads: An Operational Tool Kit, Asian Development Bank, Manila, June 2003;
- PIARC Technical Committee on Road Safety (C13) Road Safety Manual, Version 1, 2003;
- Road Safety Audits, National Roads Authority, Ireland, July 2004;
- Department for Transport, Manual for Streets, First edition, 2007, and
- Road Safety Audit Manual for Dubai, Draft First edition, 2008.

The experience of South African road safety practitioners was also solicited by means of a comprehensive questionnaire that reviewed all aspects of the road safety audit process as indicated in the South Africa Road Safety Manual. The questionnaire was divided into five parts that addressed the following broad areas of interest:

- Institutional issues ;
- The Road Safety Audit Concept;
- The Road Safety Audit Methodology;
- Management of the Road Safety Audit Process; and
- Implementation of Road Safety Audit Findings.

Responses received clearly indicated the limited extent to which road authorities have a formal road safety management policy. Although there were no identified institutional barriers, the lack of capacity, funding, time constraints and the lack of support were cited as institutional constraints. It was clear from the respondents that the exposure to road safety audit was limited.

All, but one, of the respondents commented on the onerous requirement set by the definition in requiring a qualified examination team. This was particularly set against the limited number of trained road safety auditors and the lack of mandatory requirement to conduct road safety audits on new work.

There is general agreement that a team is required to do a road safety audit, because of the combination of skills that this would offer. Certain projects, nevertheless, may not require a team but could suffice with a single auditor. Respondents agree that training is essential.

There was a clear response that the audit team need not be made up of only members totally independent of the client or design organisations. Allowance was made that independence could

mean that the team leader had no prior involvement in that project but could be from the client or design organisation.

The pre 2012 guidelines require that the road safety audit report classify identified problems in terms of their seriousness. Respondents did not experience that this was done regularly, or that similar findings were classified consistently.

The SA guidelines were also the first to suggest that road safety audits be done at six stages. The respondents were unanimous in declaring that it was not essential to conduct road safety audits at all these stages. Only in highly exceptional or very complex cases would this be necessary.

Responses on the need to conduct road safety audits on existing roads varied from “no” and “not feasible on the entire network” to “particularly important in the South African environment”.

The guidelines caution against the shortening of the checklists that are provided but do not restrict the road safety auditor to make extensive use of knowledge or prior experience to carry out the audit. Respondents are largely in agreement that road safety audits should not be conducted purely based on the checklists and that the audit team could assess other issues relevant to the audit being conducted. The respondents concurred that it would be impossible to expand the checklists to encompass all possible aspects that could be addressed in an audit and agreed that a reduced or consolidated prompt list be retained in the Manual as guidance to the audit team.

Respondents were unanimous in advising that the relevant road authority should also be the client organisation for a road safety audit and that an independent central organisation should not be the client. The use of such a central organisation could, nevertheless, improve standardisation and better use of scarce resources.

In general auditors are required to comply with the requirements for experience and training as set out in the current guidelines. Respondents were in agreement that field work pertaining to a road safety audit should not be done by lesser experienced personnel under the indirect supervision of the road safety audit team leader. They also agreed that the lack of accredited training for road safety auditors and an accreditation process are some of the constraints on the delivery of proper RSA investigations.

Notwithstanding the requirement of a completion meeting and the preparation of a response report in the current road safety audit guidelines, the responses clearly indicated a lack of any formal close-out process for the road safety audit as well as the non-preparation of a response report. The non-preparation of these response reports means that no formal recognition is given to the potential risk as advised by the audit team. It also means that the possibility exists that neither the top management of these road authorities nor the political functionaries had been advised of any increased risk exposure on the roads so audited.

Following this review and responses from SA practitioners a detailed series of recommendations were made for incorporation in the 2010 guidelines. Most of which were incorporated in the current version.

### 3.3. A Comparative Review of Road Safety Audit Guidelines of Selected Countries (2013)

This examined Road Safety Audit manuals from seven selected countries:

| COUNTRY | NAME/AGENCY/ YEAR OF PUBLICATION (LATEST REVISION) |
|---|---|
| Bangladesh | Guidelines for Road Safety Audit, Roads and Highways Department, May 2005 |
| India | Manual on Road Safety Audit, Indian Roads Congress, November 2010 |
| Ireland | National Roads Authority, Dublin, March 2007 |
| Malaysia | Guidelines for the Safety Audit of Roads in Malaysia, Public Works Dept. (Roads Branch), 1997 |
| Nepal | Road Safety Audit Manual, Department of Roads April 1997 |
| UK | Guidelines for Road Safety Audit, Institution of Highways and Transportation, November 1996 |
| USA | FHWA Road Safety Audit Guidelines, US Department of Transportation, 2006 |

The objective of this study was to compare the contents of the guidelines of a selection of countries representing low, middle- and high-income level of economies. A total of seven countries were selected, depending on the availability of the RSA document. The review included the following parameters of the RSA guidelines of the studies:

- a) Definition of RSA in the guidelines
- b) Stages of a project -when RSA is recommended
- c) Road Safety Check Lists/Forms attached to the document
- d) Other important parameters of a guideline document
    - (i) Qualification Requirements and Composition of the Audit Team
    - (ii) Consideration of Legal Liability Aspects in RSA
    - (iii) Inclusion of Workflow Charts of Audit in the document
    - (iv) Inclusion of Sample Reports and/or Case Studies on Overall Process and/or Various Stages of RSA

The definition of the term “RSA” varied among guidelines, with variations on both the independence of auditors and the definition of schemes or projects, extending on occasion to existing roads and their operation.

The RSA process was required for different stages of a project in different countries. Typically, this covered four stages during design and construction, with some extending to six defined stages and covering the operation of existing roads.

The inclusion of checklists or forms also varied in terms of contents and coverage. At a minimum they were divided into two broad categories covering from feasibility stage to existing roads. The

alternative approach was for a defined set of topics to be detailed for stage of audit. Not all topics covered were the same in each instance.

The qualifications of auditors or team requirements were unequally emphasised in the documents. In countries where RSA is an established practice, an auditor must be a qualified practitioner with experience in road design, traffic engineering, safety engineering and other related discipline. A Road Safety Audit (RSA) may be carried out by one appropriately skilled person or by a team of professionals bringing together a range of skills and experience. It is not very common for a person being expert on all topics of the audit process. Therefore, formation of an audit team is naturally common. Whether there is any requirement of the accreditation or training in the RSA process specified in the guideline is an important consideration.

The study reviewed and compared information from the guideline documents and found wide variation in both the description and detail of whether the minimum qualification of the auditors and the composition of the teams for different stages of audit was necessary.

The legal liability aspects were not given any emphasis in three of the seven guideline documents and two country documents did not contain any sample RSA report or any sample case study.

Overall, the study concluded that no single RSA guideline document can be called as the best one, as each was prepared considering the specific local conditions and requirements.

### 3.4. Road Safety Engineering in Africa – Current Practices, Challenges and Recommendations (2018)

This presentation provided a summary of the research and investigation undertaken by TRL and BRRC under contract to African Development Bank for the preparation of a series of Road Safety Manuals to be used throughout Africa. As part of understanding the current state of RSA across the continent and wider internationally, a series of research tasks were undertaken.

These included:

- A review of issues relevant to African conditions and a description of how these issues will be dealt with in the manuals and training.
- An analysis of road safety practice across Africa that is relevant to the manuals that includes common issues/hurdles for implementation that need to be addressed in the development of the manuals and subsequent training.
- A review of International and African road safety manuals and the identification of best practices for inclusion in the manuals.

In addition to reviewing a wide range of national and regional road safety audit manuals and guidelines, the work also involved an online survey completed by international road safety experts of their experiences in a wide range of countries and reference to the WHO Global Report on Road Safety (2013) for background information in relevant countries where none was provided.

The online survey covered aspects of each of the three manuals being prepared: Road Safety Audit; Road Safety Inspection; and Cluster Site Analysis. A total of 70 responses were received from experts with experience in 43 different African countries. From these responses it was clear that RSA was undertaken (in some form) in 30 different countries, yet only 14 had specific RSA manuals. Many relied on international manuals or reference to international funding agencies for relevant

standards. 11 countries had guidance documents in place, but only 9 had specific policies, system or procedures in place for the delivery of RSA.

It also identified several key issues in the delivery and development of RSA across Africa that are summarised in Table 1 below

This research provided the basis for the development of the Africa wide manuals that needed to accommodate a wide range of both institutional and infrastructure conditions.

| |
|---|
| Shortfall in number of experienced local Road Safety Auditors |
| No legal requirement for RSA – RSA is voluntary |
| Lack of RSA training available to engineers |
| Not all schemes are subjected to RSA |
| Lack of funding |
| RSA is undertaken without a formal manual/methodology in place |
| Recommendations are not always incorporated into designs |
| Fundamental road safety issues will not be addressed adequately through RSA |
| Addressing RSA comments is not considered mandatory by designers |
| Insufficient budget available to implement all recommendations |
| Draft manual only in place |
| Manual not systematically followed |
| Only pre-opening stage RSA is undertaken |

*Table 1 Summary of issues raised through online questionnaire*

### 3.5. Implementation Status of Road Safety Audit and Inspections in Latin America (2018)

In 2016, Technical Committee C.2 Design and Operation of Safer Roads Infrastructure of the World Road Association (PIARC) invited eight Latin American Countries to complete a survey with the aim of collecting information about the use and experience with road safety audits in the region. Five countries (Argentina, Costa Rica, Chile, Mexico and Uruguay) returned the completed questionnaires with responses yielding the following results:

- Only Costa Rica has legislation that makes the use of road safety audits mandatory. Argentina has a regulation on road safety audits, but this is not binding in nature and road safety audits are only conducted if required by international credit institutions in order for them to grant funds.

- Argentina and Chile are the only countries to have fully developed their own manuals on the subject of road safety audit; Costa Rica is presently in the process of doing so (currently based on the Chilean manual). Mexico follows the recommendations of the Ibero-America Road Institute (IVIA for its acronym in Spanish) and is also in the process of developing its own manual. Uruguay, on the other hand, intends to adopt the regulation defined in the United Kingdom Manual (HD 19/15)
- Regarding the decision to conduct road safety audits, this generally lies with the authorities responsible for the planning, construction and operation of the roads in each country.
- Major differences were found between the responses regarding the professional profile of the auditors, their training and the composition of the audit team. Mexico precisely defines the professional profile that must be met by auditors, detailing the necessary professional training, accreditation in road safety and years of experience.
- The competent authorities are responsible for deciding which recommendations derived from the road safety audit are adopted.
- The countries surveyed have generally had pilot experience of audits on existing roads (RSIs): Costa Rica is the only country to report working on a road safety audit during the construction phase, while one could have been conducted during the project phase in Argentina.

## 3.6. ADDITIONAL VIEWS EXPRESSED

Following discussions on the review of international manuals within members of TC C2 it was pointed out that:

- Germany and Switzerland have formal audit procedures in place that do not require the inclusion of specific recommendations to identified problems. As with other international situations. Audit practice in these countries is to identify specific road user safety problems and require designers to propose appropriate solutions. However, no recommendation of the potential solution is indicated in the audit report – simply the problem. Whist this situation is acknowledged, the wider experience of knowledge and understanding of safety issues by design engineers is limited. This is particularly true of expanding economies where resources are particularly restricted. Further guidance and training of design engineers and safety professionals needs to be widely encouraged.
- In a presentation prepared by Iulian – Cătălin Dimache and Ștefan Dinco on Roads Safety Audit and Inspection in Romania and delivered to the WG meeting held in Ottawa in April 2018, particular attention was made to the legislative difficulties experienced in getting Road Safety Audit formally accepted. In many countries the opportunity to enact new legislation to require RSA to be undertaken as a statutory requirement on all road schemes is often a lengthy and difficult process. Without such backing the incentive to undertake RSA on all roads is limited and concerns were raised that for non-national routes where audit is not a requirement the safety of road users would be compromised. Audit should be applicable to all roads.
- Further discussion took place on the regulation and training of auditors, their background knowledge requirements and the fact that ‘independence’ of the audit team was not always fully understood. It is clear that some authorities require a completely separate audit organisation whilst others will permit auditors to be employed within the road

authority. Independence from the scheme design is the key requirement of auditors rather than independence from the design organisation. Equally, restricting audit qualifications to only engineers restricts the insight and skills available for auditors. Non-engineers with a sound understanding of safety issues can be excellent auditors who understand the road user perspective rather than being fixed on the design criteria.

- Through the review of international documents and practice it is clear that the technical aspects of road safety audit are reasonably well understood. It is the process and responsibilities of the key parties at each step of the audit programme that are deficient to deliver consistent and effective road safety audits, particularly for those countries and organisations that are still developing the process.

# 4. POSSIBLE AREAS FOR INCLUSION TO FUTURE PIARC RSA GUIDELINES

Several individual manuals from across most continents have been assembled and reviewed. These are listed below:

- Manual of Road Safety audit – Denmark (1997)
- Road Safety Audit Guidelines – University of New Brunswick (1999)
- Safety Audit Handbook – Turkey (2001)
- Manual of Road Safety Audit – Ghana (2002)
- Guide d'Audit –Sécurité des Infrastructures Routières – Maroc (2003)
- Road Safety Audit Manual – Uganda (2004)
- Road Safety Audit Manual (Draft) – Federal Democratic Republic of Ethiopia (2004)
- FHWA Road Safety Audit Guidelines (2006)
- Manuel d'Intégration de la Sécurité Routière aux Projects Routiers - Benin (2007)
- Manuel d'Intégration de la Sécurité Routière aux Projects Routiers – Maroc (2007)
- Road Safety Audit Guidelines – Chartered Institute of Highways and Transportation UK (2008)
- Guide to Road Safety - Part 6 Road Safety Audit Austroads (2009)
- A Guide to Road Safety Auditing v7 – United Republic of Tanzania (2009)
- Design Manual for Roads and Bridges Part 1b) Road Safety Audit - Kenya (2009)
- Manual on Road Safety Audit – Indian Roads Congress (2010)
- Consultancy Services for Road Safety Audit of the Main Road Network Final Report – Mozambique (2010)
- Safety Manual for Secondary Roads – Pilot4Safety (2010)
- Road Safety Audit Guidelines for Safety Checks on New Projects - PIARC (2011)
- Safety Audit Manual – Idaho (2011)
- South African Road Safety Audit Manual (2nd Edition) – South Africa (2012)
- Guidelines for Mainstreaming Road Safety in Regional Trade Corridors – SSATP (2013)
- Guidelines for Road Safety Audit Karnataka (2013)
- Road Safety Audit Procedures for Projects – Interim Release New Zealand (2013)
- Road Safety Engineering for Indonesian Roads (pg. 98-123) (2013)
- AfDB Road Safety Manuals for Africa -New Roads and Schemes: Road Safety Audit (2014)
- Regional Road Safety Audit Guidelines – TRACECA (2014)
- Road Safety Engineering Manual -Draft - Malawi (2014)
- Design Manual for Roads and Bridges HD 19/15 Road Safety Audit – UK (2015)
- CAREC Road Safety Engineering Manuals – 1. Road Safety audit (2017)

Many of these documents draw upon very similar principles and content, having been developed by international road safety experts. For example, the International RSA manuals and those from countries such as Uganda, Ghana, Tanzania and Ethiopia are all very similar in layout and content. It is often only the degree of detail that varies. Similarly, whilst there are differences in approach between US and other manuals, their layout and process are all very similar.

Therefore, for the reporting of the review, the best exemplars and those that offer some difference in approach have been selected for comparison. This means that the manuals selected for detailed

review provide the best representation of different approaches available that will together be most useful in the context of LMICs

The other manuals have still been examined, and where appropriate have influenced the final comments. However, for the purposes of concise reporting a limited number of manuals are presented for comparison.

The key for the review tables is:

| | |
|---|---|
| ✔ | Topic covered |
| x | Topic not covered |
| ☆ | Best exemplar |

| Key Items Covered | PIARC Road Safety Audit Guidelines | South African Road Safety Audit Manual | Austroads: Guide to road safety – Part 6: Road Safety Audit | AfDB – Road Safety Audits for Africa | CIHT Road Safety Audit Guidelines | Review of Content |
|---|---|---|---|---|---|---|
| | 1 Introduction | | | | | |
| How this manual relates to the other manuals | N/A | N/A | N/A | ☆ | N/A | Set audit in the context of overall Safety Management and its relationship with Inspection, Assessment and Collision Investigation |
| How to use this manual | ✔ | ✔ | ✔ | ☆ | ✔ | The manuals all provide basic information on how the manuals should be used. A similar section is suggested. |
| RSA and the Safe System | x | ✔ | ✔ | ☆ | x | Details of the Safe System and how RSA inputs into this. Diagram of a Safe System Framework. An introduction to the Safe |

| Key Items Covered | PIARC Road Safety Audit Guidelines | South African Road Safety Audit Manual | Austroads: Guide to road safety – Part 6: Road Safety Audit | AfDB – Road Safety Audits for Africa | CIHT Road Safety Audit Guidelines | Review of Content |
|---|---|---|---|---|---|---|
| | | | | | | System and how RSA fits in is suggested. |
| | 3 The Road Safety Audit Concept | | | | | |
| What are RSAs | ✔ | ✔ | ★ | ✔ | ✔ | The Austroads manual has a good diagram detailing how audits fit in with planning, design and development process. |
| Costs and benefits of RSAs | ✔ | ✔ | ★ | ✔ | ✔ | Details of benefit/ cost ratios developed from a study undertaken by Austroads. Other sources provide further relevant information. |
| How RSA fits into wider road safety management | ✔ | ✔ | ✔ | ★ | ✔ | UK guidelines give a history as to how RSAs were developed and give a background into the scale of the problem.<br>Some AfDB content was developed from first principles to demonstrate where RSA fits into wider Road Safety Management. |
| Selecting the right methodology | ✔ | ✔ | ✔ | ★ | ★ | Gives details into a number of different road safety studies and summarises the difference in RSA from these studies. |

| Key Items Covered | PIARC Road Safety Audit Guidelines | South African Road Safety Audit Manual | Austroads: Guide to road safety – Part 6: Road Safety Audit | AfDB – Road Safety Audits for Africa | CIHT Road Safety Audit Guidelines | Review of Content |
|---|---|---|---|---|---|---|
| | | | | | | Most RSA manuals assume that the right tool has been selected once the manual has been opened. AfDB RSA manual makes it clear when RSA is applicable. |
| | 4 Team and personnel requirements | | | | | |
| Team composition | ✔ | ✔ | ✔ | ★ | ✔ | Comprehensive details of what experience is needed in the fields of highway, traffic engineering and road safety audits together with opportunities for countries to develop local expertise. |
| Key roles and remit | ✔ | ✔ | ✔ | ✔ | ★ | Details of roles and responsibilities given. Importance of team emphasized. Table regarding roles including the role of Arbitrator. |
| Training and experience of audit team members | ✔ | ✔ | ✔ | ★ | ✔ | Details of the experience required including the need for refresher training and continued professional development. |
| Working with the Project Team | x | x | x | ★ | x | AfDB developed guidance from first principles relevant to a range of countries. |

| Key Items Covered | PIARC Road Safety Audit Guidelines | South African Road Safety Audit Manual | Austroads: Guide to road safety – Part 6: Road Safety Audit | AfDB – Road Safety Audits for Africa | CIHT Road Safety Audit Guidelines | Review of Content |
|---|---|---|---|---|---|---|
| Working with the Client | x | x | x | ✔ | ☆ | Includes a section regarding client liaison throughout the process. |
| Audit management | ✔ | x | ☆ | ✔ | x | Contains guidance on continuous improvement. |
| Institutional management procedures | x | x | x | ✔ | ☆ | Clear and succinct outline of the independent role of auditors (both within a roads authority and externally). |
| Legislative framework | ✔ | ✔ | ☆ | ✔ | ✔ | Section about legal issues including duty of care, liability etc. |
| | 5 The Road Safety Audit Process | | | | | |
| Contracts and planning | x | x | X | ☆ | x | None of the main manuals cover this topic thoroughly. AfDB manual makes recommendations developed from first principles. |
| Steps for each stage | ✔ | ✔ | ☆ | ✔ | ✔ | Austroads manual includes a clear diagram of the steps in a road safety audit. |
| Commission the audit | ✔ | ✔ | ✔ | ✔ | ☆ | Clear requirements for commencing the audit. |

| Key Items Covered | PIARC Road Safety Audit Guidelines | South African Road Safety Audit Manual | Austroads: Guide to road safety – Part 6: Road Safety Audit | AfDB – Road Safety Audits for Africa | CIHT Road Safety Audit Guidelines | Review of Content |
|---|---|---|---|---|---|---|
| Develop and issue the audit brief | ✔ | ★ | ✔ | ✔ | ✔ | Clear requirements for the Audit Brief in the South African manual. |
| Collate information and intelligence | ✔ | ✔ | ★ | ✔ | ✔ | Provides clear details on the information that must be provided. |
| Study the plans and other information | ✔ | ✔ | ✔ | ✔ | ★ | Listed in detail with an emphasis on each team member reviewing plans. Pro-forma is also provided. |
| Hold a commencement meeting | ✔ | ✔ | ★ | ✔ | x | Provides a clear objective for this meeting. |
| Undertake a site inspection | ✔ | ★ | ✔ | ✔ | ✔ | South African manual uses prompts rather than prescriptive checklists.<br>Concerns about use of checklists since these can narrow the mind of the auditor. Suggest focusing on high level prompts and road elements as an alternative. |
| Undertake the audit | ✔ | ✔ | ★ | ✔ | ✔ | There is a section detailing the tasks which need to be undertaken as part of the audit. |

| Key Items Covered | PIARC Road Safety Audit Guidelines | South African Road Safety Audit Manual | Austroads: Guide to road safety – Part 6: Road Safety Audit | AfDB – Road Safety Audits for Africa | CIHT Road Safety Audit Guidelines | Review of Content |
|---|---|---|---|---|---|---|
| Write the audit report | ✔ | ✔ | ✔ | ✔ | ☆ | Provides clear guidance on what is expected and details the Audit Team Statement. |
| Hold the completion meeting | ✔ | ✔ | ☆ | ✔ | x | Details of the completion meeting and its objectives are provided. |
| Finalise audit record | ✔ | ✔ | ✔ | ✔ | ☆ | Audit response and a section called “closing the loop – feeding back the knowledge gained” are detailed. |
| Follow up | ✔ | ✔ | ✔ | ✔ | ☆ | Monitoring reports are discussed and requirements for timescales given. |

# 5. CONCLUSIONS

In order to address the concerns highlighted through this report, some areas of the current PIARC *Road Safety Audit Guidelines for Safety Checks on New Road Projects (2011)* need substantial rewrite or additional sections provided. Additional information is needed to cover areas such as responsibility, legislation, independence, training and competence. Some of these may be more relevant to be referenced to the on-line Road Safety Manual as they deal with some aspects of Road Safety policy. The review undertaken provides a useful resource as to areas where best practice has already been adopted and can usefully be incorporated in any future update to the document.

Relevance to LMICs can also be improved within the existing sections of the document by relatively minor amendments to the existing text – together with some typographical corrections. These, and suggestions for major change, are all listed below.

| Page No | Section | Para. | Suggested Amendment | Comment |
|---|---|---|---|---|
| | New Section | | how to apply the manual in a range of different institutional and organizational arrangements and competences that exist in LMICs. | LMICs have a range of organisational challenges that need to be recognized in any guidance |
| | New Section | | Details on the training and experience of auditors and how this can be developed in-country rather than relying on international expertise. | Development of appropriate 'mentoring' development of local expertise is vital if appropriate auditing is to be established. |
| | New Section | | Clear definition of roles and responsibility and organisational requirements to successfully integrate audit into the design process. | Whilst audit is independent of the design team, it is integral to the process and need appropriate contractual and progrgamme arrangements to be successfully applied. |
| | | | | |
| 11 | Executive Summary | 1 | Add : In some countries, political interests may dictate project priorities. | This is an unfortunate reality. |

| Page No | Section | Para. | Suggested Amendment | Comment |
|---|---|---|---|---|
| 11 | Executive Summary | 3,<br>2nd bullet | Make the I of inspections upper case. | |
| 15 | Introduction | 3 | In 2nd line, replace 'avoid' with 'mitigate against'. | Cannot avoid crashes entirely. |
| 15/16 | Introduction - Defining Road Safety Audit | New paragraph | This section needs expanding to refence audit within the wider overall Safety Management and its relationship with Inspection, Assessment and Collision Investigation. Reference to Safe System approach to be included. | Adopting the right approach for different situations is important |
| 17 | Introduction – Defining Road Safety Audit | 1,<br>Top line | Delete the word 'quality' before management system and replace with 'road asset'. | |
| 17 | Introduction – Defining Road Safety Audit | 1,<br>4th line | Add 'non-motorized transport' to the categories of road users. | Non-motorized transport such as donkey carts make use of rural highways in LMIC's. |
| 17 | Introduction – Defining Road Safety Audit | 4 | Add: 'In developing countries, improvement projects may also include the provision of pedestrian & cycle facilities, rural access roads, and fencing. | Such aspects do not always exist on rural highways in LMICs. |
| 17 | Introduction – Defining Road Safety Audit | 7,<br>bottom | Add: 'In some regions, an RSA at preliminary design stage provides an opportunity to engage with local communities and thus address their road safety concerns. | It is very important to get early local buy in to road improvement projects, particularly in rural areas of LIMCs. |

| Page No | Section | Para. | Suggested Amendment | Comment |
|---|---|---|---|---|
| 19 | Introduction – Objectives and Benefits of Road Safety Audits | 3 | Add another point under "Also, the safety audit aims to :"<br>- **improve awareness of road safety within local communities along the route.** | This may not be part of the RSA objective, but in rural areas of LMICs, every opportunity for enhancing road safety awareness is worth grabbing. |
| 19 | Introduction – Objectives and Benefits of Road Safety Audits | 5&6 | The economic benefits of RSA need to be strengthened and updated to reflect its importance and cost saving during the whole life of a project | Economic justification of any task is vital in LMICs and real justification for audit is often seen as an external requirement rather than cost benefit. |
| 21 | Area of Application | 2 | Add : 'In LMIC's, the functional classification of a road is often blurred by the lack of spatial development planning. The reality of the road's function for local road users can be very different from the design parameters contained in a design manual.' | RSA practitioners need to understand that roads may not function in accordance with theoretical design parameters in some regions. |
| 23 | Types of Projects | 1 | Add to the list :<br>'**- gravel surfaced rural access roads.**' | The introduction of motor vehicle access to rural villages has distinctive safety challenges which need to be addressed. It is worth listing as a specific type of project. |

| Page No | Section | Para. | Suggested Amendment | Comment |
|---|---|---|---|---|
| 25 | Stages | | Standardisation of possible stages of audit internationally | The South African RSA Manual has 6 stages of Audits, including during construction and on existing roads (post opening). |
| 29 | Commissioning a Road Safety Audit | 1 | Add to Order the Audit:<br>**'Ideally, RSA's should be a mandatory component of the design and construction process for all types of road.'** | |
| 29 | Commissioning a Road Safety Audit | 2 | Legal requirements | Legislation may dictate that all services are procured via a competitive tendering process. It therefore may not be possible for a client to simply appoint a team of auditors from a panel – however desirable. |
| 29 | Commissioning a Road Safety Audit | End | Add : 'Seconding a person(s) from the local municipality where the project is located can assist with capacity building and with securing local acceptance of the road project.' | This is a reality in rural, under-developed areas of LMICs. |
| 31 | Table 1 – Road Safety Audit Process | | | Clients may appoint an Agent to carry out aspects of the commissioning process. |

| Page No | Section | Para. | Suggested Amendment | Comment |
|---|---|---|---|---|
| 33 | Commissioning a Road Safety Audit | 2 | Add to para on feasibility stage:<br>'The impact of the scheme on existing and future development also needs to be considered.' | Planned developments may affect future safety along the road scheme under consideration. |
| 33 | Commissioning a Road Safety Audit | 3 | Add: 'Behavioural aspects can vary from region to region within a country. An example is a rural area in an LMIC. Local knowledge is essential. | Traffic and pedestrian behaviour in rural areas can be unpredictable and requires consideration. |
| 33 | Commissioning a Road Safety Audit | 5 | Add to the items following aspects of facility maintenance:<br>'livestock control, local customs and behaviour, ' | |
| 35 | Commissioning a Road Safety Audit<br>Collection of background information and Audit Brief | | Add to the 8th bullet point:<br>'In the absence of crash data, local inputs can be useful.' | Having a team member form the local municipality would be advantageous in rural communities. |
| 37 | Table 2 – Background Information<br>Column on Prelim Design and Detailed Design | | After 4th bullet point add:<br>'Seasonal traffic variations.' | These variations can be significant. |
| 37 | Table 2 – Background Information<br>Column on Prelim Design and Detailed Design | | Add new bullet points:<br>' - Weather data, including potential adverse conditions.'<br>' – Known adjacent land use planning.' | |

| Page No | Section | Para. | Suggested Amendment | Comment |
|---|---|---|---|---|
| 39 | Undertaking the Road Safety Audit.<br>Site inspections | 1 | Add to the last sentence:<br>'or day of the week (e.g. the last Friday of the month). | |
| 39 | Undertaking the Road Safety Audit.<br>Site inspections | 2 | Add:<br>'Again, local variations in behaviour need to be considered.' | If the auditor is from a city, he may have little understanding of rural road user behaviour. |
| 47 | Completion of the Road Safety Audit.<br>Response to the Audit Report | End | | Do not confuse the project documentation (design stage) with the Contract Document for construction.<br>Rather refer to project reports. |
| 47 | Completion of the Road Safety Audit.<br>Follow up | End | | As above. Construction documents implies the Contract Document. Rather refer to Stage 4 and Stage 5 Audit Reports becoming part of the overall Construction Report. |
| 47 | Completion of the Road Safety Audit.<br>Follow up | End | Additional wording to clarify the feedback of audit finding into future design standards and performance reviews to identify additional effective measures | The audit findings after completion are an important aspect of refining design standards to local, conditions as they identify measures |

| Page No | Section | Para. | Suggested Amendment | Comment |
|---|---|---|---|---|
| | | | that need to be applied to local conditions. | which are appropriate rather than standard. |
| 49 | Motorways / Freeways (High Speed Dual Carriageways) | 1 | Reference to crash statistics from Europe. It would be good to have comparable statistics from LIMCs. | |
| 49 | Motorways / Freeways (High Speed Dual Carriageways) | 4 | Add to 2nd bullet point:<br>**'insufficient drainage can also occur on flat gradients where there are changes in super-elevation.'** | |
| 49 | Motorways / Freeways (High Speed Dual Carriageways) | 4 | Add a new bullet point:<br>**'– control of livestock and pedestrian access.'** | Livestock and pedestrians on freeways are an unfortunate reality in LMICs. Fencing, agricultural underpasses are not always effective. Education programmes and buy-in from traditional leaders can be effective counter measures. |
| 53 | High Speed Interurban Roads | 2<br>of p.53 | After the 1st sentence add:<br>**'Poor spatial development planning can exacerbate the situation in LMICs'** | |
| 53 | High Speed Interurban Roads | 2<br>of p.53 | At end of paragraph, add:<br>**'The risk posed by livestock needs to be assessed and** | |

| Page No | Section | Para. | Suggested Amendment | Comment |
|---|---|---|---|---|
| | | | appropriate measures considered.' | |
| 53 | High Speed Interurban Roads | 3<br>of p.53 | Add to typical safety deficiencies:<br>'– failure to consider non-motorised transport and livestock.'<br>'– inadequate traffic calming at transition from rural to urban or peri-urban areas.' | |
| 55 | Major Urban Roads and Residential Roads | 4 | Add:<br>'Particular attention is required for urban roads around schools, hospitals, sports arenas and other entertainment venues.' | |
| 55 | Major Urban Roads and Residential Roads | 6 | Add to typical safety deficiencies:<br>'– inappropriate medians on urban arterials.'<br>'– poorly placed lighting, signage and traffic signals.'<br>'– inappropriate and inadequate provisions for public transport.' | |
| 57 | Roles and Responsibilities | 2 | Add to end of para :<br>', for all Audit Stages.' | |
| 57 | Roles and Responsibilities | 6 | Add bullet to audit team:<br>'– in LMICs, a local representative can alert the team to local cultural sensitivities and concerns, as well as generating acceptance of | |

| Page No | Section | Para. | Suggested Amendment | Comment |
|---|---|---|---|---|
| | | | the project / scheme in local communities.' | |
| 59 | Roles and Responsibilities | Figure | | Often, the audit team is appointed via the designer to speed up procurement. |
| 61 | Team of Auditors<br>**Qualification of the auditor** | 3 | Add:<br>**'Different qualifications and experience may also be required in different regions of a country. For example, land use patterns and behaviour can differ depending on traditional practices.'** | The concept of land ownership and herding of livestock can be very sensitive in rural areas of LMICs. |
| 67 | Checklists for Motorways<br>**Stage 1 – Feasibility Study** | Alignment<br>**No 2** | | The matter of climbing lanes for trucks is more of a cross section issue than alignment. |
| 69 | Checklists for Motorways<br>**Stage 1 – Feasibility Study** | Alignment<br>**No 3, 4 and 5** | | The questions against Nos 3, 4 and 5 appear to be very specific for the Feasibility Study stage. |

# 6. GLOSSARY

| Term | Definition |
|---|---|
| ABS | Anti-lock Braking Systems |
| AfDB | African Development Bank |
| ASSHTO | American Association of State Highway and Transportation Officials |
| Austroads | Association of Australian and New Zealand Road Transport and Traffic Agencies |
| BRRC | Belgian Road Research Centre |
| CIHT | Chartered Institute of Highways and Transportation |
| DMRB | Design Manual for Roads and Bridges |
| DOT | Department of Transport (US) |
| ESC | Electronic Stability Control |
| FHWA | Federal Highway Administration (US) |
| IVIA | Ibero-America Road Institute |
| LMICs | Low- and Middle-Income Countries |
| NCHRP | National Cooperative Highway Research Programme |
| RSA | Road Safety Audit |
| RSAR | Road Safety Audit Reviews |
| RSI | Road Safety Inspection |
| SA | South Africa |
| TRL | Transport Research Laboratory |
| UK | United Kingdom |
| US | United States (of America) |
| USA | United States of America |
| VRU | Vulnerable Road User |

| | |
|---|---|
| WG | Working Group |
| WHO | World Health Organisation |

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