

Road Safety Audit in Indian Road with Improvement of Capacity In Intelligence Transportation System

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Abstract – Transportation plays a key role in the development of an area, but it happens only when the transportation is safe, rapid, comfortable and economy. A road is considered safe when only a few, or no accidents occur. Road and its surroundings, road users and vehicles are the elements contributing to road accidents. Pedestrians, bicyclists and two-wheeler motorized riders are the vulnerable road users. The loss of human life due to accident is to be avoided. Road safety audit (RSA) is a formal procedure for assessing accident potential and safety performance in the provision of new road schemes and schemes for the improvement and maintenance of existing roads. These Audit studies or analysis give scope for the reduction of accidents and helps us to provide safe, self-explaining and forgiving roads. By this we can save the precious human life as well as the nation's economy. The selected for this study is part of Hyderabad Outer and Inner Ring Roads, HMDA Roads. Knowledge of accidents that have occurred on roads helps us to improve the design of the roads or to influence the behavior of road users, so that similar accidents do not occur again. Literature review will be done for the safe movement of the Road safety audit and will check the merits and demerits of the techniques used previously.

Keywords: Accidents, Roads, Road Safety Audit, Outer ring road, Urban Road.

I. INTRODUCTION

I. Introduction Of Road Safety Audit

Road safety audit is a systematic and formal process of checking the safety aspects of road schemes before they are built. The objective is to identify potential safety problems, so that, where possible, the design can be changed to eliminate or reduce them. The audit is carried out by trained and experienced auditors who are independent of the scheme designers.

Road safety auditing follows the principle of "prevention is better than cure". An audit conducted at the planning or design stage allows a line on a plan to be changed, which is much cheaper than having to alter asphalt or concrete once the scheme has been built. Most countries have experience of having to make major alterations to a newly-built road because a significant safety problem was designed into the road. This can be avoided if all schemes are audited before construction. Experience from other countries suggests that at least a third of crashes can be prevented or their severity reduced by conducting road safety audits and acting on the findings.

Road safety audits are appropriate for all kinds of road construction, including rehabilitation and upgrading, as well as new-build. They can also help in assessing the safety of:

- Arrangements For Traffic Control And Signing At Roadworks
- Traffic Management Schemes
- Major Roadside Building Development (E.G., Shopping Malls, Car Parks, Leisure Centres, Etc)
- Existing Roads[1-5].

The earlier a road scheme is audited within the design and development process the better. For road construction projects there are five main audit stages:

1. Feasibility Study Audit
2. Preliminary Design Audit
3. Detailed Design Audit
4. Pre-opening Audit

Safety audits involve three parties with defined roles – the Auditor, the Designer, and the Client:

- The auditor (audit team) is commissioned by the client to perform the audit and produce an audit report which identifies the safety problems and suggests what should be done about them;
- The designer is the party responsible for the design (often a consultant); they will be invited to comment on the audit report and, if necessary, will be instructed by the client to alter the design;
- The client is the road authority who commissions the audit and decides whether the audit recommendations should be accepted or rejected.

Road safety auditing can produce significant benefits at low cost if carried out in a formal and coordinated manner

at all stages in the planning, design and implementation of a road project. The process requires management commitment, donor co-operation, skilled auditors, and an ongoing training programme.

II. THE IMPORTANCE OF ROAD SAFETY AUDIT

Road Safety Auditing is a specialist process that must be carried out independently of design and construction work. Road Safety Audits are intended to ensure that operational road safety experience is applied during the design and construction process in order that the number and severity of collisions are kept to a minimum. Road Safety Audits fulfil a vital role in checking that roads have been designed and built to the highest safety standards. A well carried out Road Safety Audit adds value to a highway scheme at every level.

III. ROAD SAFETY IN INDIA

In India, at present there is no formal requirement for road safety audits to be undertaken. However, India has also started realizing the importance of road safety audits. It is because of Ministry of Road Transport and Highways sponsored the project on “Development of Safety Audit Methodology for Existing Roadway Sections” to Central Road Research Institute in April 2002. The National Highway Authority of India entrusted CRRI to carry out RSA of engineering design for construction packages under TNHP(8 packages) and GNTRIP (7 packages) on NH-2 . The total length of these 15 packages was about 900km which was the longest road project for which RSA has been carried out in the world. Also, first RSA was carried out again by CRRI in 2000 on Indore Bypass. It is understood that the entire NHDP will be subjected to RSA as part of its implementation. However it is to be recognized that RSA are to be under taken all types of roads[5-10].

1. When to conduct Road Safety Audit?

The RSA process starts with the decision to build a new road, invest in reconstruction, widening or major maintenance of an existing road or simply to evaluate the safety aspects of an existing infrastructure. Road Safety Audits should be performed periodically since the planning stage of a roadway project, so as to ensure the safety aspects for all users are taken care at all the stages. It is recommended that RSA should be conducted in the following critical stages of a project life cycle.

- Feasibility stage (if any new proposal is made on existing infrastructure)
- Design stage
- Construction stage
- Maintenance stage

In the feasibility stage audit, the existing roadway where the project is proposed will be audited considering the safety aspects of the existing road. The results of any crash investigation, especially any previous road safety inspection reports must be considered in the feasibility stage for brownfield projects (i.e. retrofitting or maintenance of existing infrastructure). Feasibility stage audit need not be carried out for a greenfield project (a project where no transport infrastructure currently exists). The comments and suggestions noted after completion of the feasibility stage audit goes as an input to the design of the proposed transport infrastructure. Once the detailed design of the proposed infrastructure is completed, the design stage audit needs to be undertaken. The deficiencies identified in the design audit, if any, are to be addressed by making necessary changes in the design of the proposed infrastructure/facility.

The construction stage audit comes into picture when the project is under implementation after the approval of design drawings/ documents and the completion of the procurement process. The objective of this audit is to check whether adequate safety measures are taken during construction. The final stage of the RSA process is termed as the monitoring stage. Monitoring stage audit needs to be carried out periodically during the service life of a project to ensure that the facility continues to serve road users in a safe manner.

2. Who should Conduct Road Safety Audit?

The RSA process is framed in such a way that auditing shall be done at various stages of a project (Planning, Designing, Execution, and Maintenance etc.), and at each stage the person responsible for a specific stage would also be responsible for conducting the audit.

For e.g. – Following is the list of people, who could be responsible for RSA at various stages of the project.

- Project Designer/ Engineer (Planning & Design Stage) - The person involved in designing or planning of the project will be responsible for conducting the feasibility and design stage audit.
- Site Engineer (Construction Stage) - The person involved in the execution or construction of the project will be responsible for the construction stage audit.
- Maintenance Engineer (Maintenance of existing Infrastructure) - The person involved in the maintenance of the existing infrastructure or in monitoring of a newly executed project will be responsible for the periodic audit.
- Administrators (Various Urban Local Bodies) – Administrators are responsible for ensuring better planning, construction and maintenance of infrastructure that is people-friendly. The checklists are simple enough for them to carry out themselves or to check on the work of their subordinates.

3. Tool to Conduct Road Safety Audit

A catalogue of checklists has been created as a tool to conduct RSA at various stages and is presented in the annexure.

The following checklist should be used at different stages of the audit:

- Standard Checklist- The standard checklist shall be filled out in the feasibility stage/ monitoring stage/ or maintenance stage. An audit using the standard checklist shall be carried out for any maintenance or retrofitting of the existing infrastructure.
- Standard checklist also needs to be filled out soon after implementation of the project and periodically thereafter.
- On all roads, a safety audit using standard checklist should be carried out every year and preferably after every monsoon season.
- Design Checklist- The design checklist shall be filled after completion of the proposed design, with a pre-requisite that a standard checklist has already been filled, in case of brownfield project.
- Construction Checklist- The construction checklist needs to be filled out during the construction phase of the project.

Multiple construction stage audits need to be carried out on construction projects that last longer than 3 months. It is recommended that the construction stage audits be carried out once every three months on longer duration projects.

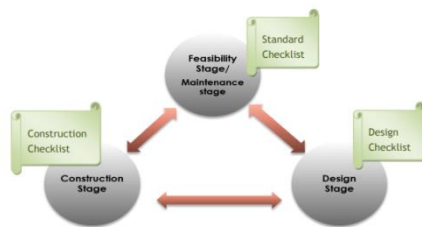


Figure 3.1 Checklists to be used at different stages of RSA.

The different stages of Road Safety Audit

Where road safety audit is applied to a highway scheme, it shall be undertaken at each of the following stages:

Stage 1 Completion of preliminary design

Stage 2 Completion of detailed design (or combined Stage 1 and 2)

Stage 3 Completion of construction

Stage 4 Post opening monitoring

IV.IMPROVEMENT OF CAPACITY AND ROAD DEFECTS AS A CAUSE OF ACCIDENTS

Although road defects are not the major cause of road crashes, efforts to improve road design, construction and maintenance are often highly cost-effective – and much easier than trying to improve the skills and attitudes of

drivers. Research shows that there are three contributing factors to road crashes: (see also Figure 1)

- Human factors (involved in about 95% of crashes)
- Road and road environment factors (involved in about 28% of crashes)
- Vehicle factors (involved in around 8% of crashes)

V.LITERATURE REVIEW

Arun S Bagi ,Dheeraj N kumar, “Road Safety Audit”

Road safety audit is formal procedure for assessing accident potential and safety performance in the provision of new road schemes, the improvement and rehabilitation of existing road & in maintenance of roads. The role of auditor is to provide independent advice in the form of written recommendations. The designer or client then considers the advice and formal decision is made by them on whether or not to adopt each of the recommended safety alterations.

The primary role of audit team is to identify the potential problems of a highway project by conducting the site inspection & collecting data from various agencies. The objective of the study is the identification of accident prone areas on the road from FIR, to study the effect of roadway geometrics and traffic conditions on the road stretch and development of statistical relationship between accident rates and various factors causing accidents. The scope of the study is to reduce accidents on road network, reducing severity of accidents and the need for costly remedial work is reduced. The road selected for the study is Bannerghatta road (12 km). The accident analysis is done from four years data. The V.F.Babkov’s analysis is done by collecting geometric features of the road. Pedestrian safety analysis also done. Accident prone locations are identified by the all analysis.

N. Naveen, “Road Safety Audit” Transportation plays a key role in the development of an area, but it happens only when the transportation is safe, rapid, comfortable and economy. A road is considered safe when only a few, or no accidents occur. Road and its surroundings, road users and vehicles are the elements contributing to road accidents. Pedestrians, bicyclists and two-wheeler motorized riders are the vulnerable road users.

The loss of human life due to accident is to be avoided. Road safety audit (RSA) is a formal procedure for assessing accident potential and safety performance in the provision of new road schemes and schemes for the improvement and maintenance of existing roads. These Audit studies or analysis give scope for the reduction of accidents and helps us to provide safe, self-explaining and forgiving roads. By this we can save the precious human life as well as the nation’s economy. The selected for this study is part of Hyderabad Outer and Inner Ring Roads, HMDA Roads. Knowledge of accidents that have

occurred on roads helps us to improve the design of the roads or to influence the behavior of road users, so that similar accidents do not occur again. Literature review will be done for the safe movement of the Road safety audit and will check the merits and demerits of the techniques used previously.

Kooi, Ir. R.M. van der, (ed.), “Road Safety Audit, tools, procedures, and experiences” Introduction This report describes tools and procedures established in different countries which apply Road Safety Audits (RSA). These RSAs are utilized to identify potential safety problems and they concentrate on safety measures to overcome these problems. This technique is used to detect possible safety hazards, in the various stages of a scheme, before a new road is open to traffic. The slogan ‘Prevention is better than cure’ is already well known to us, and Road Safety Auditing can establish an association with road safety. The application of this preventive technique can prevent accidents or reduce the severity of accidents. Except for minimizing trauma, and increasing the designer’s awareness of road safety, RSAs can also reduce the overall lifetime cost of a scheme, for it is less likely that remedial rebuilding of road sections will take place. Therefore this report deals with schemes subject to design and redesign of new roads, rather than existing roads.

Strict application of design regulations does not always lead to a safe road for general rules don’t always apply to specific situations. When applying an RSA, it improves awareness of road safety, and highlights safety among other aspects of road design. Objectives of safety audit The main objective of safety audits is to ensure that highway schemes operate as safely as possible, i.e. to minimise the number and severity of occurring accidents. This can be achieved by avoiding accidentproducing elements and by providing suitable accidentreducing elements. The purpose of safety audits is to ensure that ‘mistakes’ are not built into new schemes.

The items summarised below, concerning the Great Britain situation, give quite a general picture about specific aims of the Road Safety Audit. M to minimise accident risk on the network adjacent to new schemes; M to lay emphasis on safe design practice and increase the awareness of everyone involved in planning, design, construction, and maintenance of roads; M to highlight the importance of taking into consideration the needs of all types of users; M to reduce the wholelife cost of the schemes, by minimising the need of future corrections. The UK definition is as follows: A formal procedure for assessing accident potential and safety performance in the provision of new road schemes, and schemes for the improvement and maintenance of existing roads. (Guidelines for The Safety Audit Of Highways, IHT, 1996) In order for a safety audit to be successful, some certain factors should be taken into consideration.

The key factors that contribute to the efficiency of the safety audit may refer to the organisation and the selection of the audit team. With respect to safety audit organisation, support and commitment of senior management is necessary. Safety audits should be an integral part of an agency’s overall program. Local authorities often use a Road Safety Plan as a framework in which the RSA is placed. By doing so, the RSA is part of the overall safety management strategy. Checklists fulfill a structural position The purpose of the checklists is to insure that nothing is overlooked. Practitioners should not rely solely on them and are encouraged to expand them. Over the past few years checklists were reconsidered and the new checklists in the revised guidelines are meant to indicate ‘principal issues’ rather than provide detailed lists of the items to be examined. Different checklists are provided for each safety audit stage.

Check lists appear to be not very important. The usage of check lists decreases as the knowledge of Road Safety Audits increases. Utilization of Road Safety Audits When conducting an RSA, the audit team should not try to redesign the scheme, instead they should pay attention to road safety for all kind of different road users, and theirs suspected road user behaviour. The way this should not be done, is to compare the design with relevant standards and see if it matches, but the audit team should check if the design appropriately interacts with the design standards, for strict application of standards does not always lead towards a safe road. Some other findings about RSA are mentioned below. It is important that a site visit is carried out. Both in daylight and at night.

Omkar Gholap , Nikita Shinde , VaishnaviShelke , NavnathNavale , KuldeepakDeshmukh, “Road Safety Audit” Now a day, in every 10 minutes, one human life is lost due to road crashes. In the world, India has world’s largest heavy traffic and accidents also. It is necessary to provide the safety to roads. Road Safety Audit (RSA) is a procedure or method in which identification of existing or future road on basis of safety issues and provision of safety remedial measures on it. In this study, the section of road from “A.T.E.S. Faculty of Polytechnic, Akole to M/S. R. V. Traders Godown, Shekaiwadi (K.G.Road SH 44)” is undertaken. Road taken having considerable traffic during day time and some black spots on the road where accidents takes place continuously. A detailed analysis of road from “Agasti College,

Akole to M/S R.V. Traders, Akole” is carried out on the basis of data collection like traffic volume study, accidental data collection, potholes on road data collection, road safety signs and symbols, questionnaire survey of public, etc. The aim of study is the inspecting the road in the terms of the safety measures, road scenario, any type of flaws and to suggest the mitigative

and preventive measures for the selected section of road for audit.

Eugene M. Wilson, “Adapting The Road Safety Audit Review For Local Rural Roads” It is important to improve safety on local rural roads, but many local transportation agencies do not implement a road safety improvement program. This often is due to limitations on funding, expertise, and time. The Road Safety Audit Review (RSAR) process is a viable option for aiding local transportation agencies in addressing safety issues. This project developed a simple and cost effective local rural RSAR program.

The RSAR program was developed to identify critical safety issues and to assess the level of auditor expertise needed. The specific issues of needed safety improvements and the urgency of implementing these improvements have been defined in the audit process. These issues were correlated to a proposed local rural functional classification system, also developed as a component of this research. Pilot audit review groups were composed of experts, county engineers, and local road supervisors. The different auditor groups generally agreed on the level of urgency in correcting the needed improvements. While the control group identified more safety needs on the lower classified roads than the other groups, it should be noted that the differences generally were those on which the control group recommended no action be taken. The importance of this process in meeting the needs of local government is that road supervisors and county engineers from other counties also were effective in identifying safety needs. Implementing improvements for identified action items with the highest urgency is an approach that will be an effective tool for local rural governmental agencies.

Ishtiaque Ahmed, Othman ChePuan, CheRos Ismail, “A Comparative Review of Road Safety Audit Guidelines of Selected Countries” Road safety is a global crisis and one of the proactive preventive measures for accidents is the Road Safety Audit (RSA). The benefits of RSA are numerous. RSAs have been practiced in many countries following the guidelines of their own. The objective of this study was to compare the contents of the guidelines of selected seven (07) countries. The documents were reviewed and compared in terms of seven (07) critical parameters. The definition of the term “RSA” varied among guidelines. The RSA process was required for different stages of a project in different countries. The attached check lists or forms also varied in terms of contents and in terms of the coverage.

The qualifications of auditors or team requirements were unequally emphasized in the documents. The legal liability aspects were not given any emphasis in three of the seven guideline documents. Two country documents did not contain any sample RSA report or any sample

case study. Some country documents have good emphasis on some parameters while those lack in other aspects. No RSA guideline document can be called as the best one, as those were prepared considering the local conditions and requirements. Recommendations were made to improve the guideline documents.

Piyush Satyan, S. K. Mogre, “A Spatial Approach for Performing Road Safety Audit of Highways” Road system of developing nation has an outstanding part to play for nation’s economy and development. Transportation through road systems fulfils the essential needs of users. Many lives are lost and tremendous measure of property harm happens due to mishaps.

This paper is an endeavour to break down the activity wellbeing circumstance H B Town SQUARE to Jersey Milk Processing Plant on Bhandara road in Nagpur of National Highway 53 and Asian Highway 46, India recognition of countermeasures is done for extends in which the aggregate damage brought about by accidents can be significantly and promptly diminished. After conducting Road Safety Audit, it was found that trucks are halted on freeway which diminishes the successful width of carriageway and making movement dangers to quick moving activity. Unapproved median openings were discovered which ought to be quickly closed. Missing road and middle markings to be done and speed signs should organize with speed. Service streets are inadequate which requires quick change. The Vulnerable Road User (VRU) i.e. people on foot and cyclists offices close home are missing and should be encouraged on need. The required recommendation was given for improvements in quality consider coordinates of entire study area to be implemented in future.

Krunal Baraiya, Prof. Nekzad Umrigar, Dr. L. B. ZALA, “Road Safety Audit: A Case Study Navsari to Chikhli National Highway 48” I found that over 1.3 million people dead by road accident but there is no safety for them in our country. The accidents are linearly increasing. Because of this accidents, peoples loss there life and also it will affect the economically. Due to this accidents people have to suffer by hospital cost or treatment. These accidents can be reduce by road safety audit with involved better safety measure, good serviceability, proper geometric design of a location, traffic signs, signals, markings, street lighting, bridges, culverts, proper parking management, removing side obstacles from the road, etc. Road safety audit will reduce the road accident and increase the life of people.

I have collected data of from Navsari CH 00.00km (NH-48) to Chikhli CH 38.00km (NH-48) from police home office for my paper. I have been observed the road accident, condition of road, condition of signal of this road and also I have counted the numbers of different types of vehicle and made the graph regarding to that

data. According to that data I have also taken the remedial measurement. On NH-48 where 721 accident in the duration of 2011 to 2015. So measure to reduce road accidents and road audit at the stretch has been shown.

Hitesh Kumar, Mrs. Monika, "Comprehensive Review on Road Safety Assessment of Kaithal-Kurukshetra Road in Haryana" Road safety audit is formal procedure for assessing potential and safety performance in the provision of new road schemes, the improvement and rehabilitation of existing road and in maintenance of roads. The role of auditor is to provide independent advice in the form of recommendation. The primary role of auditing identifying the potential problems of a highway project by conducting the site inspection and collecting data.

The objective of the study in the identification of accident prone areas on the road from FIR, to study the effect of roadway geometrics and traffic conditions on the road and development of statistical relationship between accident and various factors causing accidents. The scope of the study is to reduce accidents on road network, reducing severity of accidents and the need of costly remedial work is reduced. The road selected for the study is Kaithal-Kurukshetra, Haryana, India. Accident prone locations are identified by the all analysis.

Ian Appleton, "Austroads Experience with Road Safety Audits" Austroads published its world famous Road Safety Audit Guide in 1994. Since then it has been at the forefront of the development and promotion of road safety audit world-wide. In this paper the author discusses some of the Austroads activities.

- In May 1998 Austroads hosted the first International Road Safety Audit Forum. It became known as IRSAF. That Forum prepared a 10-point communiqué, which is given in full in this paper.
- In July 2001, the Austroads hosted a Road Safety Audit Summit for the road authorities in Australia and New Zealand. The outcome of that Summit is described in this paper.
- Revision of its 1994 guideline – Austroads published the second edition in 2002
- Evaluation of the safety benefits of road safety audit – the research demonstrates that road safety audit is highly cost-effective
- Development of a methodology for assigning a risk factor to audit recommendations – the methodology is called the "Road Safety Risk Manager" and it is proving to have a much wider application that just road safety audit.
- Development of an "expert system" to help the audit process
- Development of a National Road Safety Engineering Training Course, which has a Road Safety Audit component.

These are described in detail. While a brief introduction to road safety audit is provided, this paper does not describe road safety audit in detail. Readers should refer to the second edition of the Austroads Road Safety Audit Guide for a comprehensive description of the audit process.

Michail Karantanos, Sophia Vardaki, "Road Safety Audit: A comparative Review of Current Guidelines and 2 Designers' Approach" Road Safety Audit (RSA), as a formal system of checking roadway schemes for safety problems, was originally adopted in Great Britain and spread to many countries throughout the world. RSA is considered the major and most cost-effective proactive road safety measure. Several national guidelines have been published providing guidance and information on how the RSA process should be carried out.

The present paper focuses firstly on a comparative review of the three main current RSA guidelines internationally: those published by Austroads in 2009: those published by the British Institution of Highways and Transportation (IHT) in 2008 and those published in the USA in 2006, by the Federal Highway Administration (FHWA). Relevant legislation and standards were also taken into account while undertaking this comparative review.

More specifically both the European Commission's Directive 2008/96/EC on Road Safety Infrastructure Management, issued in 2008, as well as the British standard HD 19/03 for Road Safety Audits, issued in 2003, were considered. A survey was also carried out in order to determine the approach of highway designers in Greece to this –recently introduced in the country– safety measure. In-depth interviews with designers were carried out on the basis of a questionnaire set up in advance by the authors. The findings of this paper may contribute to the enhancement of the existing RSA guidelines, as well as to the development of relevant guidelines in countries such as Greece, where the RSA is to be introduced.

Eric Hildebrand, "Quantifying the Benefits of Road Safety Audits" Although the Road Safety Audit (RSA) process is gaining widespread application throughout North America, little is understood about the net benefits being derived for design-build projects. A better understanding of collision reduction and mitigation is necessary to allow an objective economic evaluation of the RSA process. This study attempted to quantify the benefits of RSAs through a retrospective case study of the first major design-build RSA that was conducted in Canada – the Fredericton-Moncton Highway project. The Fredericton-Moncton Highway's safety performance since it has opened was contrasted against other collision rates considered to be representative of those expected for this type of facility. Any difference between observed and expected rates can, in part, be attributed to the RSA process. Expected collision rates were developed using data from five similar facilities within the region and the output of six collision prediction models.

Jennifer Atkinson; Brian Chandler; Heather Rigdon; Kelly Donoughe, “Work Zone Road Safety Audit Guidelines and Prompt Lists” The Work Zone Road Safety Audit Guidelines and Prompt Lists provides a process to individuals or agencies for performing formal work zone safety examinations to improve the safety of workers and all roadway users. This document includes guidance on conducting Road Safety Audits (RSA) at all phases of work zone planning, design and deployment, and considerations for each project phase. The guidelines and prompt lists explain the importance of the Work Zone RSA and navigate the practitioner through the RSA process. Material presented here is for informational purposes only. Users should check local standards and guidelines for additional information. Any opinions or recommendations expressed in this guidance document are those of the authors and do not necessarily reflect the views of the FHWA or ATSSA.

Katrina Aare Langer, “Road safety audits of existing roads” This paper introduces a project designed to develop a method for a future systematic audit of the existing network of state roads concerning possible measures for improving traffic safety. Since 1997, Denmark has had a model for systematic prevention of road accidents, as described in the Danish manual of Road Safety Audit (RSA). This model describes a procedure by which all highway authorities by way of a road safety audit are able to prevent road accidents on new road projects or on existing roads undergoing major alterations. Many highway authorities use Road Safety Audit when constructing new roads. There is, however, no single detailed description of how a road safety audit is conducted on existing roads. This paper describes a project designed to develop a method for a future systematic audit of the existing network.

HugoPietrantonio, “Evaluating road safety audit procedures: some questions and a new method of study” This article discusses the current views on the application of road safety audits (RSAs) as a tool for the improvement of road safety and proposes a new method of study for detailed evaluation of some features that can influence their effectiveness. This is demonstrated in the practical setting of RSAs applied to existing road reviews or inspections. Starting from a review of published sources on RSAs in different countries, a set of questions has been identified and a case study undertaken on the impact of alternative RSA procedures on its overall effectiveness.

RSA effectiveness is measured both as agreement with a safety expert assessment and to an accident-based study. The main features analyzed in the case study include the type of observer used for data collection and the type of checklist used as a guide to field work. Based on an exploratory study, the performance of RSA application is evaluated using weighted indices of concordance and

disagreement, and the rating of detection or omission for the observations gathered in the accident diagnosis of the safety problems at the intersection studied, supplemented by a statistical analysis of the influence of selected covariates on these scores.

Ishtiaque Ahmed, Othman ChePuan, CheRos Ismail, “A Comparative Review of Road Safety Audit Guidelines of Selected Countries” Road safety is a global crisis and one of the proactive preventive measures for accidents is the Road Safety Audit (RSA). The benefits of RSA are numerous. RSAs have been practiced in many countries following the guidelines of their own. The objective of this study was to compare the contents of the guidelines of selected seven (07) countries. The documents were reviewed and compared in terms of seven (07) critical parameters. The definition of the term “RSA” varied among guidelines.

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VI.CONCLUSION

Traffic congestion is an important problem in Indian cities. The characteristics of Indian roads and traffic make the problem interesting to solve. There is scope for evaluating existing ideas in different and challenging traffic scenarios, innovate new solutions and empirically evaluate ideas in collaboration with public and private sectors.

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