



Assessment of Road Safety Audit Status in Gaza Strip, Palestine

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Abstract: Local statistics in the last ten years indicate that the number of road accidents in both Gaza Strip and the West Bank is continuously increasing. Recent statistics by the Traffic Accidents Investigation Office of the Palestinian Police, recorded 2710 road accidents in 2016 in Gaza Strip, causing 84 deaths with a high rate of fatalities per 100,000 vehicles. This work aims to provide a general study about traffic safety condition in Gaza Strip and to assess the status of road safety audit (RSA). This work is also expected to encourage stakeholder agencies in Gaza Strip to make potential changes toward enhancing traffic safety. The results and discussion in this paper are based on the collected data on RSA actions in Gaza Strip's agencies by several methods; interviews, electronic communications and exploring several specialized local and international websites. This was followed by a comparison between local and international procedures of RSA. The results indicate that traffic safety sector in Gaza Strip suffers from several shortages and deficiencies. The results also proved that the local implementation of RSA is non-frequent and unsystematic. They also revealed that there is no adopted or standard guideline for RSA in Gaza Strip and that there is a lack of qualified and multi-disciplinary RSA teams. The research concludes that traffic safety sector in Gaza Strip needs more attention as well as continuous development. The adopted RSA guidelines for the West Bank (version 2013) are suitable and they are recommended to be used in Gaza Strip.

Keywords: Road Safety Audit, Road Safety Audit Review (Inspection), Traffic Safety, Gaza Strip, Palestine

1. Introduction

The daily interaction between drivers, pedestrians and other items on the road will ordinarily increase the probability of road accidents and their dire consequences. The worldwide concern about traffic safety is mainly driven by the increasing statistics of crash records, especially in developing countries. World Health Organization (WHO) recent statistics show that more than 1.35 million people die each year as a result of road traffic crashes worldwide. Moreover, 90% of road traffic deaths occur in low and middle-income countries such as Palestine; whereas, the African region records the highest rate of road traffic injury deaths. In addition, road crashes approximately cost most countries 3% of their gross domestic product. This trend can threaten the lives of both drivers and pedestrians [1].

Nowadays, the world trend and key goal are to design and construct modern roads, which achieve safer operation and avoid serious injuries and death of vulnerable road users as

well as working toward "Zero Deaths" vision. This may be performed and achieved by using an innovative efficient and cost-effective toolkit in the perception of traffic safety such as road safety audit (RSA). Yuha Huvarinen, Elena Svatkova, Elena Oleshchenko and Svetlana Pushchina have stated in their published paper that the envisaged objective of RSA is not only determining road sections associated with potential accident risks for a possible human error, but also providing a suitable recommendation in order to eliminate potential traffic safety issues as much as possible prior road accident occurrence at these sections [2].

This research tries to provide a primary assessment of the local situation of RSA in Gaza Strip, Palestine. The main objective is to stimulate auditing safety measures in both new and existing roads in order to minimize and attenuate road accidents in Palestine.

2. History of RSA

RSA has been applied in many countries. The first time RSA was applied was in the late 1980s in the United Kingdom and the first guideline was published in the United Kingdom in 1990s [3]. The Federal Highway Administration (FHWA) in its Road Safety Audit Guidelines 2006 illustrated that the first inception of RSA was in the United Kingdom (UK) during the early 1980's. The perception of RSA was released due to concerns that newly constructed roads were experiencing high crash frequencies so that, these threats could have been prevented by implementing such newly distinctive tools and procedures. This was followed by a mandatory implementation of RSA for all roads and expressways, which was sponsored by the UK Department of Transport in 1991. After that, a national guideline was released to be applied for all projects.

In like manner, countries such as Australia and New Zealand have applied RSA program by early 1990's while other countries for instance, Denmark, Canada, the Netherlands, Germany, Switzerland, Sweden and South Africa have introduced it through 1990s. By time, the subject of RSA has been practically implemented in the developing

countries of Malaysia, Singapore, Bangladesh, India, Mozambique and United Arab Emirates [4].

3. RSA Definition and General Considerations

RSA is considered as a low cost and an effective tool, which serves in saving projects cost and leads to reduction in road crashes and casualties. It eventually results in improving design standards and increasing the level of safety in the road environment [5]. The U.S. Department of Transportation is defining the RSA program as "a formal safety performance examination of an existing or future road or intersection by an independent audit team. It qualitatively estimates and reports on potential road safety issues and identifies opportunities for improvements in safety for all road users. However, the Institution of Highway and Transportation in Great Britain is defining the RSA program as "the evaluation of Highway Improvement Schemes during design and at the end of construction (preferably, before the scheme is open to traffic)" [6].

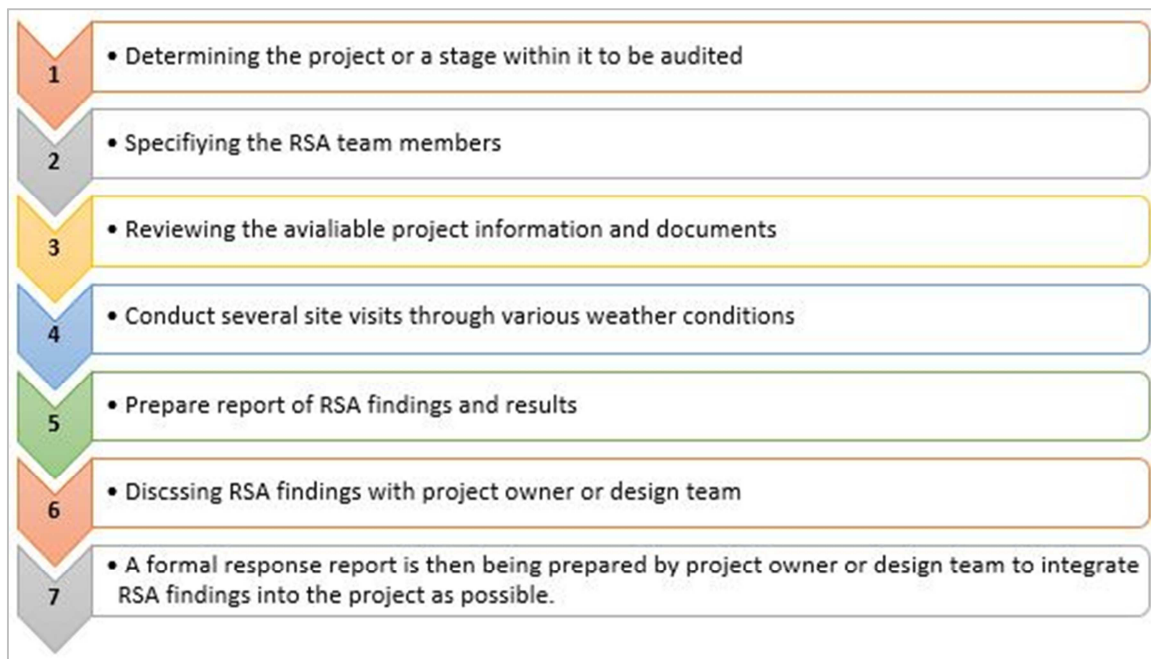


Figure 1. The Considered Steps to Conduct RSA Process by FHWA Guideline.

RSA program, such a sensitive process, shall be executed by several steps in various stages depending on the project stage. Each institution usually owns distinct steps and stages in which RSA program is being achieved effectively to improve the overall safety performance. FHWA in its well-known guideline, FHWA Road Safety Audits Guidelines 2006, is setting a group of steps as illustrated in Figure 1 in order to conduct the RSA effectively.

Moreover, the participating team in a RSA process should have multi-discipline and wide experienced members to undertake the process effectively. The process of RSA is

mainly divided into four general phases; each phase is sub-divided into several stages. Beginning with the pre-construction RSA phase, it is sub-divided into three stages of planning, preliminary design and detailed design. The second is the construction RSA phase, which is sub-divided into work zone stage, construction stage and pre-opening stage. Adding to the two previous phases, the post-construction RSA phase which deals with existing roads. The final phase is the development project RSA that deals with land use development. Figure 2 illustrates the overall phases and stages of the RSA process.

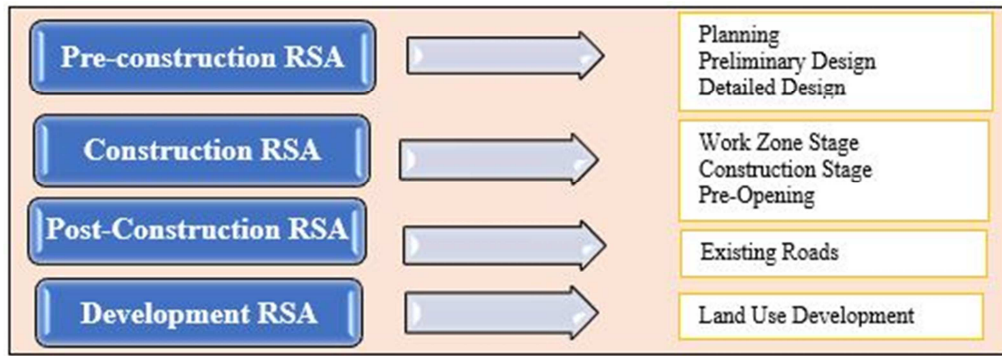


Figure 2. Phases and Stages of RSA as Set in the FHWA RSA Guideline.

4. Gaza Strip Overview and Related Information

Gaza Strip is a coastal strip on the White Mediterranean Sea with a small total area of about 365 sq. km. As part of the Palestinian territory, it lies on the southwest of Palestine, it is bordered by Sinai Desert in the south, and the Mediterranean Sea in the west and "Israeli" settlements in the east and north, Figure 3 shows the location of Gaza Strip in Palestine.

The transportation system in Gaza Strip demonstrates a clear indication of having difficult conditions. It suffers from

deficiency in maintenance and rehabilitation activities derived from major political and economic obstacles. According to statistics by the Traffic Accidents Investigation Office of the Palestinian Police, 2710 road accidents were recorded in 2016, causing 84 deaths in Gaza Strip with a high rate of fatalities per 100,000 vehicles. The statistics of registered vehicles in Gaza Strip Show an increasing trend of its number from 1970 from about 4000 vehicles to about 75,000 vehicles in 2015, Figure 4 exhibits details of the number of registered vehicles in both Gaza Strip and the West Bank between 1970 and 2015. It also shows the rate of vehicles per 100 persons [7].



Figure 3. Location of Gaza Strip in Palestine [21].

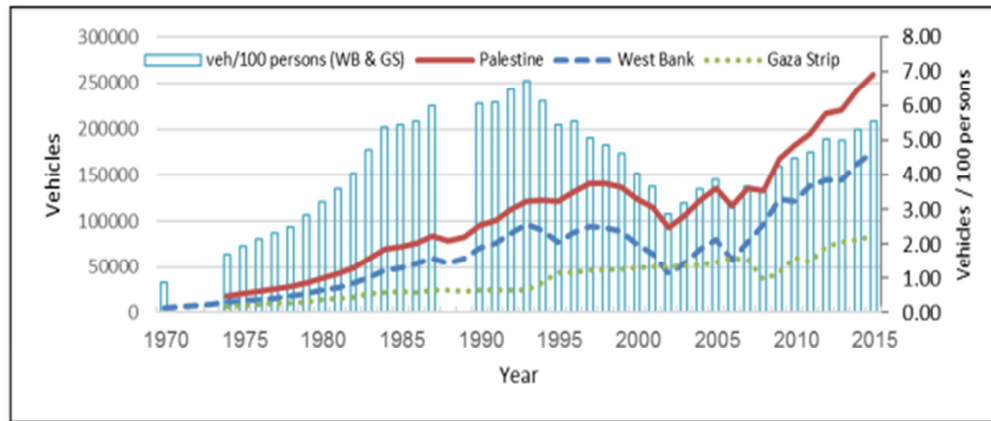


Figure 4. Number of Registered Vehicles in Palestine and rate of vehicles per 100 persons [7].

The road network of Gaza Strip consists of only about 297 km long of paved roads [8] occupying an area of 4.5 km². As a result of the trend of increasing population density and the urbanization of the area, new road construction projects as well as rehabilitation activities of existing roads are required to overcome existing and potential congestion problems. Despite of the new constructions of road facilities in Gaza Strip, there is a clear absence of uniform and standard guidelines for safety revisions.

5. Data Collection

The envisaged results of this paper are mainly based on the available RSA actions and guidelines either at the local or international relevant institutions. Data were collected using several methods: interviews, electronic communications as well as exploring several specialized local and international websites. Interviews were made with officials at local institutions such as the Ministry of Transport, the Ministry of Housing and Public Works, the Municipality of Gaza, the Palestine Traffic Safety Association and the Municipal Development and Lending Fund (MDLF). A locally authorized engineering consultancy firm in the sector of roads was also contacted. Furthermore, communications were made with some international organizations such as the Federal Highway Administration (FHWA) in the United States of America, Qatar Transportation and Traffic Safety Center (QTTSC) and the Highways England as a governmental organization in the UK.

6. Local Condition of RSA and Challenges in Gaza Strip

Gaza Strip has special local conditions. June 2007 witnessed the beginning of a political and institutional split between the West Bank and Gaza Strip. This split seriously affected all aspects of life including road safety. On the other hand, the "Israeli" occupation has also imposed a harsh siege on Gaza Strip that made it difficult to initiate development projects. These conditions as well as the lack of resources played a major role in widening the gap between Gaza Strip

and the West Bank. However, this situation did not prevent some local institutions to come forward with several initiatives and projects that aim to increase traffic safety level.

In 2014, ElAstal touched upon the traffic accident problem in Gaza Strip. He managed to specify the black spots and dangerous places in Gaza Strip using artificial neural network model [9].

The head of Traffic Department at the Municipality of Gaza [10] indicated that during the construction period of road projects, traffic and site safety are being ensured by the assigned supervision team. This may include assigning a detour of the existing road, if needed, installing the required traffic signs, suitable barriers as well as supplying night illumination. The chief of the General Directorate of Roads at the Ministry of Housing and Public Works [11] said that traffic safety in road projects is mainly the responsibility of the contractor during the construction stage. The responsibility then is referred to the project owner or operator. The Ministry of Transport indicated that RSA has been applied on some roads. In 2013, Street No 10 has been included in the Ministry of Transport initiative to review traffic safety situation [12]. The process involved checking many items such as road markings, traffic signs, lighting, vertical alignment, cat eyes and guardrail. On the other hand, Salah El-Din Street Segment from Street No. 10 to Wadi Gaza Bridge was reviewed in 2016 and three main traffic safety issues were reported [13]. Recently in 2017, Al-Aqsa Street was audited by the Ministry of Transport team [14].

The vice-president of the Palestine Traffic Safety Association [15] confirmed that the design of road projects is being reviewed by relevant authorities. During construction, professional safety requirements are provided by employing an experienced safety engineer. Finally, traffic safety components such as traffic signs, road markings and barriers are being installed on the road [16].

It is important to mention that, the Association of Engineers in Gaza Strip does not have a specialized department in traffic safety as stated by the director of the Chairperson office [17]. A designer at a locally classified engineering consulting company stated that there is a clear

shortage in the experience of road design in Gaza Strip and the main criteria used to check traffic safety aspects in road projects are geometry and design speed [16]. On the other hand, the Municipal Development and Lending Fund (MDLF) declared that they do not have special procedures in the field of RSA; however, they rely on the procedures adopted by local institutions.

The above information confirms that there are no formally adopted RSA guidelines and procedures at the local relevant institutions in the Gaza Strip.

7. International and Local RSA Guidelines and Procedures

7.1. International RSA Guidelines

The adopted RSA guidelines in selected leading countries such as the UK and USA were gathered and studied, in addition to RSA guidelines adopted by Qatar as a developing country. Table 1 exhibits general description of the collected documents.

Table 1. Description of the Collected RSA Documents from Three Selected Countries.

Country	Document Name	Sponsor Institution	Year of Publication (Recent version)
USA	FHWA Road Safety Audit Guidelines	US Department of Transportation	2006
UK	Guidelines for Road Safety Audit	Institution of Highways and Transportation	2017
Qatar	Road Safety Audit Guidelines and Procedures	Public Works Authority 'Ashghal'	2010*

* As indicated on TMS Consultancy website [18].

In order to understand what topics and components are included in each document, a general description of each one will be summarized below. The Institution of Highways and Transportation guideline comprises two main parts, chapters and Annexes. Table 2 summarizes the main contents of this guideline.

Table 2. Chapters and Annexes Submitted with the Institution of Highways and Transportation RSA Guideline, UK.

CHAPTERS	ANNEXES
Introduction	A. Stage 1: RSA checklists – Preliminary Design
Road Safety Audit	B. Stage 2: RSA checklists – Detailed Design
Road Safety Audit – Subsequent Actions	C. Stage 3: RSA checklists – Construction
References	D. RSA Team Statement
Enquiries	E. Illustrative RSA Brief, RSA Stage 2
	F. Illustrative RSA Report, RSA Stage 2
	G. Illustrative RSA Report, RSA Stage 4, 12 Month Monitoring Report
	H. Illustrative RSA Report, RSA Stage 4, 36 Month Monitoring Report
	I. Roles and Responsibilities Flow Charts
	J. RSA Certificate of Competency Requirements
	K. Illustrative RSA Response Report, RSA Stage 2
	L. Illustrative Exception Report, RSA Stage 2

On the other hand, the FHWA guideline consists of three major parts; background, process and finally road safety audit tools. Table 3 exhibits these contents.

Table 3. FHWA Guideline Major Parts.

Part A (Background)
1) Introduction to RSA
a) RSA Definition
b) Purpose of the Guideline
2) Implementation of RSA
a) Starting Steps
b) Project Selection
c) Costs and Benefits
d) Training and legal Issues
3) Overview of RSA Process
a) RSA elements
b) RSA Team and Roles
c) Project Selection
Part B (RSA Process)
1) Conducting RSA Process:
Step 1: Identifying a project.
Step 2: Select an RSA team.
Step 3: Pre-audit meeting of project information and drawings.
Step 4: Project data review and field review

Part B (RSA Process)
<ul style="list-style-type: none"> Step 5: Conduct the auditing and prepare report of findings. Step 6: Present the findings to project owner/ design team. Step 7: Prepare formal response Step 8: Incorporate findings into the project when appropriate.
<ul style="list-style-type: none"> 2) Pre – Construction RSA: <ul style="list-style-type: none"> Preliminary Design RSA Detailed Design RSA 3) Construction RSA <ul style="list-style-type: none"> Pre-Opening RSA 4) Post-Construction RSA <ul style="list-style-type: none"> For Existing Roads
Part C (RSA Tool)
<ul style="list-style-type: none"> 1) RSA Prompt Lists: <ul style="list-style-type: none"> a) Purpose and organization of prompt lists b) When and how to use the prompt lists 2) APPENDIX A: Road Safety Approaches 3) APPENDIX B: RSA Evolution 4) Case Studies and Bibliography

The Qatar Transportation and Traffic Safety Center (QTTSC) cooperates with multidisciplinary companies and research centers, such as TRL, AECOM and VICROADS. QTTSC has embraced the perception of road safety by addressing the needs and aspiration of the country in the field of traffic safety to adopt the reference of ROAD SAFETY AUDIT GUIDELINES AND PROCEDURES in the local situation in Qatar. Table 4 describes the QTTSC guideline contents.

Table 4. Major Contents of QTTSC Guideline.

Part A
<ul style="list-style-type: none"> 1) Introduction to RSA <ul style="list-style-type: none"> a) Purpose and Scope of Guidelines b) The Safe System Approach c) RSA Definition d) Other Definitions 2) RSA Stages <ul style="list-style-type: none"> a) Overview b) Exemptions c) Site Visit d) Stage 1: Concept e) Stage 2: Preliminary Design f) Stage 3: Detailed Design g) Stage 2/3: Preliminary and Detailed Design h) Stage 4: Construction i) Stage 5: Post Construction j) Stage 6: Existing Road k) Other RSA l) Responsibilities 3) RSA within Project <ul style="list-style-type: none"> a) Project Types in RSA b) Contractual Requirements c) Hold Points and Exemptions 4) RSA Team <ul style="list-style-type: none"> a) Overview b) Composition and Experience c) Accreditation
Part B
<ul style="list-style-type: none"> 1) RSA Procedure <ul style="list-style-type: none"> a) Overview b) STEP 1: Project Identification c) STEP 2: Selecting of RSA Team d) STEP 3: Pre RSA Briefing Material e) STEP 4: Desktop Study f) STEP 5: Site Visit g) STEP 6: RSA Debrief h) STEP 7: Reporting

Part B

- i) STEP 8: Completion of Decision
- j) Tracking Form
- k) STEP 9: Audit Closure
- 2) RSA Management
 - a) Overview
 - b) Roles and Responsibilities
 - c) Management Procedures
 - d) Sub-management within Organizations

Part C

Appendix A: Checklists	Table 1: Document Structure	
Appendix B: Safe Systems	Table 2: Summary of RSA Definition	
Appendix C: Exemption Certificate	Table 3: List of Definitions	Figure 1 – Stage Responsibilities Summary
Appendix D: CV	Table 4: Work Zone RSA Intervention Level	Figure 2 – RSA Procedures Flowchart
Appendix E: RSA Report	Table 5: RSA Intervention Levels	
Appendix F: RSA Review Report	Table 6: RSA Within Hold Points	
Appendix G: RSA Team Statement	Table 7: Training and Experience for RSA Team Members.	
Appendix H: Example of RSA Brief	Table 8: Required Information to RSA Team within RSA Brief.	
Appendix I: Example Decision Tracking Form		
Appendix J: Bibliography		

7.2. Local RSA Guidelines in Palestine

The West Bank as a Palestinian territory has adopted a formal document for reviewing and auditing procedures of road safety. Table 5 illustrates a general description of this document.

Table 5. Description of the West Bank RSA Guideline.

Country	Document Name	Sponsor Institution	Year of Publication (Recent version)
Palestine (The West Bank)	Road Safety Audit & Review	Higher Traffic Council	2013

8. Comparative Review Between Local and International RSA Procedures

The suggestion of a local RSA guideline suitable for Gaza Strip condition will be based on a comparative review between RSA guidelines of three countries (UK, USA and Qatar) as well as the RSA guideline of the West Bank. The comparison process will basically depend on five selected aspects as listed below:

- a) How can RSA be defined?
- b) Time of initiation and chronological steps of development.
- c) RSA stages through the entire project
- d) Submitted checklists of RSA.
- e) Involvement of sample reports or case studies for various RSA stages.

It should be noted that aspects a, c, d and e above were

used by Ishtiaque Ahmed and his team in 2013 [19], while the authors added aspect b to the list because it may be important to compare the time of initiation of each procedure.

8.1. RSA Definition in the Selected Guidelines

Each of the guidelines is defining RSA process in a different way. Based on that, the studying process of RSA definition will basically depend on decisive terms required in the stating which are:

- a) A formal procedure or examination to distinguish it from any traditional safety review.
- b) Performed by independent and multi-disciplinary team.
- c) Performed before, during and after completing project.

The extraction result of the RSA definition from each of the guidelines is shown in Table 6, and the key findings of the compression process are listed in Figure 5.

Table 6. RSA Definitions According to Reviewed Guideline Documents.

Country	RSA Definition Text
USA	The RSA is a formal safety performance examination of an existing or future road or intersection by an independent audit team. It qualitatively estimates and reports on potential road safety issues and identifies opportunities for improvements in safety for all road users.
UK	The evaluation of Highway Improvement Schemes during design and at the end of construction (preferably before the scheme is open to traffic). The aim is to identify potential road safety problems that may affect any users of the highway and to suggest measures to eliminate or mitigate those problems.
Qatar	A RSA is a formal examination of the operational safety of an existing or future road link or intersection by an independent and suitably qualified RSA team. It reports qualitatively on potential road safety issues at various milestones of the design and construction process and identifies opportunities to improve operational safety for all road users with the objective of minimizing the number and severity of personal injuries.
Palestine (The West Bank)	* Evaluation of road projects during the design and construction phase, before opening a road project to the traffic, in order to identify possible safety hazards which may affect any of the road users, and to propose procedures to mitigate or eliminate those problems.

* This definition was translated from Arabic by the author

UK	<ul style="list-style-type: none"> • a) A “formal procedure” is not included. • b) No term related to “independent and qualified examiners”. • c) Clearly mentioned the “new highway or permanent change to the existing highway”.
USA	<ul style="list-style-type: none"> • a) A “formal procedure” is plainly stated. • b) An “independent audit team” is mentioned but the qualification of the team members is not indicated. • c) Obviously mentioned the “an existing or future road” .
Qatar	<ul style="list-style-type: none"> • a) A “formal examination” is taped. • b) Clearly indicated the term of “independent and suitably qualified Road Safety Audit team” • c) Clearly mentioned the “existing or future road”
Palestine (The West Bank)	<ul style="list-style-type: none"> • a) A “formal procedure” is not mentioned. • b) No term related to “independent or qualified examiners”. • c) Clearly mentioned the “new highway or permanent change to the existing highway”.

Hint: The terms of a, b and c represent the decisive wordings in the definitions.

Figure 5. Findings Regarding the RSA Definitions in the Reviewed Guideline Documents.

8.2. Time and Development Stages of Reviewed Guidelines

The development level of RSA sector in a country maybe measured by the improvement steps toward the adopted RSA guideline as well as the implemented procedures and actions, which aim to enhance and increase efficiency. Studying the time sequence of the development stages and versions of the adopted RSA guidelines gives an indication of the gained

experiences. Figure 6 illustrates the development stages and versions in the selected countries.

This explains that the UK guidelines are the oldest and have more improvement steps, followed by the USA guidelines. However, both the Qatar and the Palestine guidelines are recent with only one released version.

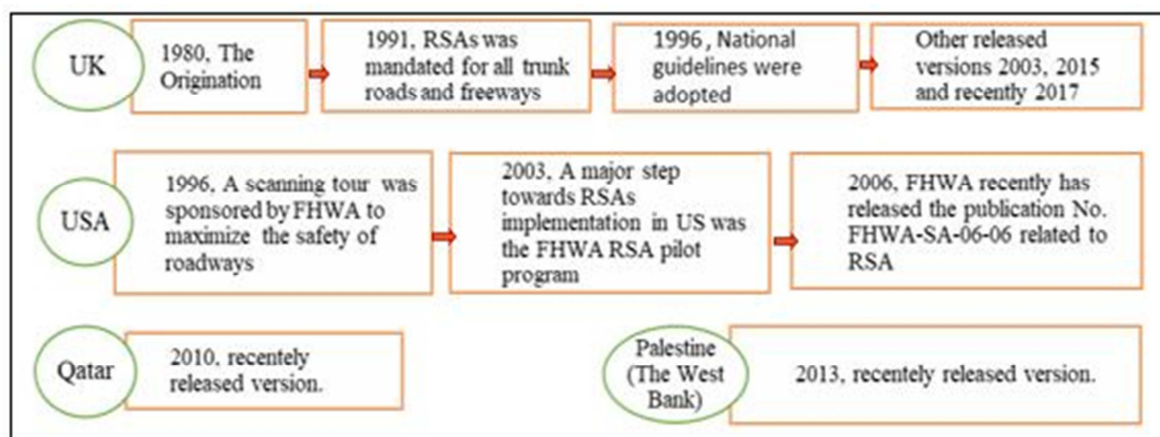


Figure 6. Development Stages and Versions of RSA in the selected Countries.

8.3. Stages of RSA Process in a Project

Each of the studied RSA guidelines differently divides the process of auditing. The international experience promotes conducting RSA process through three key project phases that are pre-construction, construction and post-construction to guarantee including all safety aspects. Based on the above suggestion, the reviewed guideline documents were compared and the list of stages for each individual guideline is described in Table 7.

Table 7. RSA Stages in the Reviewed Guidelines (When It Is Required to Implement RSA).

UK
<p>The four adopted audit stages are:</p> <ul style="list-style-type: none"> a) Stage 1: Completion of Preliminary Design b) Stage 2: Completion of Detailed Design c) Stage 3: Completion of Construction d) Stage 4: Monitoring (Where no personal injury collisions have been recorded in the vicinity of the Highway Improvement Scheme over the 12 months or 36 month periods, a formal Stage 4 Road Safety Audit collision monitoring report is not required)
Qatar
<p>The six applicable RSA stages are:</p> <ul style="list-style-type: none"> a) Stage 1: Concept b) Stage 2: Preliminary Design c) Stage 3: Detailed Design d) Stage 2/3: Combined Preliminary and Detailed Design e) Stage 4: Construction f) Stage 5: Post Construction g) Stage 6: Road Safety Assessments (Existing Road Network)
USA
<p>The four adopted RSA stages are:</p> <ul style="list-style-type: none"> a) Stage 1: Pre-construction including: <ul style="list-style-type: none"> I) Planning II) Preliminary Design III) Detailed Design b) Stage 2: Construction including: <ul style="list-style-type: none"> I) Work Zone II) Construction III) Pre-opening c) Stage 3: Post-construction including: <ul style="list-style-type: none"> Existing Roads d) Stage 4: Development Project <ul style="list-style-type: none"> Land Use Development
Palestine (The West Bank)
<p>RSA and subsequent actions are classified into four explicit stages:</p> <ul style="list-style-type: none"> a) Stage 1: Pre-construction consisting: <ul style="list-style-type: none"> I) Planning II) Preliminary Design III) Detailed Design b) Stage 2: Construction <ul style="list-style-type: none"> I) Work Zone II) Construction III) Pre-opening c) Stage 3: Post-construction <ul style="list-style-type: none"> Existing Roads d) Stage 4: Other RSA stages <ul style="list-style-type: none"> Audit of development projects

Various levels of RSA stages were demonstrated in the reviewed guidelines in the previous comparison process. The UK guideline divides RSA stages into four levels starting from preliminary design stage up to monitoring, although the considered stages encroach planning. However, in the USA guideline, the adopted RSA stages represent a wide-ranging coverage, which starts from planning to audit existing roads. The Qatar guideline divides the safety audit process into six stages starting from a concept stage and finishing with an auditing stage of existing road network. Also, the Palestinian document such a local guideline covers RSA stages in a wide area, which starts from planning and exceeds an existing road stage to audit development projects.

8.4. Supplemental Checklists for RSA in Reviewed Guidelines

Conducting an efficient and effective RSA process requires all-inclusive field surveys of important topics and items in relevance [19]. Moreover, performing a RSA process by experienced team and with assistant of prescribed forms, checklists or prompt lists, more likely, will insure covering all road safety aspects and issues. Lists of prescribed forms in each of the guidelines are included in Table 8. It briefly discusses the included forms in each individual guideline. The results revealed that UK guidelines comprise checklists for three stages with mention to the items and the related possible issues up to the completion of construction. Although existing road and planning stages are not included,

a RSA monitoring report of 36 months is annexed. The USA guidance document encompasses seven checklists in the form of “Prompt Lists” for different stages and specific items with a greater comprehensiveness. Likewise, the Qatar guideline sheds the light on various project stages and provides

exhausted checklists while it mandates to program interim and work zone RSAs into the design process. The annexed checklists cover predominant project phases from the planning to development projects in the Palestine guideline.

Table 8. Detailed Description of Involved Check / Prompt Lists in The Guidelines.

UK	USA	Qatar	Palestine (West Bank)
Checklist 1: Completion of Preliminary Design	Checklist 1: Planning	Checklist 1: Concept	Checklist 1: Planning
Checklist 2: Completion of Detailed Design	Checklist 2: Preliminary Design	Checklist 2: Preliminary Design	Checklist 2: Preliminary Design
Checklist 3: Completion of Construction	Checklist 3: Final Design	Checklist 3: Detailed Design	Checklist 3: Detailed Design
	Checklist 4: Work Zone Traffic Control Plan	Checklist 4: Post Construction Pre-opening	Checklist 4: Construction Phase and Traffic Management at work
	Checklist 5: Pre-Opening	Checklist 5: Existing Road	Checklist 5: Pre-opening
	Checklist 6: Existing Road		Checklist 6: Existing Roads
	Checklist 7: Land Use Development Proposal		Checklist 7: Development Projects

8.5. Containment of Sample Reports or Case Studies for Various RSA Stages.

Existing of sample reports and previously carried out RSA case studies offer an unpretentious implementation of auditing process. Table 9 exhibits the attached supplementary RSA reports and carried out case studies in the reviewed guideline.

Table 9. RSA Reports and Case Studies Contents in the Reviewed Guidelines.

Country	Case Studies Contents in Guidelines Condition of Coverage
UK	Attached with partial representation
USA	Attached with good representation
Qatar	Attached with some representation
Palestine (The West Bank)	Not attached except for some descriptions

9. Discussion and Conclusions

Gaza Strip is one of the most densely populated areas in the world and it is suffering from the lack of or inadequate infrastructure facilities. Therefore, there is a bad need for developing the existing roads and for constructing new ones. Local statistics showed that the number of road crashes is increasing with a high rate of fatalities per 100,000 vehicles.

Findings imply that ineffective road safety mitigations are being adopted by the responsible agencies in Gaza Strip and the related actions are unsystematic and not consistently applied. Moreover, they do not follow RSA guidelines. The results also revealed that there is an ambiguous condition in the dedicated agencies responsible for improving road safety situation in Gaza Strip.

The traffic safety condition in Gaza Strip may be summarized as follows:

1. Absence of a road safety auditing guideline in Gaza Strip.
2. Gaza Strip is suffering from shortages in specialized equipment and facilities in the field of RSA.
3. Local transportation institutions and agencies lack comprehensive knowledge of the process of RSA, which leads to the inability to take proper actions at different stages of highway projects.
4. Lack of qualified and experienced personnel in RSA, which make it difficult to form the RSA team.
5. Absence of a special department for auditing engineering drawings of road projects at the Palestinian Association of Engineers in the Gaza Strip affects the

traffic safety condition.

Based on the above revision and comparison of the collected data, the Palestinian Guideline for RSAs appears to be suitable for local conditions in Gaza Strip. This conclusion was built on the following warrants:

- a) The Palestinian Guideline for RSA is very similar to the international reviewed guidelines based on the considered parameters.
- b) It has been certified and authorized by the Ministry of Transportation in The West Bank and using it will practically assist in the unification of respective regulations in Palestine.
- c) The used methods and criteria considerations for selecting which projects to be audited (black spots) and when, have been involved in the guideline that is expected to keep the level of costs and efforts to the minimum.
- d) It was written in Arabic, the local language, which can easily be followed by the local institutions and organizations.
- e) It is the most appropriate to be adopted and considered as an assistant tool in manipulation of RSA process in the local situation because it follows the locally released document of Road Safety Guide in Palestine (Version 2013).
- f) Feedback on any component of the documents, such as the checklists will be very beneficial to develop such a local guideline.

It is also recommended to benefit from checklists and sample reports attached in the other guidelines.

10. Recommendations and Future Work

It is recommended that the responsible institutions of RSA process in Gaza Strip should pay further efforts in order to enhance the local traffic safety condition. This may be achieved by cooperative efforts among the Ministry of Transport, the Ministry of Public Works and Housing and The Palestinian Association of Engineers to adopt uniform guidelines for RSA. It is also recommended for the Ministry of Transport to conduct an awareness program on RSA for the related agencies, which will increase their knowledge about its benefits thus, it will encourage considering RSA in highway projects. It is also recommended to train a qualified and multi-disciplinary RSA team that is able to conduct an RSA process effectively. It is very important mandating the use of RSA process in all project stages by a capable local institution. Moreover, it is highly recommended for research institutions to apply the adopted RSA guidelines on local case studies and encourage a standard pattern that would facilitate the implementation of RSA.

Local road safety concerned institutions are required to follow up the world trend in using new and developed tools for performing RSA processes as well as encouraging using Interactive Highway Safety Design Model (IHSDM) which is recommended by FHWA, geo-referenced video techniques, GPS, smart cameras and software.

Research institutions are also requested to apply the adopted RSA guidelines in the West Bank (version 2013) on other road projects during different road project stages in Gaza Strip.

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