Funded under European Union's Horizon 2020 research and innovation programme - Grant agreement No 724029

TRAIN-THE-TRAINER MANUAL

Project	SAFER AFRICA
Work Package:	WP6 Capacity building
Deliverable:	D6.2 Train-the-trainer manual
Version	3.0
Date	December 2018
Report authors:	Casimir Sanon, Andrew Morris, Sandra Vieira & Ludo Kluppels

DOCUMENT CONTROL SHEET

Document title	Train-the-trainer manual
Work package:	WP6
Deliverable	D6.2
Version	3.0
Last version date	October, 23th 2018
Status	2nd draft
File Name	
Number of pages	
Dissemination level	
Responsible author	
Editors	

VERSIONING AND CONTRIBUTION HISTORY

Version	Date	Author/Editor	Contributions	Description / Comments
1	August 2018	Ludo Kluppels, Casimir Sanon	Sandra Vieira	Too much on road safety itself in part 1
2	October 2018	Ludo Kluppels, Casimir Sanon, Andrew Morris	Sandra Vieira	Changing part 1 and adapting a chapter on case studies in part 2
3	December 2018	Ludo Kluppels, Casimir Sanon, Andrew Morris	Sandra Vieira	Adding a chapter on RS audit and inspection / taking into account the remarks of the external reviewer.

Table of Content

Introduction

This manual is meant to support lecturers who wish to incorporate a course on road safety into the curriculum of another educational program.

Various professions have linkages with the problems and issues related to road safety. For some of these it is evident: engineering and technology, political and social sciences. In other professions, specific aspects of road safety can hold important input.

- Road safety education requires a place in the training of teachers (primary and secondary schools), since children need to be taught as early as possible how to behave safely on the road.
- Government wanting to set up an effective enforcement plan need to ensure police men have good knowledge of road safety behaviour.
- For new drivers, learning to drive concerns not only traffic rules and handling a car, but also understanding the psychology of a road user and traffic in general.

Furthermore, many more professions deal with road safety issues in their job which makes it worthwhile considering implementing aspects of road safety into the existing curriculum.

The first part of this manual will focus on the importance of implementing road safety curricula. The first chapter explains the current road safety situation and related problems in Africa. This overview provides arguments for exposing more students to road safety expertise. Chapter two speaks about the most common framework in road safety: the Safe System approach. It provides a definition and broader context on what road safety really constitutes: a systematic and combined approach of all important elements. Road safety is not only a matter of building strong roads – it requires various coordinated actions and significant engagement from authorities, stakeholders and road users.

On the basis of these two theoretical chapters, examples will be given to provide an indication of which learning outcomes could be of relevance for which profession/curriculum. These examples are not exhaustive, and are primarily intended to inspire the reader for the analysis of their situation. This is vital, since road safety implementation will vary depending on the context of a country's organisational structure with regard to traffic and road safety.
Special attention will be given to the education of road safety auditors and road safety inspectors.

The second part of this manual is more didactical. It discusses the main aspects of organising a specific curriculum. Experienced teacher will already have sufficient background in developing a course, however we recommend to pay particular attention to the chapter on learning outcomes. A key error experts make when organising trainings is the attempt to pass on their entire knowledge to their students, even if these students have an entirely different background and profession. Emphasising how students can apply their newly gained road safety knowledge in their profession is crucial in order to ensure engagement during these trainings.
The following chapter on 'Tools and Methodology' discusses three interesting road safety case studies. Working with case studies is an effective tool to demonstrate the interlinkages of various road safety elements. Furthermore, we propose leaving the classroom and using live examples as a learning experience drawing on reality is definitely worth the time investment to engage participants. As a third possibility, we discuss the option of working with E-learning tools in

combination with a classroom course. The SaferAfrica project has developed various E-learning modules concerning road safety issues that can provide a great general introduction to the subject. In the last chapter we emphasise the importance of evaluations and various techniques thereof.

This manual does not provide detailed content for a road safety curriculum. A lot of documentation is already available on the various topics and expertise regarding road safety. A comprehensive list of references for further reading can be found at the end of the course. Additionally, extensive material can also be found on the SaferAfrica website: http://www.saferafrica.eu/ .

PART 1:

INCORPORATING ROAD SAFETY TRAINING IN MORE PROFESSIONAL SECTORS.

1 Road Safety on the African continent.

(author: Casimir Sanon- HI)

In contrast with the struggle against certain pandemics like malaria and HIV/AIDS, the fight against road unsafety has not yet reached the expected results. With a fatality rate of 26.6 per 100.000 inhabitants, the African continent has the highest rate of road fatalities in the world (17.4 worldwide). Some African countries have rates well above the African average. Twelve African countries are among the fifteen countries in the world with the highest fatalities. These are Libya, Malawi, Liberia, Democratic Republic of Congo (DRC), Tanzania, Central African Republic, Rwanda, Mozambique, Burundi, Togo, Sao Tome and Principe and Burkina Faso.

Based on the estimations of the World Bank[1] in 2013, road accidents are the main cause for death for the age group of 15 to 24 year olds in the whole world, and for the age group of 25 to 39, it is the second most important cause, after HIV/AIDS. Twice as many people die as a result of a car crash as of malaria. Furthermore, the World Health Organisation (WHO) expect that the number of road crash victims will continue to increase rapidly and will in fact exceed the number of HIV/AIDS victims by 2030. In Sub-Saharan Africa, the WHO expects an increase of road victims of 112%; from 243.000 in 2015 to 514.000 in 2030.

1.1 The cost of road insecurity.

Road insecurity represents not only an enormous cost for the people involved, but also for society as a whole. The direct costs are of course the impact on victims and their families. However, besides the cost of accidents themselves, road traffic also results in external costs, such as air and noise pollution, which may impact the health of the entire community.

1.1.1 Socio-economic costs of road accidents.

According to the 2015 Third Global Road Safety Status Report, road traffic accidents cost governments about 3% of GDP. This cost hovers around 5% for low- and middle-income countries. In addition to the deaths caused, millions of people suffer non-fatal injuries every year as a result of road accidents. In short, road accidents can have many negative consequences such as loss of resources, lives and well-being. They generate costs, some of which may be directly related to individual victims, while others are not specific to the victims, but relate to the accident as a whole. These costs are understood by society as socio-economic costs.

Costs related to the victim.

These costs consist mainly of medical costs, non-medical rehabilitation, loss of production, human costs and other economic costs.

Medical Costs (Medical Rehabilitation): These costs include first aid and ambulance, treatment of hospitalised patients, ambulatory care, non-hospital care, aids and appliances

Non-medical rehabilitation: the transformation of the home for people with disabilities, the requirements for special private transport of disabled people, vocational rehabilitation, special education for children.

[1] Institute for Health Metrics and Evaluation, Human Development Network, The World Bank. The Global Burden of Disease: Generating Evidence, Guiding Policy — Sub-Saharan Africa Regional Edition. Seattle, WA: IHME, 201

Loss of production capacity (net or gross): the lack of production of employed persons, lack of non-market production (for ex. housework, volunteering), future or potential lack of production (for ex. Children, unemployment)
Human costs: the loss of life expectancy of the deceased victims, the physical and moral suffering of the victim (physical and mental injuries, suffering, deterioration of the quality of life, permanent damage to the aesthetic) and the moral suffering of the parents and friends of the victim (physical and mental injuries, suffering, deterioration of the quality of life).
Other economic costs: cost related to the visit of the sick, the lack of production of members of the household, the funeral, the housekeeper.

Costs related to the accident.
These are costs related to the consequences of road accidents. They do not include accident prevention (road safety measures) or fear of accidents. Accident costs consist of property damage, administrative costs and other costs.
Property damage (including damage to the environment): vehicle damage (costs of repairs or replacement), degradation of the road environment, property damage, damage to personal property, deterioration or loss of cargo of trucks, damage caused to the environment.
Administrative costs: police fees, fire department fees, health insurance management fees, insurance management fees other than health insurance, court fees.
Other costs: the loss of enjoyment of investment goods (e.g. rental costs of a building, a vehicle), congestion costs (fuel consumption, air pollution, loss of time, etc.). .), the loss of productive capacity of people incarcerated as a result of the accident

1.1.2 Environmental costs

Traffic has a lot of negative impact on the environment; all kinds of pollution are the results of increasing motorised transportation.

Noise pollution
This is the most direct external effect caused by the movement of vehicles, often perceived as a nuisance by the population. Noise pollution is characterised by a noise level so high that it has consequences for human health and the environment. It can affect health and the quality of life and has physical and / or psychological consequences for men. The health risks related to noise are three-fold:

- ✓ **Hearing effects**: noise can cause the destruction of hair cells in the ear. This destruction is irreversible and may result in hearing loss.
- ✓ **Non-auditory effects**: the main effects on individuals attributed to noise, apart from auditory effects, are: sleep disturbances, namely, shallow sleep, difficulty falling asleep, more frequent movements; general reduction of well-being; difficulties of concentration and oral communication; cardiovascular disorders / hypertension; the stress; impacts on the immune and endocrine system; sensory effects / physical pain in the ear. Studies have already verified the responsibility for automobile noise pollution in the exacerbation of cardiovascular diseases, the risk of cardio-respiratory death in subjects residing near a road. According to the World Health Organisation (WHO), noise pollution from traffic causes the loss of one million years of good health every year.
- ✓ **Discomfort**: it results from the disruption of a conversation, sleep, rest, study, etc.

The noise caused by road traffic varies depending on the type and condition of the vehicles. In Africa, few countries have defined road vehicle import standards, and where this is not the case, age limits for

vehicle imports have been set. Due to lack of financial resources to buy new vehicles, African people are rushing to second-hand vehicles imported from Europe, Asia and the United States. These vehicles are usually decommissioned in their country of origin either because they are older or because they do not meet health and environmental standards. They are therefore very often extremely polluting and noisy.

Air pollution

Air pollution caused by transport is characterised by the release of gas and odours, especially in urban areas. In fact, it is the short daily journeys in urban areas that consume proportionately the most fuel. To the pollution by the discharges of greenhouse gases, it is necessary to add the dust that the vehicles raise during their passage, because many roads remain unpaved in developing countries. The harmful effects of these various pollutants (gas and dust) contribute to degrading the health of the local residents and have found to increase morbidity rates.

In fact, air pollution related to land transport is a serious public health problem that attests, in addition to traffic accidents, to the level of insecurity engendered by road transport. Air pollution causes a variety of socio-economic and health costs. The related health impacts induce the following costs:

- ✓ care expenses, namely medical consultations, medication purchases, hospitalisation expenses
- ✓ economic losses related to the reduction of daily activity such as restricted activity days, work stoppages;
- ✓ non-market costs, particularly related to the loss of well-being due to worry, discomfort or the restriction of leisure or domestic activities;
- ✓ losses related to mortality: years of life lost, deaths, funeral expenses

Air pollution has an impact on a large range of medical pathologies[2]:

- ✓ respiratory diseases, such as asthma, rhinitis, bronchitis, lung cancer
- ✓ cardiovascular diseases, such as stroke, angina pectoris, myocardial infraction
- ✓ pathologies of the reproductive system: decline in male fertility, premature births, increased intrauterine mortality.

According to a 2013 World Bank and Institute for Health Metrics and Evaluation (IHME) study, pollution is the fourth leading cause of premature death globally, and 87% of the world's population is more or less exposed to the pathologies it causes (cardiovascular diseases, lung cancer, chronic lung diseases, respiratory infections). The study shows that 5.5 million premature deaths worldwide, or 1 in 10 deaths, are attributable to pollution. The loss of labour income from air pollution related deaths was about $ 225 billion in 2013, or about $ 5.11 billion in welfare losses around the world[3]. The economic cost of air pollution is higher in countries with a young population because the consequences of pollution reduce the earning capacity of this population. In sub-Saharan Africa, for example, the loss of labour income represents the equivalent of 0.61% of gross domestic product (GDP) each year. All of this underscores the burden of air pollution on the global economy.

[2] www.developpement-durable.gouv.fr

[3] The cost of air pollution : strengthening the economic case for action, World Bank Group and HHME, 2013 http://documents.worldbank.org/curated/en/781521473177013155/pdf/108141-REVISED-Cost-of-PollutionWebCORRECTEDfile.pdf

1.2 The link between road safety and poverty

Globally, road traffic injuries and deaths are more pronounced in middle- and low-income countries. Low- and middle-income countries with 82% of the world's population and a vehicle fleet representing 54% of the world's registered vehicles account for 90% of road deaths. This number of deaths is disproportionate to the level of motorisation of these countries. The low level of motorisation is explained by the lack of financial resources. Moreover, the majority of motor vehicles circulating in low- and middle-income countries are obsolete and of poor technical condition. They consist mainly of vehicles imported from Europe, Asia and the United States. The findings of the African Development Bank report on road safety in Africa reveal that most African countries depend on the importation of used vehicles. 60% of the countries covered by the study apply import standards, but no vehicle age limit, and only 67% have safety standards for putting vehicles into circulation.

Vulnerable users account for 50% of road deaths and the African region has the highest proportion of pedestrian fatalities (39%). In the first Global Road Safety Report 2009, produced under the auspices of WHO, it appears that road traffic injuries burden already drained and overburdened health systems in developing countries. They also aggravate the misery of households. Three-quarters of the victims are men, most of whom are of working age. Many families descend into poverty as they lose their livelihoods and are faced with the additional burden of having, to pay for medical care and care for someone who is hurt or disabled, depleting their meagre financial savings. The situation is all the more worrying because, in poor countries more than elsewhere, the absence of urban development endangers not only motorists, but the entire population. Up to 80% of those killed on the road are pedestrians, cyclists or motorcycle riders in developing countries, compared to an average of 46% in the world. According to WHO, only one-third of the world's population lives in countries that promote walking and cycling, whilst 44% of countries do not have a public transport policy.

Sylvanie Gogillon[4] observes that although road safety has improved since the 1970s, socio-spatial inequalities persist. The risk of being involved in a grave accident is significantly higher for residents of disadvantaged neighbourhoods than for residents of wealthy neighbourhoods. . The explanatory hypotheses for this is an additional accident risk exposure due to significant pedestrian mobility, as well as a strong appropriation of public spaces close to home, and neighbourhoods often being located closer to transit traffic. This reality is evident in developing countries where the majority of the inhabitants of peripheral neighbourhoods live in precarious conditions in an area devoid of sanitation works, appropriate urban roads and basic social services and are forced to converge towards the centre. They are thus more exposed to the risk of road accidents.

1.3 Three major factors in African Road Safety struggle.

Road Safety in Africa is characterised by a number of factors that make it extremely challenging to find an effective one-size-fits all solution. It includes the lack of management, the actual state of the infrastructure and of the vehicles, and the weak organization of post-crash care.

1.3.1 Road Safety management in African countries

For many African governments, road safety is not perceived as a priority. Often, the lack of reliable statistical road safety data hinders policymakers from grasping the full magnitude of the issue and

[4] Sylvanie Godillon, « Réduire les inégalités de risque d'accident dans les quartiers défavorisés : le succès d'une expérimentation britannique », Reflets et perspectives de la vie économique 2014/3 (Tome LIII), p. 19-29.

results in them underestimating the benefits of introducing preventive measures. As a result, an integrated and systemic approach to road safety is frequently amiss, resulting in limited coordination between those responsible for road engineering, road operations, enforcement and health and emergency services. Even where leading road safety governing bodies have been established, these often have insufficient legal powers, institutional and human capacity, as well as financial resources, resulting in insufficient coordination power to implement road safety action plans. As a result, several road safety actors intervene in the field without their actions being supervised or monitored.

Overall, road traffic laws and regulations in Africa rarely comply with the standards set by the World Health Organisation, and even the adopted road safety regulations and measures are inadequately applied, an issue exacerbated by petty corruption of traffic police officers.

Nevertheless, there is a growing concern about road fatalities and many governments take initiatives to improve the situation.

1.3.2 Actual state of the road infrastructure and the motor vehicles fleet.

The African motor vehicle fleet is generally old and in a poor state. It is mainly composed of second-hand vehicles imported from Europe, Asia and the United States. There is also a large share of high-powered motorcycles, the importation of which is insufficiently regulated. Most vehicles do not meet the minimal safety and security standards and constitute real sources of accidents, pollution and noise.

Much of Africa's road network has not incorporated road safety measures. There are many sections of unpaved roads that are impractical at certain times of the year, especially during the rainy season.
There are few sidewalks for pedestrians and tracks and strips are insufficient. The lack of separation between different types of road users is the cause of some accidents.

1.3.3 Road users and post-crash care system.

The poor culture of road safety in Africa results in the human factor often being the main cause of accidents. Virtually all users of two-wheeled motor vehicles and tricycles and quadricycles drive without a driver's license, meaning they received no formal training on driving land motor vehicles. This is exacerbated by a lack of awareness regarding accidents risk factors as there a limited financial resources for awareness campaigns.

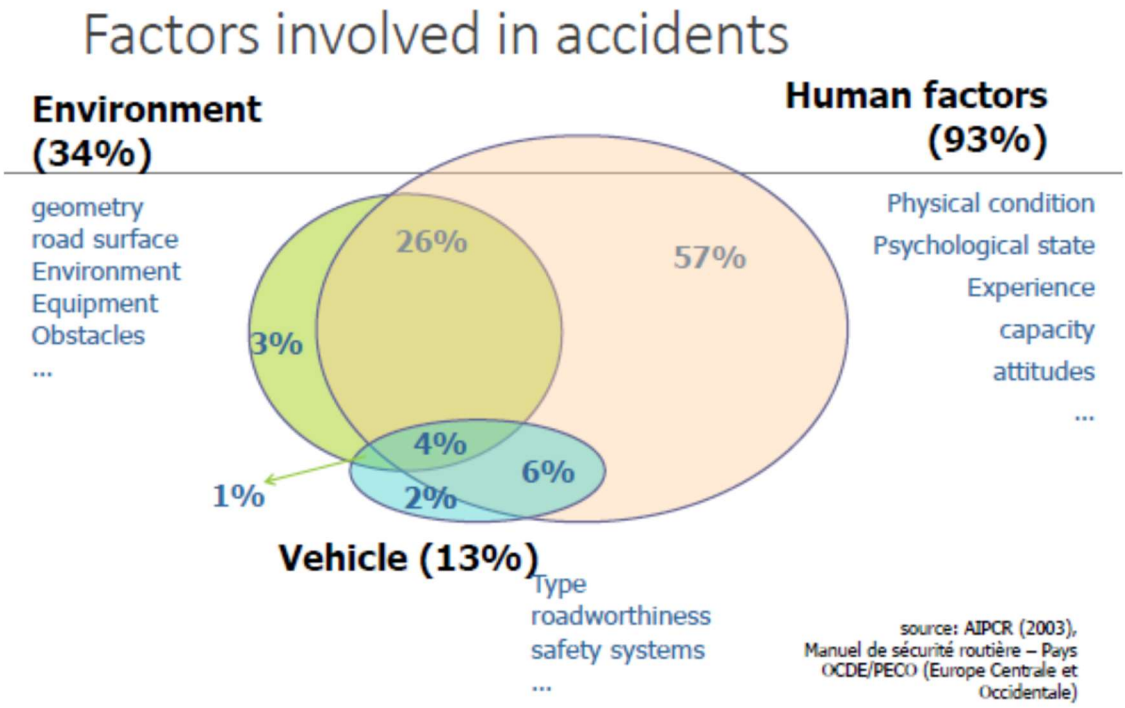
Post-accident care is very weak. For lack of means, relief to road accident victims is slow. In fact, the services responsible for evacuating the wounded as well as many health centres are poorly equipped. Very few medical ambulances exist and often they provide no first aid. The sprawl and size of cities combined with the frequency of road accidents compared to the limited number of vehicles and personnel, means rapid interventions are rare. In addition, health centres lack the materials and equipment needed for proper care of the wounded. Even where care is available, this may be inaccessible to some p patients for lack of money, and may result in the injured not receiving the appropriate treatment

2 A Safe System approach.

2.1 Introduction

When an accident occurs, an investigation is conducted to understand the causes. Was it the driver who drove too fast, or was he distracted, or not experienced enough to make this manoeuvre? Did the car malfunction? And what about the road: was there a hole in the road, or another kind of obstacle?

In Europe, the human factor plays an important role in most accidents, with it being the primary cause in 57% of cases. Vehicle malfunction plays a minor role in Europe. It is likely that an assessment of African data will reveal a somewhat different finding as roadworthiness of vehicles is not guaranteed, and the traffic environment is not always in a reasonable state (see Chapter1). However, most experts agree that the human factor is also the key cause of accidents in Africa.



Whilst the human factor is the key source of accidents, this does not mean road safety activities should focus exclusively on individual drivers or road users. As experience has shown, focussing only on the education and training of road users has not solved the road safety problem effectively (Peden et al., 2004).

A first step towards a more systematic approach was found in the proposition of William Haddon (Haddon, 1968). He developed a systematic framework for road safety based on his knowledge of epidemiology. His famous HADDON-matrix (see figure 2) analyses the possibilities for preventing harm through 'interventions' before, during and after the crash for the three components: infrastructure, vehicle and users.

As stated in the PIARC Road Safety Manual: "Central to this approach was the understanding that the exchange of kinetic energy in a crash leads to injury, which needs to be managed to ensure that the thresholds of human tolerances to injury are not exceeded"[5].

Figure 2: HADDON-matrix

	Before	During	After
Infrastructure			
Vehicle			
Road users			

2.2 Principles of a safe system.

Further developments, especially in Sweden (Vision Zero) and in the Netherlands (Sustainable Safety), provide a more elaborate approach in which the design of roads takes a more central role. This approach is based on the following principles:

a) People make mistakes. The human capacities are enormous, but also limited and fallible.
b) Humans are vulnerable. There are some physical limits for energy beyond which the human body is seriously injured.
c) A well-designed system (which takes all the elements into account) can ensure that these physical limits are not exceeded in a crash. Speed is thereby a central element.
d) The focus is the elimination of fatalities and severe injuries, not only on a reduction.
e) Road safety is based on a shared responsibility between 'designers' (government) and road users.

Following these principals, a good safe system model has four main design elements:

1) **Safe roads and roadsides**: The design of the infrastructure must make roads predictable and encourage safe travel speed (self-explaining) and minimise the mistakes users make so that a crash can be prevented or so damage can be minimised (forgiving roads).
2) **Safe speeds**. Speed is the most important factor in accidents and their severity. Users have to understand the importance of limits and the design of the road must make limitations not only acceptable, but also natural.
3) **Safe vehicles**. Vehicles must protect road users, not only the driver or the passengers, but also vulnerable road users such as pedestrians and two-wheelers. Roadworthiness is an important issue, but safety goes a step further.
4) **Safe road users**. All users have to comply with road rules and need to be responsible, not only for their own safety, but also for the safety of everyone around them.

2.3 Illustration of a safe system approach.

To illustrate the safe system approach we will take the common example of a truck on a rural road going off the road accidentally and ending up rolled over in a ditch.

[5] https://roadsafety.piarc.org/en/strategic-global-perspective-key-develoments/shift-safe-system

The key question when using the safe system approach is not to ask 'What was the cause of this accident?', but 'How can we prevent such crashes?'.

Possibly the driver was driving too fast, or he was distracted, or tired. Long, monotonous roads and landscapes can induce fatigue, and even where appropriate speed limits are installed, there may be few visual indications that driving above this limit would be dangerous.

On a side note, the World Road Association (PIARC, 2009) proposes a maximum speed of 70 km/h on these kind of roads where frontal conflicts between vehicles are possible.

Regardless of whether the driver was tired or distracted, or whatever mistake he made, there are possibilities to prevent this kind of outcome.

The picture displays a lack of a real safety zone next to the road. A minimum recuperation zone of 2 meters is required. Furthermore, are there any warning markings on the ground to 'wake up' the driver and warn him that he is leaving the road? A safety barrier (guardrail) may have prevented the truck from going into the ditch. Could the ditch have been built further away from the road side?

Importantly, the safety of the vehicle also needs to be addressed. Roadworthiness of trucks is crucial (brake system, tires, …), similarly to regulations and the enforcement thereof on (over)loading. New technology can also prevent (or warn) the driver when he is distracted or too tired to drive and speed adaptors (ISA) can prevent driving too fast.

People make mistakes, and as traffic experts, we must look for tools and designs that can prevent these mistakes as much as possible or to minimise their impact.

Another illustration can be found in the video 'The Difference between Life and Death' from the New Zealand Transport Agency: https://www.youtube.com/watch?v=mFcLUCtUAzc

2.4 The WHO approach: working with 5 pillars.

In 2010, the General Assembly of the UN proclaimed the 'Decade of Action for Road safety'. The aim is to reduce road traffic fatalities all over the world, with particular focus on low-and-middle-income countries. Therefore, a Global Plan of Action was developed which provides practical tools to help governments and stakeholders to develop specific action plans in their country or region.
Activities are based around five key pillars, as indicated in figure 3.

Figure 3: The five pillars for National activities on road safety.

All five pillars hold equal importance and must be viewed as integrated actions which will reinforce and support each other.

The 5 pillars are described as follows by the Global Plan (WHO, 2010):

Pillar 1: Road Safety Management
Adhere to and/or fully implement UN legal instruments and encourage the creation of regional road safety instruments. Encourage the creation of multi-sectoral partnerships and designation of lead agencies with the capacity to develop and lead the delivery of national road safety strategies, plans and targets, underpinned by the data collection and evidential research to assess countermeasure design and monitor implementation and effectiveness.

Pillar 2: Safer roads and mobility
Raise the inherent safety and protective quality of road networks for the benefit of all road users, especially the most vulnerable (e.g. pedestrians, bicyclists and motorcyclists). This will be achieved through the implementation of various road infrastructure agreements under the UN framework, road infrastructure assessment and improved safety-conscious planning, design, construction and operation of roads.

Pillar 3: Safer vehicles
Encourage universal deployment of improved vehicle safety technologies for both passive and active safety through a combination of harmonisation of relevant global standards, consumer information schemes and incentives to accelerate the uptake of new technologies.

Pillar 4: Safer road users
Develop comprehensive programmes to improve road user behaviour. Sustained or increased enforcement of laws and standards, combined with public awareness/education to increase seat-belt and helmet wearing rates, and to reduce drink-driving, speed and other risk factors.

Pillar 5: Post-crash response
Increase responsiveness to post-crash emergencies and improve the ability of health and other systems to provide appropriate emergency treatment and longer term rehabilitation for crash victims.

3 Road Safety training for different professionals.

Ezra Hauer (Hauer, 2005) describes road safety experts as "the purveyors of the factual road safety knowledge who must inform the decisions of a much broader workforce that affects safety on the roads". In an overview of different curricula for road safety experts (Transportation Research Board, 2007) a differentiation is made between full-time road safety professionals and those experts who apply selected road safety issues in their specific field of practise. Both publications insist that all professionals dealing with road safety issues are educated on basic road safety knowledge and competences. Actions and measures taken to improve safety cannot be based on intuition or tradition, but must be based on empirical evidence and scientific research (Hauer, 2005).

Five core competences for the education of all professions with a link to road safety are described by the Transportation Research Board (TRB) as follows:

1) Nature of Road Safety: Understand the management of road safety as a complex multi-disciplinary system.
2) History and institutional structures: Understand and be able to explain the history and institutional settings in which safety management decisions are made.
3) Use of (Crash) data: Understand the origins and characteristics of traffic safety data and information systems to support decisions
4) Countermeasures: Assess factors contributing to road crashes, identify and implement potential countermeasures and evaluate their effectiveness
5) Program management: Develop, implement, and administer a road safety management program.

The content to achieve these competencies may differ for different road safety linked professions and the focus for their specific domains must be identified.

3.1 Overview of workforces involved in road safety.

The variety of professionals involved in a country's road safety depends on the understanding and concept the government holds regarding the nature and severity of the road safety topic.

When viewing road safety purely as a matter of good or bad driving, and when believing that improvement can only be achieved through better education and enforcement, the perceived necessity to teach road safety to different professions is low. High quality driving schools and an effective police force should be sufficient to control the situation.

On the other hand, in a 'safe system' approach, the occurrence of an accident is conceptualised as an error in the system, where components from infrastructure, the vehicle, the regulations and the user himself are interacting with one another. From this viewpoint, decreasing the number of accidents requires various considerations and for different scientific disciplines to come together.

Once dominated by traffic engineers and traffic police, the road safety profession has been transformed by the presence of economists, statisticians, planners, psychologists, epidemiologists, policy analysts, mechanical engineers and others. This diversity of expertise has come to characterise the road safety workforce, with each discipline bringing different sets of skills and perspectives to achieve shared safety goals (Transportation Research Board, 2007).

To give an overview of all these disciplines and professions, the pillar structure, presented by the WHO, can be used. Figure 4 will present an overview of the different professionals that are involved for each pillar. This list is not exhaustive and only provides a general idea of the diversity of the field.

Figure 4: Different workforces involved in road safety according to the 5 pillars

RS Pillar	Workforces involved
1. Road Safety management	Statistics, economy, political science, civil engineers, urban planners, environmental sciences, etc.
2. Safe roads and mobility	Civil engineering, RS auditors, mobility planners, road workers, economists, urban planners, etc.
3. Safer vehicles	Car engineering, biomechanics, experts in crash analysis, mechanical engineering, IT-experts (robotics, …), environmental sciences, etc.
4. Safer road users	Psychology, pedagogical experts; teachers, police forces, lawyers, judges, toxicologists, sociologists, marketing experts, communication experts, prevention workers in companies, etc.
5. Post-crash response	Emergency personnel, rehabilitation personnel, psychologist, police forces, firemen, health care workers, insurance experts, lawyers, etc.

There are many ways to educate different professions on road safety issues. For some professions road safety is evidently crucial, that road safety knowledge must be incorporated in any basic curriculum. For civil engineering, for example, it is obvious that road safety should constitute an important part of the 'normal' educational program. For other professions, such as economists or psychologists, road safety may be viewed as a specialisation during or after their basic education. For most of the above mentioned professions, an optional course during their basic education, a continuous education program, short courses and/or an on-the-job training are like to be the most preferable solutions.

3.2 Application of the 5 core competences in regular education

Although the TRB (TRB, 2007) states that for each person involved in road safety the 5 core competences (mentioned in the introduction of chapter 3) are essential, the content to realise these competences must be adapted to the specificity of the work domain in which the person is acting. To concretise in which way this adaptation may take place, this chapter discuss the specific content for three different professionals: a civil engineer, a police officer and a secondary school teacher. Of course, the standard curriculum for each of these professions may vary depending on the educational system and context within a country. For this discussion, we must step away from these differences and speak in more general terms.

3.2.1 Road Safety courses for civil engineers.

Civil engineers are experts in building roads, bridges and other kinds of road infrastructure. They have expertise regarding international standards, different building and surface materials, etc. Their knowledge on road safety is already elaborate. Nevertheless, their knowledge regarding certain road safety aspects may be incomplete and could be ameliorated through a specific module or course on road safety, if their work will fit in a real road safety system.

Probably the most important topic to cover in this context, is with regard to a safe system approach (see chapter 2). The ***concretisation of self-explaining*** roads demands some notions of psychology besides engineering competences: how do people react to visual stimuli, and, how and to what extent must one implement nudging principles? Self-forgiving roads needs insight in the movement and possibilities of each road user and the impact of speed.

Engineers can also use accident analysis to adapt infrastructure in order to remediate black spots. To interpret the relevant data they require specific skills and a broader view on road safety.

In the American study on competences of road safety experts (TRB, 2007) they arrive at the conclusion that "analytic skills received fair to good coverage in the engineering curricula at different universities in the States, but content concerning communications and management skills was limited".

In the next figure (figure 5), the specific content concerning RS competences for civil engineers that could be offered in a specific additional course are mentioned.

Figure 5: Additional content on road safety for civil engineers

Competences (TRB, 2007)	content
Nature of Road safety	• Understanding RS as an integrated approach where infrastructure is only one of the topics. • Being able to work with the principles of self-explaining roads. • Understand and being able to applicate the idea of functionality of roads
History & Institutional structures	• Taken into account the different stakeholders and interest groups to develop a plan. • Taking into account other transportation priorities in designing infrastructure (congestion, mitigation, environmental protection, air quality, economic prosperity, …)
Use of (crash) data	• Analysing crash data in function of infrastructure • Understand the importance of crash data to evaluate road infrastructure measures.
Countermeasures	• Application of road safety audits and inspection • Knowing a broad range of possible infrastructural measures for the different road users (motorised and vulnerable road users)
Program management	• Ability to establish multidisciplinary relationships. • Effective communication skills.

3.2.2 Road Safety courses for police forces.

Police forces play a crucial role in road safety, especially in monitoring human behaviour. They have to execute several tasks:

- Regulate traffic flows
- Monitor road users behaviour
- Intervene in road accidents
- Control technical and administrative regulations
- Summon aberrant and dangerous behaviour.

In some countries, a specific traffic police unit within the police force is designated to these tasks, although every police officer can intervene when necessary. Certainly in large cities such a specialised traffic unit can hold a lot of advantages. In some countries, for example Mauritius and Burkina Faso, such a specific unit can also provide road safety education projects. By focusing on these tasks, the policemen gather a lot of practical experience, however, organising specific training programs can be of additional benefit.

In the next figure (figure 6), the specific content concerning RS competences for police officers that could be offered in a specific additional course are mentioned.

Figure 6: Additional content on road safety for police officers.

Competences (TRB, 2007)	content
Nature of Road safety	• Understanding RS as an integrated approach where human factors are very important. • Understand the nature of road behaviour (traffic psychological issues) • Recognise that road users' behaviour is influenced by road design, vehicle characteristics and a lot of other aspects.
History & Institutional structures	• Taking into account other transportation priorities in regulation traffic (congestion, mitigation, environmental protection, air quality, economic prosperity, …) • Recognise the importance of different kind of safety regulations (concerning infrastructure, car technology, health, etc.)
Use of (crash) data	• Analysing crash data in function of preventive measures • Collection of crash data on a reliable way • The importance of Safety Performance Indicators.
Countermeasures	• Understand the importance of enforcement activities • Using different data to organise and to plan these activities • Evaluate the effectiveness of enforcement activities
Program management	• Ability to establish multidisciplinary relationships. • Effective communication skills.

3.2.3 Road safety courses for secondary school teachers.

Whilst secondary school teachers play a less direct role in road safety, their importance should not be underestimated as they have the power to influence their pupils. During their secondary school time, pupils' road behaviours undergo a lot of changes. Although they are already independent pedestrian or

cyclist during the last years of primary school, their independence grows significantly during these years. Often, they also take on the responsibility of looking after their younger brothers and sisters. In the upper grades they are likely to start using motorised vehicles, especially mopeds or motorbikes; or to prepare themselves for driving a car. At the same time, during this period, they undergo a lot of hormonal changes.

Given the above reasons, it is obvious that road safety education must play an important role in secondary schools and that it cannot be limited purely to the knowledge of rules.

A good curriculum and manual for school teachers is a necessity. However, they also need broader knowledge, especially with regard to road users' behaviour, in order to be able to contextualise and better understand the principles behind the curriculum.

The next figure (figure 7) provides examples of the specific content concerning RS competences for secondary school teacher.

Figure 7: Additional content on road safety for secondary school teachers

Competences (TRB, 2007)	content
Nature of Road safety	• Understanding RS as an integrated approach where human factors are very important. • Understand the nature of road behaviour (automatic versus cognitive behaviour, role of emotions in traffic, …) • Recognise that road users behaviour is influenced by road design, vehicle characteristics and a lot of other aspects
History & Institutional structures	• Recognise the importance of regulation of road user behaviour • Understand the interaction between different kinds of road users.
Use of (crash) data	• Knowing tools to translate crash data into understandable outcomes for secondary school children • Having tools to analyse the safety of the school environment.
Countermeasures	• Applying the basic didactical principles to road safety aspects. • Applying different methods to talk about attitudes, motives, emotions in connection with road behaviour
Program management	• Realise a plan for promoting safe behaviour in the school environment. • Communicate on road safety with parents.

4 A curriculum for auditors and road safety inspectors

Building roads and improve the existing road network is one of the most important activities during the last decade in African countries. The rapid economic growth, as observed in many African countries, needs a more performed infrastructure to deal with the big increase in traffic. But as stated already in 2014 by Oumarou (Oumarou, 2014): *As roads are improved to allow greater capacity and/or higher speeds, the safety of road users can become compromised.*

Although roads are build following the international standards, safety is not guaranteed. Many situations and events are not covered by these standards. The mix of all kind of road users, especially the mix between motorized traffic and pedestrians – as seen in so many African countries - makes it more difficult and complex. Road users may not always react in the way road designers expected their behaviour.

Performing road safety audits and inspections can help to overcome these problems and/or to suggests solution to adapt the design and to go further than the international standards to guarantee safety for all road users.

In 2015, already 82.5% of all countries worldwide reported implementing for at least a part, these procedures (www.irf.global). Nevertheless, the results are still limited: IRF stated that at that time" *over 70% of roads are rated under 2 stars across at least one user category"*. Beside the efforts to develop good regulations on this matter in each country, the need to train people in this field is of paramount importance. That's why this chapter is added in this manual.

The first two subchapters will give a basic insight in what it is meant by road safety audits and inspections.
The third chapter will focus on the development of a course for these competences. Learning outcomes, as well as content and methods will be briefly discussed.

4.1 Road Safety audits – a short introduction.

(Author: Andrew Morris – Loughborough University)

A Road Safety Audit (RSA) is a systematic process for checking the road safety implications of highway improvements and new road schemes. Road Safety Audits have been defined as "the formal safety performance examination of an existing or future road or intersection by an independent, multidisciplinary team which qualitatively estimates and reports on potential road safety issues and identifies opportunities for improvements in safety for all road users."
Therefore, the main objective of an audit is to minimise future road accident occurrence and severity once a new road-scheme has been built and the road comes into use. The audit should consider all road users, particularly vulnerable road users such as pedestrians and pedal cyclists. The Road Safety Audit will identify potential road safety issues or problems that may affect all users and will recommend measures to eliminate or mitigate these problems. A RSA is **not** simply a check that a scheme meets design standards.

With these safety objectives in mind, the checking process undertaken within audits should always address the central question "which road-users could be hurt here and in what way?"

Having identified potential road safety problems, the auditor can then make recommendations for improvement.

Road Safety Auditing is a specialist activity that must be carried out independently of design and construction work. RSA's 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 future collisions are kept to a minimum.

RSA's fulfil a vital role in checking that roads have been designed and built to the highest safety standards. A well carried out RSA adds value to a highway scheme at every level.

Road safety audits differ from conventional traffic safety studies in two key ways;

(1) road safety audits are often pro-active investigations, rather than reactive investigations of sites with histories of complaints or poor safety performance; and
(2) the Audit team is independent from the team that designed the road. The team members must not have been involved in the design or maintenance of the facility being examined, so that they can form an objective point of view.

Therefore, a key feature of a road safety audit is the use of a team of professionals with varied expertise. Ideally, the team should include road safety engineers, highway design engineers, maintenance personnel, and law enforcement. Additional specialties should be added to the team as needed.
If historical crash data are available, the audit team should make use of them. However, one of the strengths of the audit process is that it can find safety concerns before they contribute to crashes
Road Safety Audits usually involve four key phases which are as follows:

Stage 1 – Completion of Preliminary Design
Stage 1 RSA's are undertaken at the completion of preliminary design and where possible, before planning consent is granted. At the RSA Stage 1, all team members shall visit together and examine the existing road layout or features and where the new roady improvement scheme ties into the existing road. The following questions could be asked;

- Will the new road drain adequately?
- Can all accesses be used safely?
- Are horizontal and vertical alignments consistent with required visibility?
- Is provision for turning vehicles required?
- Have pedestrian and cycle routes been provided where required?
- Are lighting columns located at new junctions and where adjoining existing roads?
- Are any road markings proposed at this stage appropriate?

Stage 2 – Completion of Detailed Design
Stage 2 RSA's are undertaken at completion of the detailed design stage of the road improvement. The Audit Team should consider the layout of junctions, position of signs, carriageway markings, lighting provision and other issues. At the RSA Stage 2 all team members should visit together and examine the existing road layout or features and where the new road improvement scheme ties into the existing road. Stage 2 should consider the following;

- General basic design principles
- Local alignment
- Visibility

- Junctions layout and visibility
- Non-motorised and Vulnerable Road User provision
- Road signs, carriageway markings and lighting

Stage 3 – Completion of Construction
The Stage 3 RSA should be undertaken when the Road Improvement Scheme is substantially complete and preferably before the road is opened to road users. The Audit Team will examine the scheme site during daylight and during the hours of darkness, so hazards particular to night operation can also be identified. The Audit Team Leader should ideally invite representatives of the Police, the Local Authority and Roads Maintenance Operators to offer their views for the Stage 3 Audit.
The Audit Team should consider whether the design has been properly translated into the scheme as constructed and that no inherent road safety defects have been incorporated into the works.

Stage 4 - Monitoring
During the first year a Highway Improvement Scheme is open to traffic, a check should be kept on the number of personal injury collisions that occur, so that any serious problems can be identified, and remedial work arranged quickly. Stage 4 collision monitoring reports should be prepared using 12 months and 36 months collision data from the time the scheme becomes operational. Sometimes the Safety Audits can be combined; most often if the work is smaller in nature, or time scales are tight, a Stage 1 & 2 RSA may be carried out together. Some road improvement schemes may not require Stage 4 Road Safety Audits unless the relevant authority request further collision monitoring/investigation. RSA may be undertaken on road schemes covering the following;

- Major and minor road improvements
- Traffic management and calming schemes
- Pedestrian and cycling schemes
- Roundabout junctions
- New or amended traffic signal junctions
- Priority junctions
- Motorway improvements

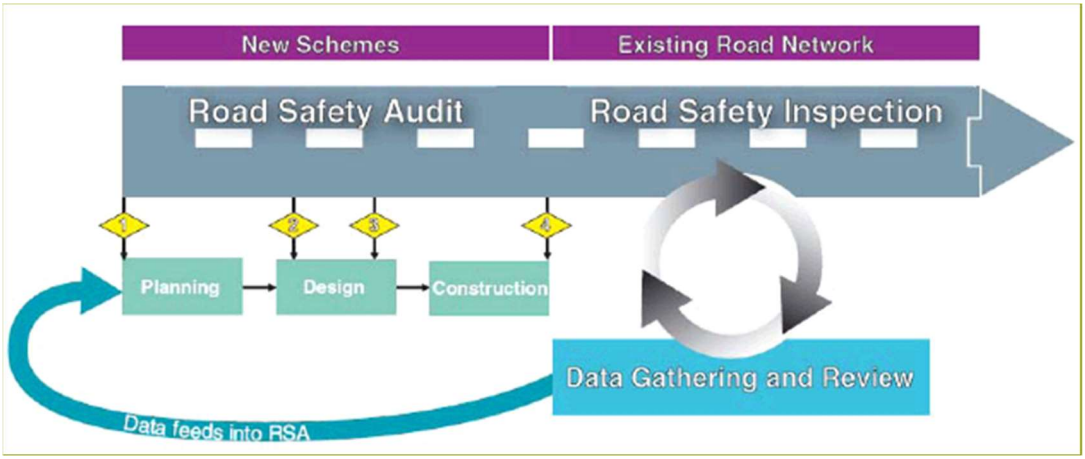
4.2 Road safety Inspections – the difference with a RS audit.

Road Safety Inspection (RSI) is defined by Allan (Allan, 2006) as "*an on-site systematic review of an existing road or section of road to identify hazardous conditions, faults, deficiencies that may lead to serious accidents*".
RSI could be seen as a follow up of safety issues of existing roads taken into account the changes in traffic. Oumanou (Oumanou, 2014[2]) distinguishes three different kind of inspections on existing roads:

1) ***Maintenance inspection***s: centred on the technical aspects (degradation due to the passage of traffic and/or action of atmospheric agents, damage of road infrastructure due to accidents or vandalism, …)
2) ***Road safety inspections***: a general inspection across a significant proportion of the road network, every 3 or 5 years. Can be performed with the help of dash cam on an inspection car.
3) ***Road safety assessment***: a more detailed inspection, focused on safety issues undertaken on roads or section of a road that have been identified as 'high risk'. This approach closely resembles the so-called ***black spot analyses*** (SWOV, 2012)

In this chapter the term 'Road Safety Inspection' as defined by Allan, will be used, which covers the road safety inspections and assessment mentioned by Oumanou. Figure 8 indicates the different stages (see 4.1) of road safety audits and the role of road safety inspections.

Figure 8: overview on RS audits and RS inspections (Broeckaert, 2016)



There are various approaches, depending on the organization, none of which have real standardized procedures. Central in all methods of RSI is **the visual inspection** of the road by road safety experts. Usually they use a checklist, although Broeckaert and Guillaume (Broeckaert, 2016) indicates that a checklist is too limited and can narrow the global view. Oumanou (Oumanou, 2014[2]) also indicates that the use of a long checklist, although it can appear to be thorough, can be problematic for three reasons:

1) no list can be truly comprehensive – typical and unique 'scenarios' can be overlooked
2) some people can be over reliant on checklists
3) long list are overwhelming and are not always relevant for the actual situation.

An example of such a comprehensive checklist can be found on the Road safety Audit Portal: https://www.road-safety-audit-wa.org/images/Road-Safety-Inspection-Existing-Road-Checklist.pdf. Other checklist could be also found by PIARC (https://www.piarc.org/ressources/publications/7/18718,2012R27-EN-Road-Safety-World-Road-Association.pdf), RIPCORD-ISEREST (https://ec.europa.eu/transport/road_safety/sites/roadsafety/files/pdf/projects_sources/ripcord_d05_road_safety_inspections.pdf ,

During the visual inspection on the spot, five main issues are considered:

- road function and context,
- facilities for all road users,
- forgiving function of infrastructure,
- speed management and
- consistency of road readability.

Figure 9 will give some examples for each of these issues.

It's important the RSI will be carried out by an independent team of well-educated road safety experts. The different views of each team member leads to a discussion and a kind of consensus. Taking all road users into consideration, some advice can be formulated to the road authorities (town, local or national government).

Figure 9 : some examples of important issues in RSI (based on Broeckaert, 2016 – Oumadou, 2014[2] - Allan, 2006)

RS issue	Examples
Road function 	• suitability for the function (local, collector, distributor,…) • suitability for traffic flow and mix • impact on surrounding network • …
All road users 	• What's the mix? • Which facilities for each group of users? • Accessibility • Special road users (disabled people, …) • …
Forgiving roads 	• Survivability of different crash types • Visibility and lighting • Lateral obstacles • Safety measures • …
Speed management 	• Appropriate for road function • Credibility / 'easy' to compliance • Coherence of speed limits over time • In accordance with access roads • …
Road readability 	• Surprising elements • Consistency of design • Advance warning of hazards • Information devices • …

Overviewing these issues, there is probably not a big difference between RS audits and RS inspections in that sense that the focus of both investigations are rather the same. In a RSI the behaviour of the different road users on the spot gives more information about the real interaction and possible problems. It could be helpful to make a video recording of some road section to analyse the situation in more detail and to understand and document the recommendations.

In the meantime, a group of researcher from the University of Hasselt and VIAS-institute (De Ceunynck et al. 2017) have developed a software that analyses video recordings of near-accidents. This could be an additional source of information for the RSI report.

These observations can be supplemented with accident data and in-depth analyses of specific accidents on the spot.

4.3 Developing a course for RS auditors and inspectors.

Based on the previous description of RS Audits and RS Inspections, the skills and competences needed to perform these tasks are nearly the same. Therefore the further description of learning outcomes, course content and specific methodologies, will not distinguish between these two functions. It will be conceived as one unique course for both.

This chapter refers to several course existing course descriptions. To avoid several recurring references in the text, the used documents are displayed here:

- Course for road safety auditors from the University of Hasselt, Belgium https://www.uhasselt.be/vva
- Post-academic course for road safety auditors from the University of Gent, Belgium https://www.ivpv.ugent.be/verkeer
- La formation des audits et les inspections de la sécurité routière en Algiers (2016-2017) (Broeckaert & Guillaume, 2016)
- Road Safety Audit Modules of Main Roads organization and IPWEA (Institute of Public Works Engineering Australia), https://www.road-safety-audit-wa.org/training-and-development.html
- Road Safety Audits & Inspections training of IRF, https://www.irf.global/category/knowledge-products/online-training/road-safety-auditor/

4.3.1 Learning outcomes

Learning outcomes describes in a more practical way what would be achieved by the student at the end of the course. What will he/she be able to practise in his future job as a qualified auditor (or inspector)? Good defined learning outcomes make it easier to fulfil a more targeted selection of content. This will be done in 4.3.2, and in 4.3.3 the focus is on specific methods, beside the normal and overall used classroom courses, presentations and lectures, needed to achieve the these learning outcomes.

The following list of learning outcomes are based on the common grounds of the previous mentioned RSA courses. Although this list is not exhaustive, it covers the most important aspects.

- The student can apply the different principles of a Safe System approach (self-explaining, forgiving, …) in the development and for the improvement of new and existing roads or road sections.
- The student understand the needs of the different road users and transport modes and can implement these needs into a safe design of the road network.
- The student can analyse an existing traffic situation in terms of risk factors and can propose measures to improve the safety of all road users involved.
- The student understand which data sources are available to support recommendations for remedial measures.

- The student can communicate with and understand the needs and 'language' of different stakeholders involved in road safety management: authorities, engineers, police officers, …

4.3.2 Course content for RS auditors and RS inspectors.

Learning outcomes can be easily transformed into specific content for a specific and well-tailored course. In figure 10 the same structure is used as in previous chapter (chapter 3) to classify the different issues, although it is sometimes a little bit superficial. Unlike the previous examples in chapter 3, the description of the different issues will be a little more elaborated.

Figure 10 : Course content for RS auditors and RS inspectors

Competences (TRB, 2007)	content
Nature of Road safety	• Understanding RS as an integrated approach where infrastructure is only one of the topics. • Being able to work with the principles of a safe system approach (self-explaining, self-forgiving roads, ...) • Understand and being able to applicate the idea of functionality of roads • Factors contributing to crashes. • Impact of human factors. • Needs of different road users (pedestrians, two-wheelers, cars, truck, public transport, … but also disabled people, children, elderly, …)
History & Institutional structures	• RS approach in the specific country and/or region. • Taking into account other transportation priorities in designing infrastructure (congestion, mitigation, environmental protection, air quality, economic prosperity, …). • Officials (universal) directives concerning road infrastructure (crossings, intersections, markings, roadside design, signalisation, …) • The existing manual(s) and checklist(s) for RSA and RSI.
Use of (crash) data	• Analysing crash data in function of infrastructure • Understand the importance of crash data to evaluate road infrastructure measures. • Cost-effectiveness of interventions • Risk analyses and management • In-depth analysis of crashes.
Countermeasures	• Speed impact and countermeasures (traffic calming) • Protective measures for vulnerable road users. • Measures and approaches to deal with road 'furniture' (signs, pillars, ditches, …)
Program management	• Ability to establish multidisciplinary relationships. • Effective communication skills (presentations and reports). • Procedures to fulfil RSA and RSI • Legal issues and confidentiality.

4.3.3 Methodology

Besides classroom activities like lectures, discussions and case studies on paper, this kind of training needs a lot of real life practices.

This can be done in different stages:

1) The trainers prepare a case study in different well-structured components. For example, different real traffic situations are analysed on risk factors for specific group of road users. This can be done on the hand of maps, photos or videos of the situations. Afterwards, the risk analysis for the different road users on one situation can be brought together to see if there are contradictions or similarities and how this can be brought to a solution for the specific situation. It's a strictly guided exercise.
2) The trainer choose a specific road section in the neighbourhood of the institute and guide the student to fulfil a RSI. With questions he target the students to certain aspects. A summary, the discussion and the search for countermeasures is organized in the classroom.
3) Students will work in small groups on a certain road section (RSI) or on a road design plan (RSA) on their own. Afterwards their report will be discussed with the whole class group.
4) Students participate in a real RSA or RSI project. The feedback from the school (trainer) and the official project group is not only centred on the specific capacities to do the assessment, but also on the competences to work in a team and to communicate.

PART 2:

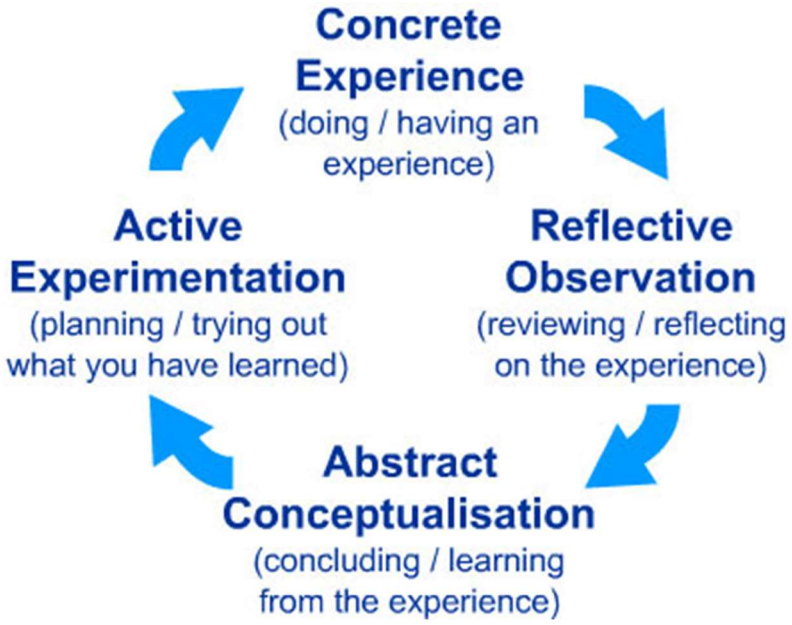
TEACHING ROAD SAFETY TO NON ROAD SAFETY EXPERTS

5 The learning process of professionals

> *Tell me what you know, and I will forget it. Show it to me and probably I will remember it. Let me try to do it, and I will understand it!*
>
> Confucius 450 B.C.

These wise words, spoken by Confucius in 450 B.C., are still accurate today. Most people learn best by doing and by trying to solve a problem themselves. Unfortunately, for practical reasons, this approach is rarely applied during trainings. Talking to participants about knowledge is typically a lot less complicated than guiding them to discover it by themselves. However, as first-hand experience constitutes a fundamental part of the learning process, we strongly encourage trainers to have a sound understanding of this process and incorporating this into the development of their course material. David Kolb (Kolb, 1984) has illustrated this process, as shown in Figure 8.1.

Figure 11: Learning process by Kolb (https://simplypsychology.org/learning-kolb.html.)



Concrete Experience: Encouraging participants to talk about their personal road safety experiences or to share some of their road safety-related work cases can be hugely beneficial. Further, simulations or role-plays are excellent tools for incorporating practical experience into a training. Before beginning a training, a questionnaire to assess participants' level and depth of road safety knowledge could be deployed. This, together with asking participants to share their expectations for the training at the beginning of the session, can provide helpful indicators to the trainer as to what topics should be covered and in what level of detail.

Reflective observation. All the ideas and experiences (cases, questions, behaviour, …) of the participants should then be organised in a structured manner, allowing to detect similarities and form

the basis of further reflection. Key words here are: “how”, ”why”, “what’s common in each situation?”, “are there general tendencies?”,…

Abstract conceptualisation. Once the experiences have been sufficiently reflected upon, it is the fundamental task of the trainer to break down theoretical and abstract concepts into clear and understandable terms for the participants. The trainer can use this phase to capitalise on their area of expertise to direct participants’ awareness towards novel ideas and notions, ideally creating an “*Aha-Erlebnis*” (“of course, this opens my eyes”) of learning something entirely new and interesting for participants.

Active experimentation / application: Applying the insights derived from the theory section of the learning process, participants can then use these to address, understand and solve new case studies, or revisit previously studied ones.

This learning cycle includes two complementary aspects of learning, which are both important processes in every training in one way or another:

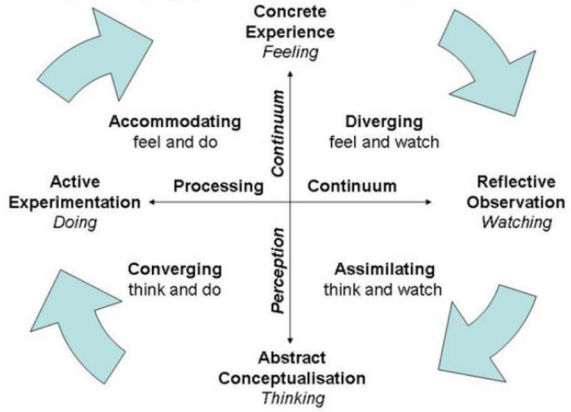
1) Induction process: proceeding from concrete material to more abstract theory / models, to then learning general guidelines to tackle a broad range of different situations.
2) Deduction process: Having the more abstract guidelines and models in mind, one learns to apply them to different situations, ranging between:
   a. Close to the earlier experience versus new type of situations
   b. Very easy versus more complicated to put in the model

People learn in different ways, and every person has a preferred learning style. Based on the model discussed above, Kolb identified four styles of learning, which are based on two major preferences:

1) how people want to approach a task (“I want to ***do*** it” versus ”I want to ***watch*** how other people do it”)
2) how people reflect on things (“I want to ***experience*** things” versus “I want to ***think*** in more abstract ways”)

Each of the four learning styles is focused in one quadrant of the learning cycle.

Figure 12: Different learning styles placed in the learning process model.
(https://simplypsychology.org/learning-kolb.html



Trainers need to be aware of different learning preferences and must try to accommodate all, to avoid participants losing motivation and focus. At the beginning of a course, it will not be immediately evident which participant prefers which learning style, however, it is likely that all four learning styles

will be represented equally in every group. The next table provides concrete ideas on how a trainer can prepare themselves to give an optimal response to the different styles.

Figure 13: Different learning styles and how a trainer can be prepared

Learning style	What do you see	What can you do
Diverging (feel and watch)	Wants to act, is full of energy and enthusiastic to approach matters hands-on, not detail-oriented, likes to work with people and emotions.	Discussions, brainstorm, role play, simulation, give a lot of examples, a lot of variation, … ***Do you have sufficient examples to illustrate what you are teaching?***
Assimilating (think and watch)	Likes to think about things, waits before acting or asking questions, can pose challenging questions.	Provide different perspectives, pose questions with several different aspects and possible answers, give structure to investigate things (check lists), leave enough time to think about the issues. ***Do you have more challenging examples***?
Converging (think and do)	Is very critical towards presented materials, has many abstract questions, wants to know more.	Presentation of a model / theory with sound references and back up literature; needs individual exercises. ***Are you aware of opposing models/ theories to the one you are presenting? Expect to be challenged!***
Accommodating (feel and do)	Needs a direct link between theory and practice; likes easy and fast solutions, dislikes big discussions, needs a simple systematic approach. Important questions are: what's essential for applying this knowledge? How do I have to react/handle the situation?	A fluid rhythm, a certain speed, good demonstrations, work in little groups, … ***Do you have sufficient examples to demonstrate how to apply the knowledge? How well do you know the day-to-day activities of the group?***

6 Defining learning outcomes for different professionals

Many experts are so enthusiastic about their area of expertise that they attempt to cover everything they know in a course or training they are developing. This can lead to a replication of the handbook that helped them become an expert in their domain and should be avoided.

6.1 Learning outcomes

Rather than focussing on the trainer's extensive knowledge and expertise, the focus should lie on the participants. What do participants need to practise or know by the end of the course or module? When working with professionals, it is essential that the course has a direct link with their work. A road engineer needs other skills and knowledge concerning road safety than a police officer or a school teacher. Whilst basic insights are the same, the competences and focusses are very different.

The most important questions to ask before developing the course content are: What do participants need to know or be able to do after the course to ameliorate their work? How can the course improve the job (or life) of the participant? What's in it for the participant?

These reflections should lead to clear **learning outcomes**, which can be defined as: *"the skills and knowledge which it is intended that students should be able to demonstrate by the time the assessment processes for the course have been completed. Objectives state what the teacher plans to achieve; learning outcomes state what that the students should achieve"* (Williamson, 2010).

Clear learning outcomes emphasise the application and integration of knowledge. Instead of focussing on the coverage of material, learning outcomes articulate how students will be able to employ the material, both in the context of the class and more broadly.

Learning outcomes can be defined in different domains of learning, depending on the context: knowledge, skills and competences, and attitudes.

- ***From knowledge to understanding***. These are often the most common type of outcomes. It's about recalling, remembering, understanding of theories and models.
- ***From competences (or skills) to application***. Intellectual competences (analysis, evaluation, creative thinking, problem solving,…), as well as motor skills (drawing a plan, manipulation of some instruments, …) could be involved to make applications possible in the real world.
- ***From knowledge to attitude***. Knowledge can open a different world and this can change lifestyle or self-image. Responsibility and autonomy are two of the learning outcomes that are frequently mentioned in education.

6.2 The importance of working with learning outcomes

Defining learning outcomes is a process. The teacher has to engage in an analysis of the future work domains of the participants and to examine what road safety could add to that specific domain. Thereafter, the results need to be translated to a set of learning outcomes. Taking the time to complete this process thoroughly is extremely worthwhile, as when it is well done, it can be useful in numerous ways:

1) It facilitates the teacher making the appropriate selection regarding:
    a. The content that is essential for the course.

b. The methodology. Focussing on knowledge demands different tools and methods versus working on skills or attitudes.

2) It provides clear indicators on how the course and its effectiveness should be assessed. As far as possible, learning outcomes are defined in very concrete terms.
3) Learning outcomes are a good way to communicate about the course:
    a. With the potential students so that they know what is expected
    b. With colleagues who work with the same students, to better coordinate between modules. Minor overlaps between modules are not an issue, as repetition is a key element of any learning process. However, one must pay attention:
        i. Repeating a specific item from another module is only positive if it serves the specific context and learning outcome from the present module.
        ii. Learning outcomes from different modules cannot stand in contradiction with each other. This would confuse the learner.
        iii. Different modules in the same curriculum should build on each other, or, at least, be in accordance with each other.

On a broader, societal level, working with learning outcomes increases qualification transparency and reduces barriers to transfer across institutional and national borders (CEDEFOP, 2017). Further, it allows external stakeholders to evaluate what is offered and delivered by educational institutes. It could, in the long run, facilitate the cooperation between education and industry.

6.3 Defining learning outcomes

As stated above, useful learning outcomes are those which describe what the student will be able to do by the end of the course. They should be focussed on the student, and be as detailed as possible. To define learning outcomes in the right way, these are some examples:

- Start with the student / participant, not with the actions of the teacher:

Not…	Instead..
The different stages of developing an awareness campaign are explained.	The participant is able to recall the different stages necessary to develop an awareness campaign.

- Make it as concrete as possible:

Not…	Instead..
The student can apply road safety issues.	The participant can demonstrate how they will make use of the principles of a safe system (self-explaining, forgiving, speed management) on a given road.

- Describe it, if possible in process terms and not only in outcome terms:

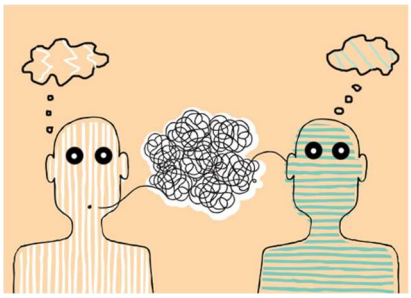
Not…	Instead..
The student is able to write a research report on accident data.	The student is able to plan, analyse and synthesise accident data and to describe the results in a comprehensive language for police officers and government officials.

7 Tools and methodology

7.1 General remarks

Training and teaching are essentially forms of communication, and communication is generally a highly complex topic. The difference between what people intend to say and what others ultimately understand can be enormous.

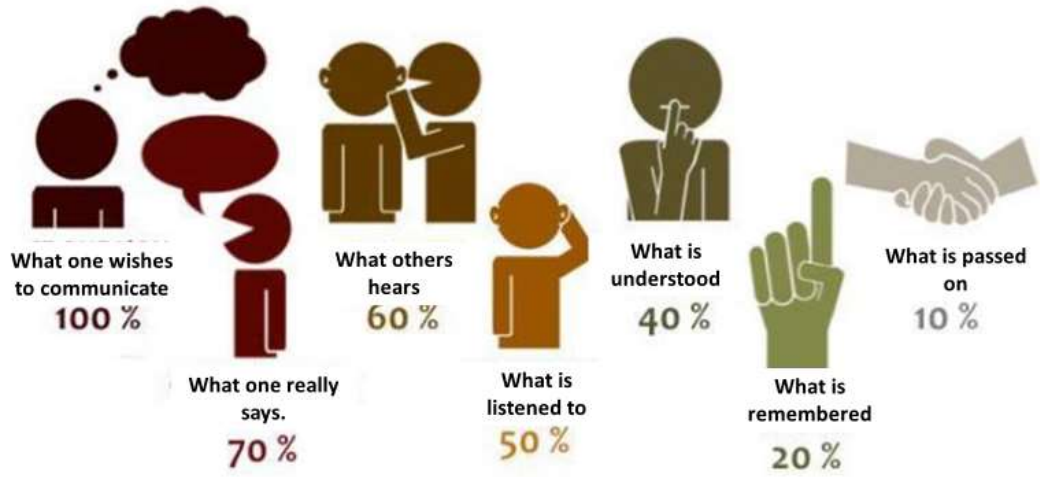
- **What I think**
- **What I want to say**
- **What I think I am communicating**
- **What I am really communicating**



- **What you want to hear**
- **What you really hear**
- **What you want to understand**
- **What you really understand**

Below is an insightful illustration of the way content is lost during verbal communication[6].

Figure 14: How messages get lost



This is somewhat similar to the Pareto Principle, originally used in economics, which states that the majority of results come from a minority of inputs. It suggests that 80% of course results come from 20% of the given content. Although these numbers should not be viewed as an absolute truth, it is undeniable that only a small portion of what teachers deliver during a course has a clear result and impacts on the students.

This leads us to the 5 important principles in developing the content and the methodology of a course:

[6] For further information http://cursus.edu/article/27389/non-verbal-formation/#.V1-nEPmLTIX

Take one main subject at the time. Even when teaching difficult and complicated issues, try to divide the content into short and simple components, which can be integrated at the end.

Remember the Pareto Principles. You have to focus on the most important things and repeat these multiple times during the course. Recapping the basic structure of the course several times also helps students a lot.

Always have the learning outcomes in mind. These outcomes should not only direct the content, but also the way exercises are introduced, how feedback on the students' work is given, how students' questions are reacted to, …

"Kill your darlings", a famous expression used by writers and film directors. As a teacher you must drop everything that is nonessential to the chosen learning outcomes, even when this means that your favourite subject will not be covered.

Please don't overestimate the students. You, as an expert in the field, are likely to take for granted a lot of knowledge that you accumulated over the years. For your students, it may be the first time they hear about a certain topic.

7.2 Looking further than the classroom

As much as possible, road safety courses should incorporate interactive and practical learning methods. Especially when introducing road safety in the curriculum of professionals from other backgrounds / careers, additional tools are required to demonstrate the importance of road safety in their daily practice. The best way to do so is by implementing different kinds of practical sessions.

Below are some suggestions for practical sessions, classified per road safety pillar (see chapter 2.4).

Pillar 1 Road safety management

- Accident data analysis: provide each (small) group of students with a restricted database and ask several questions about this data.
  - Let students develop or criticise a system to collect accident data.
  - Given a specific road safety problem, let students make an inventory of which data they need to develop a 'solution' and let them propose options how to obtain this data.
- Let small groups of students conduct a minor survey on a specific road safety problem (interviews on the street, by phone,…)

Pillar 2 Safer roads and mobility

- Detecting road safety problems in road photos or videos
- Let small groups of students do a road safety inspection (under supervision)
- Providing examples with high accident rates, let students suggest solutions to this using the principles of a safe system.

- Plan a visit to a technical inspection unit.
- Organise an inspection of a real car / truck / motorbike.
- Give a demonstration on the difference it makes when controlling a car with good versus bad tires, and normal load versus overload (on secured grounds) …

- Students can do a survey concerning specific safe or unsafe behaviour and ask people why/when they comply with the rule and why/when not.
- Students can develop an awareness campaign on a specific topic, based on the different principles of developing campaigns
- Students can develop a short teaching module on road safety for a specific target group
- Students can review road safety publicity videos providing positive and negative feedback (comparing different styles of campaigning).
- Students can develop an enforcement plan on a specific behaviour.

- Students can visit an emergency service, such as an ambulance, and talk to the professionals involved to get a realistic understanding
- Invite an organisation working with road victims to hear their point of view and to look for the gaps in the care system
- Present real accidents with a detailed description of the situation and let students invent scenarios of the ideal post-crash care. Compare their scenario with what really happened.

7.3 Working on Case Studies

(Author: Andrew Morris – Loughborough University)

Research-informed teaching and training is increasingly regarded as an effective approach to improving the quality of learning (Pan et al - 2015). Therefore Case Studies are so important and relevant to training. In road safety training they are especially effective since it is possible to develop countermeasures based on major traffic accident scenarios – even if they only seldomly occur.

Classroom discussion of case studies almost always reflects the real-world and therefore learners receive knowledge that is both grounded in real-life scenarios which can then be directly applied in everyday situations.

The concept of utilisation of Case Studies in training fits within the Framework for Relevant Learning which is known as Andragogy (Kearsley, 2010.) This framework suggests that professional learners learn differently compared with young students and learning programmes tailored to characteristics of professional experiences such as real-life situations, are more likely to motivate and engage the learners within the learning process. Below are core assumptions of andragogy that should be considered when preparing Case Study materials;

- Professional learners need to know why they need to learn something;
- Professional learners need to learn 'experientially';
- Professional learners approach learning as problem-solving;
- Professional learners learn best when the topic is of immediate value.

There are several definitions for the term 'Case Study'. For example, Fry et al (1999) describe case studies as complex examples which give an insight into the context of a problem as well as illustrating the main point. Effectively therefore, Case Studies could be defined as learner-centred activities based on topics that demonstrate theoretical concepts in an applied setting. Both Bonwell and Eison, (1991) and Sivan et al, (2001) report that students can learn more effectively when actively involved in the learning process and that the Case Study approach is a highly effective way in which such active learning strategies can be implemented in training.
Furthermore, many learners are more inductive than deductive reasoners, which means that they learn better from examples rather than from logical development starting with basic principles. This further supports the view that Case Studies can be a very effective classroom technique.

Case-Studies have long been used in other disciplines (business, law, medicine etc.), but the literature suggests they can be used in any discipline when trainers want learners to explore how what they have learned applies to real world situations. The literature also suggests that Case Study learning approaches come in many formats, from a simple "What would you do in this situation?" question to a detailed description of a situation with accompanying data to analyse.

In Traffic Safety Case-Studies, assignments should require learners to answer an open-ended question or develop a solution to an open-ended problem with multiple potential solutions. Requirements can range from a one-paragraph answer to a fully developed group action plan, proposal or decision. As an example, theory regarding human factors in response to traffic may be explained but then the trainer can illustrate how this might change when humans are under duress in (for example) emergency or conflict situations. This can then be followed by a "participation and interaction session" in which the learners work in groups to apply the individual theories which they have learnt to the situation (or Case-Study) that is introduced to them. The learners work most effectively in groups during Case-Study sessions and may typically be given around 20 minutes to respond to each Case-Study. Their discussions should be supervised and facilitated by the Trainer.

Encouraging interaction within case-study teaching is a key element to learning but Case Studies can be well illustrated though use of multimedia for animated visual content (e.g. YouTube etc.) which in turn helps interaction in the classroom whilst providing an opportunity to provide meaningful learning through mapping visual and narrative content (Mayer, 2002).

Suggested Format for Trainers

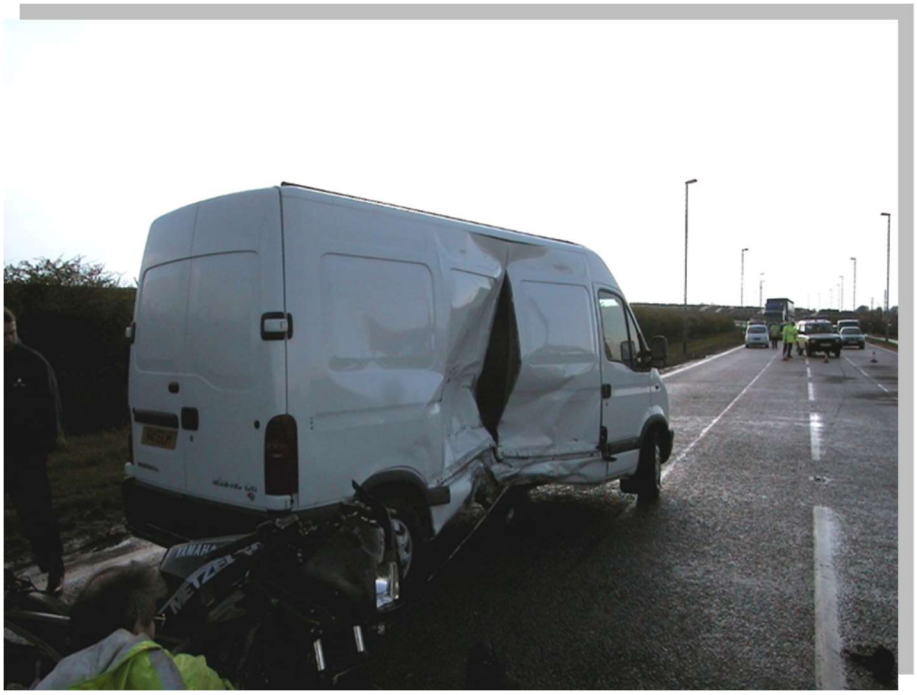
Utilisation of Case Studies can follow a standardised format. This could involve the following stages:

Stage	Description	Duration
1. Introduction	Trainer introduces the traffic accident case study to the group. Also highlights any theory or research literature that is relevant to the case. Introduction should use as many illustrations as possible including photographs and videos (if	About 10 to 15 minutes

	available)	
2. Initial discussion	Class discussion follows asking for clarification of the evidence – what is known and unknown.	About 10 minutes
3. Group work	Class divides into groups for further in-depth discussion of the case-study. Each group is expected to address e.g. the following: • How did the accident occur? • What were the main causation factors taking into account vehicle/road-user/rod infrastructure? • What are the main countermeasures to the accident? • What is the feasibility/cost of the countermeasures?	About 20 minutes per case study
4. Reporting	Each group reports back on each case-study discussed to the rest of the class. All to contribute to discussions and	About 15 minutes per case study
5. Conclusions	The trainer draws the session to a close with some concluding remarks	5-10 minutes

Case examples
Accident Scenario

- A Vauxhall Movano emerged from a garage forecourt and turned right, directly across the path of an oncoming Yamaha Motorcycle
- The sightline to the right, out of the garage forecourt was restricted by a cycle track sign fixed in the verge



Rider details:

- Male
- Aged 28yrs
- In-patient for 32 nights

- Height / Weight not known
- Police severity 'Serious'
- 21 injuries
- Maximum Abbreviated Injury Score (MAIS) = 5 (Critical – survival Uncertain)
- Injury Severity Score (ISS) = 38

Questions for the group

- What factors caused this accident to happen?
- How could the accident have been prevented?
- How feasible are any potential countermeasures?
- Which stakeholders should be contacted to implement remedial actions?
- Summarise the overall learning from this case

7.4 Working with E-learning tools.

More and more, e-learning has become a regular feature in education. A lot of information is available on the web by video, e-books or well-structured courses (for free or requiring payment). In addition, a lot of schools and universities have their own web-based learning platforms.
There is no clear and unequivocal definition of e-learning. It is difficult to distinguish the term e-learning from terms such as 'virtual learning', 'distance learning', 'on-line learning' and similar terms, because these are often used as synonyms (Hadjerrouit, in Buzetto-More, 2007). The main ideas behind all forms of E-learning variations are:

- Students can learn at their own pace and time
- Greater possibilities to individualise the content
- Pupils do not have to travel
- More visual materials are readily available
- Interaction can be stimulated in different ways.
- …

In this chapter we will not discuss all the possibilities of e-learning. In Deliverable 6.1 of the SaferAfrica project we have made an inventory of the existing e-learning modules on road safety. Some of them are free and always available, some of them demand membership or subscription and others are only available at a certain time and for a certain target group.

In the same work package, the SaferAfrica project has developed different e-learning modules that are available for free on the website (www.saferafrica.eu). These modules consist of several short videos (20 to 30 minutes) based on spoken PowerPoint presentations - a very simple framework for e-learning. No interaction is possible, however, pupils are offered exercises to do on their own.

These e-learning modules are intended as an introductory course for a broad group of people. Figure 11 present the themes of the seven modules which cover the main aspects of the five pillars of the WHO road safety plan. Each module consists of several separate sessions on a specific topic. Figure 12 provides the titles of the different sessions.

Figure 15: Different modules of the SaferAfrica e-learning course.

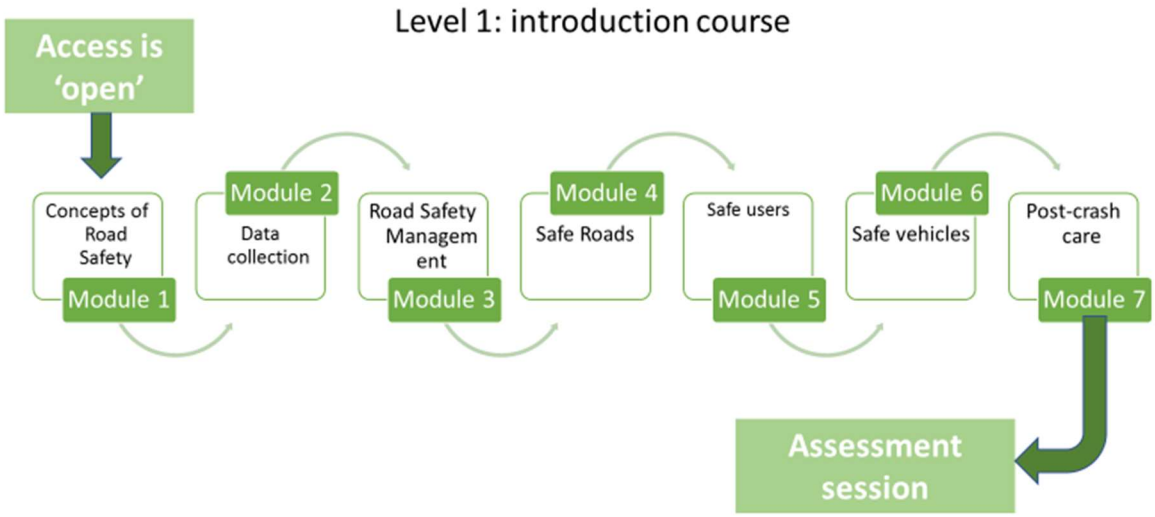


Figure 16: Topics per SaferAfrica e-learning modules.

Module	Different sessions
Concepts of Road safety	1. Introduction and definitions 2. Road safety approach 3. Risk factors 4. Safety performance indicators
Data collection	5. Definition of "data" 6. Collection of data 7. Analysing data 8. Good practise
Road safety Management	9. Country management 10. Developing strategies 11. Defining targets 12. Financing
Safe roads	13. Road transport & street life cycle 14. Crash contributing factors in road infrastructure 15. Infrastructure for vulnerable road users 16. Traffic management 17. Methodology to assess effects
Safe users	18. Introduction 19. Vulnerability of road users 20. Education 21. Enforcement
Safe vehicles	22. Active safety 23. Passive safety 24. UN vehicle regulations

	25. Technical control and inspection
Post-crash care	26. Global vision 27. Medical care and rehabilitation 28. Mental health care 29. PCR as an integrated approach 30. Side components of PCR

Depending on the group, some of these modules or session could be used in high level education as an alternative or a supplement to a classroom course. Some people may use the video during the classroom course. After a suggested task or exercise, the teacher could stop the video and discuss the exercise with the pupils, and give direct feedback. Although this is a possibility, this is not the initial idea behind the e-learning courses.

A more appropriate suggestion is using the videos as 'homework' for the pupils. This will minimise the number of hours they have to spend in the classroom. Classroom time should be primarily reserved for discussion, specific questions, applications to the specific country or situations of the pupils, and for putting the specific content into perspective.
We will give an example for session 24 about technical control and inspection.

Suggested format for trainers

Stage	Description	Duration
1. Introduction	Trainer introduces the topic by referring to the local situation: - Overview of statistics on vehicles - Overview on accident data concerning causes linked with vehicle technologies / mode of transports	10 minutes
2. Discussion	Class discussion on the students' vehicles: what do they do to maintenance the safety of the vehicle? How can they know if their vehicle is still in order?	10 minutes
3. Group work	Make a list of the things they can control by themselves for each vehicle (car, motorbike, bicycle?)	10 minutes
4. Reporting	Each group reports, all contribute to the discussion.	10 minutes
5. Preparing the e-learning session	Open discussion on what a government can do to secure the safety of vehicles: • Regulations on sale (import) of vehicles • Technical inspection – how is this organis ed in the country? Describe what the teacher expects of the students: • When do they have to view the video? • What should they pay special attention to? • What do they have to do with the suggested tasks in the video? (written preparation, or gathering some ideas, …)	15 minutes

The second classroom session, after the students had the opportunity to watch the video:

Stage	Description	Duration
6. Introduction	Everybody has seen the video? First impressions? Specific questions?	10 minutes
7. Tasks in the video	The teacher discusses the exercises the students completed and provides feedback on their work.	20 minutes
8. Application	Discussion about the difference or similarity between what was presented in the video and the actual situation in the country. What could be/ has to be adapted to improve safety? Suggestions for an improvement plan	20 minutes

8 Evaluation of the training.

Becoming a good trainer takes time and requires skills that can only be acquired through experience, step-by-step. We can draw learnings from each experience as long as we have the courage to reflect on what worked well and what did not. There are different ways to learn from our experiences. In this chapter we will discuss three common options for training situations:

1) Formal evaluation
2) Effect evaluation
3) Process evaluation

8.1 Formal evaluation

It is always important to gather participants' comments during the course. Of course, you do not have to adapt your course and approach for each comment, however, after a few courses you may see some tendencies. At the end of each course, it is good to have a more formal moment in which you will ask the participants how they have experienced the course. This could be done in an open discussion, or alternatively with a small questionnaire. Using a questionnaire makes it possible to collect everyone's view and to retain something on paper that can be compared with the evaluation of other groups or courses.

A good questionnaire…:

- ✓ Will be a short one. Too many questions will frustrate people at the end of an already tiring day, and could lead to general answers.
- ✓ Ask questions about the course and the approach, not about the trainer.
- ✓ Relates to :
  - Impact of the course on the daily work of the participants (link with their expectations, was it worthwhile, can the content be applied by the participants,…)
  - Comments on the tools and the approach used during the course
  - Suggestions for ameliorating the course in the future

8.2 Effect evaluation

The formal evaluation gives a first indication of the impact of the course, however, it is a primarily subjective response. To really know if the course has reached the target learning outcomes, an effect evaluation is more useful. This requires defining the learning objectives as specific as possible.

- ✓ Learning objectives based on knowledge and insight can easily be evaluated by a questionnaire (quiz) or an oral examination.
- ✓ Learning objectives about competences need a practical examination; case study, role playing, simulation,…

- ✓ Learning objectives about the applications are more difficult to measure and require that an evaluation is made after the course end during their daily job, and will mostly be conducted by supervisors/ managers. Requesting feedback from participants on how useful the course proved in their daily jobs a couple of months after course completion is another possibility.

Indirect measures of the impact on the daily job are questions about changes in productivity, efficiency, the welfare of the workers, … These are more long-term effects.

8.3 Process evaluation

During the course, a good trainer is not only working with his content, but also with the group and its reactions. Whilst his approach may, in theory, be the best possible approach for this kind of content, it may still be inadequate for the group involved in this specific course. People differ in the way they learn and in the way the react … and a good trainer has to deal with a lot of different people. His duty is to try to bring them all a little bit further in their knowledge and competences.

After each training, the trainer has to ask himself a few questions to enrich his own competences:

- ✓ Were all the participants engaged in the learning process? Can I find the reason why the involvement was strong or weak, or absent?
- ✓ Were there some exercises that worked less well, and if so, how can they be improved?
- ✓ In which moment did some participants lose focus?
- ✓ Did you as a trainer have some problems during this course :
  - o With the content? Were some sections of the course difficult to explain, or some questions difficult to answer?
  - o Was there a flaw in the methodology, for example an exercise that did not work?
  - o Were there behavioural problems in the group? Was my reaction adequate?

References

Allan, Ph. (2006), Road Safety Inspections. Presentation at the Road Safety Seminar in Lome, Togo, October 2006, PIARC World Road Association. (https://www.piarc.org/ressources/documents/actes-seminaires06/c31-togo06/8718,2-PIARC_Oct06_Allan.pdf)

Bonwell, C. C., & Eison, J. A. (1991). Active Learning: Creating Excitement in the Classroom. ASHE-ERIC Higher Education Report, Washington DC: School of Education and Human Development, George Washington University.

Broeckhaert M. & Guillaume M. (2016) L'inspection de Sécurité Routière : un outil au service du gestionnaire de voirie. Présentation dans la formation en Algiers. L'institut VIAS, Bruxelles, Belgique.

Buzetto-More, N.A. (ed), 2007 Advanced Principles of Effective e-Learning Informing Science press, California, USA

Cedefop (2017). Defining, writing and applying learning outcomes: a European handbook. Luxembourg: Publications Office. http://dx.doi.org/10.2801/566770

De Ceunynck, T., Dorleman, B., Daniels, S., Laureshyn, A., Brijs, T., Hermans, E., & Wets, G. (2017). Sharing is (s)caring? Interactions between buses and bicyclists on bus lanes shared with bicyclists. Transportation Research Part F: Traffic Psychology and Behaviour, 46(B), pp. 301-315.

Haddon JR W (1968), The changing approach to the epidemiology, prevention, and amelioration of trauma: the transition to approaches etiologically rather than descriptively. *American Journal of Public Health, 58*:1431–1438. 33. Henderson M. Science and Society.

Hauer, E. 2005, The Road Ahead. In Journal of Transportation Engineering, May 2005, pp 333-339.

Kennedy, D. (2007) *Writing and Using Learning Outcomes. A practical Guide*. Quality Promotion Unit University College Cork, UK.

Kearsley, G. (2010). Andragogy (M.Knowles). The theory Into practice database. Retrieved from http://tip.psychology.org

Kluppels, L. (2016) *Train-the-Trainer* –. Brussels, Belgium : Vias-institute

Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development* (Vol. 1). Englewood Cliffs, NJ: Prentice-Hall.

Mayer (2002) THEORY INTO PRACTICE, Volume 41, Number 4, College of Education, The Ohio State University

NCHRP, 2010, Model Curriculum for Highway Safety Core Competencies. National Cooperative Highway Research Program Report 667, Transportation Research Board, Washington D.C.

Oumarou, A. (red.) (2014). New Roads and Schemes: Road Safety Audit. Road safety Manuals for Africa, African Development Bank Group Abidjan

Oumarou, A. (red.) (2014²), Existing Roads: Proactive Approaches. Road Safety Manuals for Africa, African Development Bank Group, Abidjan.

Pan, W., Cotton, D., & Murray, P. (2014). Linking research and teaching: Context, conflict and complementarity. Innovations in Education and Teaching International, 51, 3–14

Peden M, Scurfield R, Sleet D, Mohan D, Hyder A, Jarawan E & Mathers C eds. (2004), *WorldReport on Road Traffic Injury Prevention*, World Health Organization and World Bank (Washington), Geneva

PIARC, (2009) *Catalogue of design safety problems and potential countermeasures'* World Road Association, La Défense CEDEX, France (http://www.piarc.org)

Sivan A, Wong Leung R, Woon C and Kember D (2000) An Implementation of Active Learning and its Effect on the Quality of Student Learning Innovations in Education and Training International. Vol. 37 No 4 pp381-389

SWOV Fact sheet (2012) The Road Safety Audit and Road Safety Inspection. SWOV, Leidschendam, the Netherlands.

Sylvanie Godillon, « Réduire les inégalités de risque d'accident dans les quartiers défavorisés : le succès d'une expérimentation britannique », Reflets et perspectives de la vie économique 2014/3, Tome LIII

Transportation Resarch Board, 2007, Building the Road Safety Profession in the Public Sector, Washington D.C. www.TRB.org

Williamson,M. Chow, K. & Pallant, J. (2010) Good Practise Guide on Writing Aims and Learning Outcomes. The learning Institute, Queen Mary, University of London, http://www.qmul.ac.uk/gacep/.

Further readings concerning Road safety Issues

AASHTO, (2010). Highway Safety Manual

Bekiaris, E., Wiethoff, M., Gaitanidou, E., (Eds), "Infrastructure and Safety in a Collaborative World", Springer [ISBN: 978-3-642-18371-3(hardcover) – ISBN: 978-3-642-18372-0 (online)], 2011

Belcher, M., Proctor, S. & Cook, Ph. (2014) Practical Road Safety Auditing ICE Publishing

Buylaert, W. ed. (1999) Reducing injuries from post-impact care. European Transport Safety Council, Working Party on Post Impact Care, Brussels

Cardoso, J. L.; Stefan, C.; Elvik, R.; Sørensen, M. (2008). Road Safety Inspection: Best practice and implementation plan. INCVC 3. LNEC, Lisboa, ISBN978-972-49-2138-9

Carson, J.l. (2010) Best Practices in traffic incident management. US Department of Transportation, federal Highway Administration Washington D.C

Carter, D. (ed.) (2017), Road Safety Fundamentals. Federal Highway Administration, US Department of Transportation, USA https://rspcb.safety.fhwa.dot.gov/rsf/

CITA (2010). Autofore - Study on the Future Options for Roadworthiness Enforcement in the European Union. Final report. International Motor Vehicle Inspection Committee, Bruxelles.

Cuerden, R., Loyd, L., Wallbank, C., Seidl, M. (2015) The potential for vehicle safety standards to prevent road deaths and injuries in Brazil. TRL PPR766, Crowthorne, UK.

Cuerden, R., Pittman, M., Dodson, E. & Hill, J. (2008). The UK On The Spot Accident Data Collection Study – Phase II Report: Road Safety Research Report No. 73. Department for Transport: London.

De Brucker, K. & Wiethoff, M., "Implementation scenarios and concepts towards self explaining roads", In-Safety D2.1, October 2006.

Dragutinovic, N. & Twisk, D. (2006) The effectiveness of road safety education. A Literature review. SWOV, Leidschendam, The Netherlands.

Dupont, E. et al (2010) "Deliverable 1.1/4.1 Consultation of a panel of experts on the needs for data and technical tools in road safety policy-making" EC-funded project DaCoTa – www.dacota-project.eu.

EEVC (1994) Review of Motorcycle Safety. European Experimental Vehicles Committee.

EEVC (2003) Working Group 17 Report Improved test methods to evaluate pedestrian protection afforded by passenger cars. European Experimental Vehicles Committee.

EFRTV - European Federation of Road Traffic Victims (1997) Impact of road death and injury - Proposals for improvements. Geneva

Elvik, R. (2009) The Power Model of the relationship between speed and road safety. Update and new analyses. Institute of Transport Economics, Oslo, Norway.

Elvik, R., Hoye, A. Vaa, T., Sorensen, M (2009) The Handbook of Road Safety Measures. Emerald Group Publishing.

Engström, I., Gregersen, N.P., Hernetkoski, K., Keskinen, E. and Nyberg, A. (2003) *Young Novice Driver Education and Training, Literature review*, VTI-rapport 491A., Swedish National Road and Transport Research Institute, Linköping

ETSC (1998) *Forgiving Roads* ETSC's Working Parties on Road Infrastructure an Vehicle Safety, Brussels

ETSC (1996) Low cost road and traffic engineering measures for casualty reduction. European Transport Safety Council, Brussels, Belgium.

European Parliament and the Council of the European Union, 2008. Directive 2008/96/EC of the European Parliament and of the Council of 19th November 2008 on Road Infrastructure Safety Management.

Girma Berhanu BEZABEH, La sécurité routière en Afrique, Évaluation des progrès et enjeux du système de gestion de la sécurité routière, Banque Africaine de Développement, 2013

Global Transport Knowledge Practice (gTKP), Project Group "Safer Roads and Mobility", https://www.gtkp.com/themepage.php?themepgid=370 , 2018

Greibe, P., Nilsson, P.K., Herrstedt, L. (1999). Speed management in urban areas. A framework for the planning and evaluation process. DUMAS WP 5 Report. Danish Road Directorate, Report 168. Copenhagen, Denmark.

Gwilliam, K., Foster, V., Archondo-Callao, R., Briceno-Garmendia, C. Nogales, A. & Sethi K. (2008) Africa Infrastructure Country Diagnostic: Roads in Sub-Saharan Africa. Backgroudn Paper AICD. http://eu-africa-infrastructure-tf.net/attachments/library/aicd-background-paper-14-roads-sect-summary-en.pdf

Helman, S., Vlakveld, W., Fildes, B. Oxley, J., Fernandez-Medina, K. & Weekley, J. (2016) Study on driver training, testing and medical fitness. EU, DG MOVE Unit C2 (road safety), Brussels

Lamm, R., Psarianos, B., Mailander, T. (1999). Highway design and traffic safety engineering handbook. McGraw-Hill.

La Torre, F., Saleh, P. Cesolini, E. & Goyat Y. (2012) Improving roadside design to forgive human errors. Procedia, Social and behavioral Sciences, 53 (2012) p 235-244

Lerner, E.B., Moscati, R.M. (2001) The golden hour: scientific fact or medical "urban legend". Academic Emergency Medicine 2001,8:758 –760

Les données de l'IBGE : "Bruit – Données de base pour le plan http://document.environnement.brussels/opac_css/elecfile/Bru_3.PDF

MASTER (1998). Managing speed of traffic on European roads. Final report. VTT, Helsinki, Finland. Matena, S.; Weber, R.; Huber, C.A.;Hruby, Z.; Pokorny, P.; Gaitanidou, E.; Vaneerdewegh, P.; Strnad, B.; Cardoso, J.L.; Schermers, G.; Elvik, R. (2005). Road Safety Audit - Best Practice Guidelines, Qualification for Auditors and Programming. Report D4, Ripcord-Iserest.

Mock CN, nii-Amon-Kotei D, Maier RV. Low utilization of formal medical services by injured persons in a developing nation: health service data underestimate the importance of trauma. Journal of Trauma, 1997, 42:504–513

OECD (2006). Speed management. Joint OECD/ECMT Transport Research Centre, Paris, France.

OECD (2008) Towards Zero: Achieving Ambitious Road Safety Targets through a Safe System Approach. OECD, Paris

PIARC, (2017a) Vulnerable Road Users. Diagnosis of design and operational safety problems and potential countermeasures. La defense CEDEX, France (http://www.piarc.org)

PIARC, (2017b) Vulnerable Road Users. Diagnosis of design and operational safety problems and potential countermeasures - APPENDIX. La defense CEDEX, France (http://www.piarc.org)

Piarc (2003), The World Road Association “Road safety manual”

PIARC: Best Practices for Road Safety Campaigns

Prestora, J., Klemenb, B., Zotlarc, S. & Renčeljd, M. (2014) Self-explaining roads: concept analysis and a proposal for the establishment in Slovenia. Presentation at the XII International Symposium "ROAD ACCIDENTS PREVENTION 2014" Hotel Jezero, Borsko Jezero, 09th and 10th October 2014

Razzak, J.A., Kellermann, A.L. (2002). Emergency medical care in developing countries: is it worthwhile? Bulletin of the World Health Organization, 80 (11).

Richards, D.C. (2010) Relationship between Speed and Risk of Fatal Injury: Pedestrians and Car Occupants. Transport Research Laboratory, Department of Transport, London, UK https://nacto.org/docs/usdg/relationship_between_speed_risk_fatal_injury_pedestrians_and_car_occupants_richards.pdf

Rose 25 (2003) Inventory and compiling of a European Good practice Guide on Road safety education targeted at young people. EU Brussels, Belgium.

Rosén, E. & Sander, U. (2009) Pedestrian fatality risk as a function of car impact speed. Accident Analysis and Prevention 41.

Roadside infrastructure for safer European roads: D06 European best practice for roadside design: guidelines for roadside infrastructure on new and existing roads (2006). THOMSON et al. Project RISER, European Community. http://hdl.handle.net/2134/2205.

Small, M. & Runji, J., La gestion de la sécurité routière en Afrique -Un cadre de gestion pour les agences nationales chefs de file, SSATP, 2014

Speed management: a road safety manual for decision-makers and practitioners. Geneva, Global Road Safety Partnership, 2008

SWOV 2007, SWOV Fact Sheet: Recognizable road design. Dostopno na: http://www.swov.nl/rapport/Factsheets/UK/FS_Recognizable_road_design.pdf [12.6.2010].

Terje Assum, La sécurité routière en Afrique-Évaluation des initiatives de sécurité routière dans cinq pays africains, Programme de politiques de transport en Afrique subsaharienne, Banque mondiale et Commission économique pour l'Afrique, Document de travail SSATP No 33F, Février 1998

Theeuwes, J. & Godthelp, H. (1995) Self-Explaining Roads, in Safety Science, Vol. 19, issues 2-3, June 1995

Thomson, J. A. (1997). Developing safe route planning strategies in young child pedestrians. In: Journal of Applied Developmental Psychology, 18, p. 271-281.

U.S. Department of Transportation. National Highway Traffic Safety Administration (2005) Tire pressure

WHO (2010) Global Plan for the Decade of Action for Road Safety 2011-2020. World Health Organization, Geneva, Switzerland.

WHO (2013) Global Status report on road safety 2013: supporting a decade of action. World Health Organization, Geneva, Switzerland.

WHO (2016) Road safety mass media campaigns: a toolkit. Geneva: World Health Organization; 2016. Licence: CC BY-NC-SA 3.0 IGO.

WHO (2013) The cost of air pollution: strengthening the economic case for action, World Bank Group and HHME, 2013

WHO (2009). Global Status Report on Road Safety: Time for Action. World Health Organization, Geneva, Switzerland.

WHO (2011). Global Plan for the Decade of Action for Road Safety 2011-2020, World Health Organization, Geneva, Switzerland.

WHO (2015). Global status report on road safety 2015. World Health Organization, Geneva. ISBN 9789241565066. http://www.who.int/violence_injury_prevention/road_safety_status/2015/en/

WHO (2016). Post-crash response: Supporting those affected by road traffic crashes. WHO/NMH/NVI/16.9, World Health Organization, Geneva, Switzerland.

WHO (2017). Save LIVES. A road safety technical package. World Health Organization, Geneva, Switzerland.

WHO (2017). Powered two- and three-wheeler safety: a road safety manual for decision-makers and practitioners (‘Motorcycle Safety in Vietnam’) Pg 63. World Health Organization. http://www.who.int/iris/handle/10665/254759

XXX La charge mondiale de la morbidité : génération de données factuelles, orientation des politiques, Edition régionale pour l’Afrique subsaharienne, Institut des Mesures et Evaluations de la Santé- Université du Washington, Réseau du développement humain Banque Mondiale-2013

XXX La sécurité routière dans la région africaine, Organisation mondiale de la sante, Bureau de l’Afrique, 2015

YOURS (2012) Youth and Road Safety Action Kit. Youth for Road Safety, Amsterdam

List of Abbreviations

ACM	Accident Cost Management
CEDEFOP	European Centre for the Development of Vocational Training / Centre européenne pour le développement des formations professionnelles.
DRC	Democratic republic of Congo
ECM	Emergency Care Management
EFRTV	European Federation of Road Traffic Victimes
EMRI	Eliminate – love – reduce - isolate
ETSC	European Traffic Safety Council
GDP	Gross Domestic Product
HIV/SIDA	Human Immunodeficiency Virus
ISA	Interactive Speed Adaptation
LMIc	Low and Middle Income countries
PIARC	Permanent International Association of Road Congresses
RCM	Rehabilitation Cost management
RSA	Road Safety Audit
RSI	Road Safety Inspection
SWOV	Stichting Wetenschappelijk Onderzoek Verkeersveiligheid
TIM	Traffic Incident Management
TSR	Together for Safer Roads
UN	United Nations
WIIFM	What's in it for me?
WHO	World health Organisation