

Transport System Telematics, Burundi Case Study

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ABSTRACT

Mobility supported via transportation processes are the engine to economic growth of any country. Unfortunately, the existing infrastructure cannot keep up with both growth of population and people mobility, especially in the developing countries. One of the main problem in transportation processes in Africa are accidents caused among others by reckless driving, fatigue, and illegal overloading, as well as poor transportation infrastructure. To improve transportation-oriented safety and drastically reduce transport based accidents and the unnecessary loss of lives are the main today important goal. Can this goal be achieved using telematics? Telematics is a fast-growing industry and it is interesting for various applications and places around the world. The subject of the article is the concept of transport telematics system and its introduction on the example of Burundi. In most cases, intelligent transport system applications in Africa are focused on: traffic monitoring using CCTV cameras, automatic number plate recognition systems, automatic vehicle location systems, and variable traffic management systems.

KEYWORDS: intelligent transport system, telematics

1. Introduction

The road plays an important role in the socio-economic development of a country. International roads allow the development of trade and the reduction of transport costs. Urban roads are also of paramount importance in the fluidity of economic activities, the reduction of road accidents and the reduction of the cost of living. As for rural roads, they must also be in good condition to allow the opening up of production areas by improving the flow of goods to cities. In addition, they provide access to basic services (health services, schools) and access to markets for agricultural products. Fortunately, Africa, although from afar, is starting to improve far and wide in all aspects of road infrastructure (quantity, quality, cost and access), Fig. 1.

Burundi has a network of about 12.300 km, which corresponds to a high density per square kilometer, but less in terms of density per capita. In the absence of rail infrastructure and access to the sea, road transport dominates. Its quality is therefore crucial for the entire Burundian economy, but also for human development (access to healthcare, education). Mobility supported via transportation processes are the engine to economic growth of any country.



Fig. 1. Road construction site, Bujumbura rural [4]

The road challenge is even more important for Burundi, where 90% of the population still lives in rural areas, still unequally served. Conscious of the necessity of the development, Burundi had conducted an Infrastructure Action Plan 2010 - 2015, included in the "Burundi Vision 2025". The aim was to alleviate the infrastructure deficit that is limiting the country's growth. The need of such a plan is imperative.

The main routes are the northern corridor connecting Bujumbura to Mombasa (Kenya) through Kigali (Rwanda) and the central corridor, which connects Bujumbura to Dar-Es-Salaam (Tanzania).

Railway infrastructure. Burundi does not yet have rail infrastructure, but several projects are under discussion. The most current of these would be to link Dar Es-Salaam in Tanzania to Musongati in Burundi via Kigali in Rwanda. This new rail would thus be part of the major expansion plan of the Tanzanian rail network.

This project is included in East Africa's rail network plan, the "East African railway master plan" (largely funded by China), which seeks to extend existing lines to improve connectivity in the region. The construction of the rail will be accompanied by a lifting of the customs barriers which will improve the economic integration and thus the growth of the countries which will benefit from it.

2. Generalities: road safety in the African Region: key facts

The African region has the highest estimated road traffic fatality rate of 26,6 per 100.000 population, despite having the lowest level of motorization in the world.

Half of all road traffic deaths in the region occur among vulnerable road users (pedestrians, cyclists and motorcyclists). The African region has the highest proportion of deaths among pedestrians at 39 %. This indicates an urgent need for policymakers to ensure the prioritisation of interventions specifically targeted at improving the safety of these vulnerable road users.

While the majority of countries in the region have enacted national laws on key behavioural risk factors (speed, drink-driving, motorcycle helmets, seat-belts and child restraints), in very few countries in the region do these laws meet best practice.

In order for road safety legislation to be effective, there needs to be sustained and strong enforcement. In most countries in the region, enforcement of key road safety laws is weak, thus limiting the ability of legislation to achieve its full potential.

Developing intermediate indicators is important in order to measure changes in road user behaviour, and thus allow an assessment of programmes that include legislation and enforcement. However, to date there are few countries in the region report data on helmet-wearing rates, seat-belt wearing rates, or the proportion of deaths attributed to alcohol.

Vehicle safety is a key component for road safety. Only one country in the region applies 4 of the 7 UN priority vehicle safety standards.

Road traffic fatality data are vastly underreported in the region, with estimated figures almost 4 times that of the official reported figures, while the quality of data on non-fatal injuries is also of concern.

While a number of countries in the region have adopted policies to encourage walking and cycling, there is concern that if these are not accompanied by additional safety measures – notably speed reduction, they will not achieve the desired effects, and may indeed make roads more dangerous for vulnerable road users.

2.1. Findings: Road traffic fatalities and motorization, by WHO region

Every day, about 650 deaths occur on the Africa's roads (Fig. 2).

Almost a quarter of a million people were (246.718) killed on the region's roads in 2013, approximately a fifth of the global total number of deaths. This means about 675 people die each day on the region's roads. This is in addition to the burden of non-fatal injury, material damage and costs incurred.

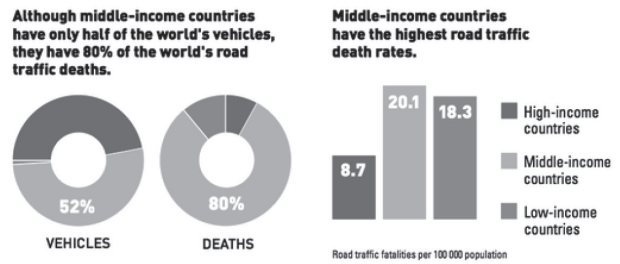


Fig. 2. Global Status on Road Safety 2013 [10]

The African region has the highest road traffic fatality rate, despite being the region with the lowest level of motorization (Table 1).

The African Region has the highest estimated road traffic death rates of 26,6 per 100.000 population, relative to a global rate of 17,4. However, the region is the least motorized, with 46,6 vehicles per 1000 people – relative to 510,3 vehicles per 1000 people in European region. In terms of absolute numbers of deaths and vehicles, Africa is over represented in terms of the number of road traffic deaths that occur on its roads, relative to its vehicle fleet: it contributes to 20% of the world's road traffic deaths but has only 2,3% of the world's vehicles.

Table 1. Road traffic fatalities and motorization, by WHO region [9]

Rank	Estimated fatality rate/100 000 population	Rank	Number of vehicles per 1000 persons
1	African Region (26.6)	1	European region (510.3)
2	Eastern Mediterranean Region (19.9)	2	Region of Americas (502.8)
3	Western Pacific Region (17.3)	3	Western Pacific Region (250.5)
4	South East Asia Region (17)	4	South East Asia Region (168.9)
5	Region of Americas (15.9)	5	Eastern Mediterranean Region (126.0)
6	European Region (9.3)	6	European Region (46.6)

One of the main problem in transportation processes in Africa are accidents caused among others by reckless driving, fatigue, and illegal overloading, as well as poor transportation infrastructure. To improve transportation-oriented safety and drastically reduce transport based accidents and the unnecessary loss of lives are the main today important goal. Can this goal be achieved using telematics? Telematics is a fast-growing industry and it is interesting for various applications and places around the world. The subject of this article is the concept of transport telematics system and its introduction on the example of Burundi. Telematics is a field of science that integrates telecommunications and informatics in the range of information processing with their effective transfer to the points, where it can be used to achieve specified quality of the action.

Modern telematics gained economic potential from increasing capabilities at drastically decreasing costs for telecommunication

links, as well as for data processing. Telematics essentially increases the transportation safety, optimizing the routes of carrying cargos, and in effect, reduce the costs of transportation, as well as enlarge the reliability of transportation systems. As different authors worked on these questions:

- supporting of decision process in the range of managing the motion of transportation means, and management;
- supporting of the transportation means service process, as well as transport control generating the information in the form of rescue code (in case of danger-event);
- supporting or three decision process in managing means of transport and the special services (in case of unfavorable events, which can menace the operation safety of the transportation system)

That shows the telematics as a support increases the transportation safety, optimizing the routes of carrying cargos, and in effect, reduce the costs of transportation, as well as enlarge the reliability of transportation systems. In Africa, likewise in other developing countries like Central and Eastern Europe in the road sector country throws a disconcerting light on this matter: “Three principal impediments to safety interventions were identified: mobility is considered as primary importance; the freedom of the car is difficult to restrict; as consequence there is much more lobbying for mobility than for safety; and road safety commitments and policies are weak, even among some of those responsible.”

According to the report of [7]:

- the reduction rate for traffic safety differs per country and is not a constant one per country over time; nowadays the decline in the fatality rate is lower than it used to be;
- during, the last ten years the number of vehicles per head of population multiplied by ten in some developing countries (e.g. South Korea, Thailand), while in others was more modest (South America). In many countries in Africa, the motorization remains very low, between 1 and 100 vehicles per 1.000 inhabitants. The traffic safety record for many developing countries remains very high, compared to high-motorized countries (decuple). Any conclusion about developments in time is obscured by poor quality of available data.

2.2. Causes of accident in developing countries

According to the World Health Organization, with only 2% of the global car fleet, Africa is registered 24,1% of victims of the road in 2016 (Fig. 3). Around 1,25 million of person lost their life on the road in the World in 2016, don't 300.000 victims on African continent. This slaughter is disproportionate, compared to the road network as to the number of cars in circulation. Failing regulations, obsolescence of vehicles or roads, risky driving behavior, rising income levels, alcoholism, corruption, and other factors comply.

The Ethiopian expert Girma Berhanu Bezabeh, during an African Bank of road development report in 2013, confirmed: “the losses caused in Africa are disproportionate to the level of motorization and the density of the road network compared to other regions of the world”. In 17 countries that responded to AfDB survey, out of the 38

solicited, he noted that road safety is not a priority everywhere, with regulations failing.



Fig. 3. Picture of SIA KAMBOU/AFP (Posted on 28.07.2017 on RFI)

According to estimations by the World Bank, 350.000 people are killed in automobile accidents in the developing world every year. Two thirds of the accidents involve pedestrians, most of whom are children. Two thirds occur in the cities or in the surrounding areas. As a result of the surge in urban areas and vehicle ownership, the figures are mounting. In Africa, road accidents are in the second group of important cause of death after the diseases' group.

2.3. Concept of road safety around the world

The next question should be answered is, of course: how can a reduction in the fatality rate be achieved? What factors can explain an established reduction, and to what degree has road safety policy been a contributing factor? In considering these questions, it is of course impossible to treat all parts of the world in the same way when considering these questions.

Main causes are:

1. Much of the problem is related to a shortage of funds, both for owners of vehicles and for governments.
2. Many private and commercial vehicles are old and in poor condition.
3. Streets have deteriorated.
4. Presence of different kinds of traffic: pedestrians, non-motorized transport, buses, trucks, and cars, all share the same streets, unsegregated.
5. Footpaths are often non-existent, particularly in outlying areas.
6. streets and vehicles are poorly lit, increasing the risk at night.

The improvement of road safety in developing countries requires the development of sustainable project components to match public awareness and governmental commitment.

Countries exhibit different degrees of readiness to implement road safety measures, depending on the government's sensitivity to the problem and its importance on the political agenda. The lower the awareness level, the less likelihood there is of government interest and ability to absorb safety components in projects sponsored by the World Bank or other donors. By the way, World Bank consultants in the field of road safety have pinpointed three levels of awareness:

1. Awareness level 1. In these countries, there is little safety awareness. Accident data may or may not be collected and any

data system will be primitive. Little is known about trends or road users at risk. There is no one working specially on safety matters. General interest by the government is low.

2. Awareness level 2. The government is aware of the road problem, but has given it little priority. Accident data are sparse. Occasionally, there may be road safety pressure groups. The media may be beginning to press for the action. Some university research may be underway. (Remarks : Burundi is in this awareness level, with the will of changing according to the road safety standard but issue comes with lack of priority on resolving the problem.)
3. Awareness level 3. The government has recognized the need for assistance. An improved data system has been established and staff trained in safety operations. Analysis is undertaken of black spots and to identify the road user groups most at risk. A National Road Safety Council (NRSC) co-ordinates a national road safety programme. Efforts are made to improve driving tests and vehicles examinations, to develop children's traffic education and improve legislation. There is a core of people specialized in safety who are keen to tackle the problem but lack resources. Road safety research is being undertaken and media is active in pushing for action.

In recent years, a large number of conference, workshops and seminars have been organized, focusing on the promotion of road safety. Organizations such as the United Nations, the World Bank and other banking institutions, WHO and the OECD have played an important role in this regard. The following could be mentioned: road safety conferences in Africa (Addis Ababa), Asia (Kuala Lumpur), Latin America (Sao Paulo). These conferences bring together a wealth of information and many contributors who know how to promote road safety. It seems to be more a question of how to get road hazard recognized as a political problem, and how to realize the financing and organization of road safety policy, than which measures to take.

2.4. Effective recent initiatives

To date, it has proven impossible to explain the development in the number of accidents and road accidents victims on the basis of our understanding of the causal relationship between these road hazard indicators and explanatory variables, such as the volume of traffic, composition of traffic, behavior in traffic, quality of infrastructure and vehicles, weather conditions, etc. only in highly exceptional cases it proved possible to trace the actual influence of road safety measures in the accidents statics.

Based on contributions from the various authors and literature review, the following subjects have been included in the report. Subjects can offer a significant contribution to the scope of road hazard and for which it has also proven possible to realize improvements (Table 2):

- drinking and driving, under the influence of alcohol (Zaal, 1994);
- excessive an inappropriate driving speeds (ETSC, 1995; Zaal, 1994);
- assistance given to road accident victims (Trinca et al, 1988; NRTAC, 1993);
- restrained systems: seat belts, child restraints etc. (SWOV, 1992);
- vehicle safety (ETSC, 1994).

Many examples can be given of programmes which have proved successful in promoting road safety. This is overview will describe a number of programmes of world renown.

Table 2. Best practice legislative criteria met by countries of the African region [9]

Risk factor	Best practice legislative criteria as defined by WHO for this report	Countries meeting legislative criteria for best practice
Speed	Setting national speed limits with maximum urban speed limits lower than or equal to 50 km/h and local authorities are allowed to reduce speed limits	7 countries (15%) Algeria, Burkina Faso, Kenya, Madagascar, Mali, Rwanda and Sao Tome and Principe
Drink-driving	National drink-driving law based on BAC or equivalent BrAC. BAC limit for general population ≤ 0.05 g/dl and BAC limit for young/novice drivers ≤ 0.02 g/dl	1 country (2%) Algeria
Motorcycle helmets	National motorcycle helmet law applies to motorcycle drivers and adult passengers, all road types, all engine types, requires helmet to be properly fastened and meet a national or international standard	6 countries (14%) Botswana, Cabo Verde, Ghana, Madagascar, Malawi and Swaziland
Seat-belts	National seat-belt law applies to drivers, front seat and rear seat passengers	17 countries (40%) Algeria, Angola, Botswana, Burkina Faso, Eritrea, Ethiopia, Ghana, Kenya, Mauritius, Mozambique, Namibia, Seychelles, Sierra Leone, South Africa, Togo, Uganda and Zambia
Child restraints	National child restraint law based on age-weight-height or a combination of these factors and restrict children under a certain age-height from sitting in front seat	9 countries (21%) Angola, Botswana, Burkina Faso, Cabo Verde, Ethiopia, Eritrea, Guinea, Mozambique and Zambia

Drinking and driving. App. 76% of African countries studied have a law prohibiting the conduct of a vehicle beyond a certain blood alcohol level in the blood. In almost all countries, sanctions are more when an accident causing injury or deaths occurs under the influence of alcohol. Controls Random breath tests are only performed in one third of the countries and only a few uses the combined breathalyzer and sobriety tests during police checks to prevent driving in intoxicated. A third of the countries are not aware of the control methods for drinking and driving. Generally, countries, the police lack the means to enforce legislate on the subject. No specialized training is also offered to law enforcement officers to fight against this scourge. The results of the survey revealed a low level of law enforcement.

The WHO recommends that drink-driving laws should be based on blood alcohol concentration limits no more than 0.05g/dl, with lower limits for young and novice drivers who constitute a high-risk group. While 95% of countries in the region have some type of national drink-driving law, only 33 countries base this law on breath or blood alcohol concentration, and only 8 have a BAC limit of less than or equal to 0.05 g/dl as is recommended. Only one country in the region, Algeria, meets WHO's criteria for best practice on drink-driving laws, namely having a law based on a BAC of less than or equal to 0.05g/dl and having a limit of less than 0.02 g/dl for young-novice drivers;

Speed. Eighteen African countries studied among them Burundi, regulate the speed of movement, either nationally, at the local level. Most of countries determine the speed limits according to the hierarchy of roads, their environment (rural network and urban network, for example) and categories of vehicles. The law sets a default speed limit for zones in the majority of countries. Its application is not always sometimes not strict in more than 80% of cases.

Motorcycle helmet. Wearing a motorcycle helmet can reduce the risk of death by almost 40% and the risk of severe injury by approximately 70%. Effective enforcement of motorcycle helmet laws can increase helmet-wearing rates and thereby reduce head injuries.

Most (93%) countries in the African region have a motorcycle helmet law but only 11 have a law that meets WHO's standards of best practice, that is it applies to both drivers and adult passengers, all road types, all engine types, and stipulates that the helmet be properly fastened. The effectiveness of national helmet legislation in reducing injuries also depends on the quality of helmets worn: 40% of countries specify a national or international standard. Only 6 countries (Botswana, Cabo Verde, Ghana, Madagascar, Malawi and Swaziland) meet all these best practice criteria, i.e. have both a comprehensive law and specify a standard, with this figure higher among middle income countries (20%) than among low-income countries (9%).

Seat belt. Wearing a seat-belt reduces the risk of a fatality among drivers and front-seat occupants by 45–50%, and up to about 25% among rear-seat occupants. Seat-belt legislation, when combined with strong and sustained enforcement, is an effective mechanism for increasing seat-belt wearing rates. While 38 countries (88%) in the region have a seat-belt law, only 17 (40%) have a seat-belt law that meets best practice, meaning it applies to drivers, front seat passengers and rear-seat passengers, with this figure higher among middle income countries (45%) than among low-income countries (35%).

Child restraints. Children in appropriate restraints are significantly less likely to be killed or injured than unrestrained children, and are also less likely to be killed or injured than children using adult seat-belts. Furthermore, young children are safer sitting in the rear seat than in the front seat. Fifteen countries (35%) in the region have a national child restraint law while 17 countries (40%) restrict children from sitting in the front seat. Nine countries have laws in line with best practice with regard to child restraints, specifically that restricts children under a certain age from sitting in the front and have a child restraint law based on age, weight and-or height.

2.5. Infrastructure safety road

The results of the study show that safety road traffic is one of the elements taken into account by authorities in many countries in the development of the road sector. The main road design standards for most countries.

Better roads improve road safety (Table 3). The principles of safe network design and road design are rather well-known, however, practical conditions, others criteria than safety and limited funds lead rather often to sub-optimal road design.

Table 3. Progress in integrating safety issues into road infrastructure, 2013 [9]

	Country	Audit standards	Audit and inspection of security	Use of data for road accidents	Improvement works of security
1	Burkina Faso	Existing	Not realized	Yes	Limited
2	Burundi	Inexistent	Not realized	No	Not realized
3	Cameroun	Existing	Realized regularly	No	Limited
4	Egypt	Existing	Realized regularly	Yes	Realized regularly
5	Ethiopia	In project	Not realized	No	Limited

6	Gabon	Inexistent	Not realized	No	Limited
7	Gambia	Inexistent	Not realized	No	Limited
8	Ghana	Existing	Not realized	Yes	Limited
9	Kenya	In project	Not realized	No	Limited
10	Mali	Inexistent	Not realized	No	Limited
11	Morocco	Existing	Realized regularly	Yes	Realized regularly
12	Nigeria	Inexistent	Not realized	No	Limited
13	Uganda	Existing	Realized regularly	No	Limited
14	Sierra Leone	Existing	Realized regularly	Yes	Realized regularly
15	Tanzania	Existing	Not realized	No	Limited
16	Chad	Existing	Not realized	No	Limited
17	Tunisia	Inexistent	Not realized	No	Limited

Design guidelines and road design standards, are available in many countries. But to date, these existing national standards only rarely contain information on the safety effects of the roads designs that are recommended or even prescribed. To enable the design of safety roads, more clarity is needed about the relationship between the layout and the safety aspects of the infrastructure elements.

Roads are built with one major function in mind: to enable people and goods to travel from one place to another. However, it's necessary to make differentiations in traffic function because the character of the travel process differs (long distance, allowing for access etc.) while these differences require different road design (Fig.4). An explanation of the high accident rates on all purpose roads might be that these roads are multifunctional (flow function, distributor function and access function) and allow different types of road users in the same space and, at the same time, at relatively high speeds and big speed differences.



Fig.4. Differentiations in traffic [own study]

Different types of road users in the same space and at the same time at relatively high speeds and big speed differences lead to high accident rates.

Safety auditing. An audit technique can be used to make as explicit as possible the safety consequences of certain choices in the detailed planning and the design process and to optimize a road design. The primary objective of using an audit technique is to ensure that road safety is optimally incorporated during the design which is simple and recognizable for future roads users, thereby minimizing potential error.

Following the different procedures audit activities would involve five phases:

1. feasibility/initial phase (or the strategic level of a RIA);
2. preliminary design;
3. detailed design;

4. inspection of the roads in the pre-opening phase;
5. inspection of the road in-service.

Sustainable safe traffic. A sustainable safe system has:

- an infrastructure whose proper road design is adapted to the limitations of human capacity;
- vehicles fitted with ways to simplify the task of the road user and constructed to protect human beings as effectively as possible, and;
- a road user who is adequately educated, informed and where necessary, controlled.

As to the infrastructure, the key to arrive at sustainable safety lies in the systematic and consistent application of three safety principles that reduce in advance the liability of encounters with implicit risk the three safety principles are:

- the functional use of the road network, by preventing unintended use of reach road;
- the homogeneous use, by preventing large differences in vehicle speed, mass and direction of movement;
- the predictable use, thus preventing uncertainty amongst road users, by enhancing the predictability of the road's course and the behaviour of fellow road users.

This approach could be characterized as a preventive one, a systematic one and a consistent one which is in contrast to the curative one, the incidental one, and the compromise approach of many road policies of today.

2.6. Telematics

Telematics (Applied Transport Telematics ATT) is increasingly considered as a means to improve traffic and transport management as well as road safety. Roads safety arguments turn out to be a good sales argument. High-pitched expectations are created around telematic applications and their expected positive effect on road safety; expectations which are not completely fulfilled. In addition, the developments in this area are barely directed by relevant social and policy-making developments but rather by a technology push. From the point of view of road safety, the following questions are of importance in an assessment of telematic applications:

- controlled traffic growth; (i.e. route planners, fleet management with GPS)
- optimal distribution of traffic over time and space; (actual radio traffic information)
- management of traffic streams (i.e. homogenizing driving speed)
- reducing risks; (i.e. warnings of extreme road and weather conditions, improvements of visibility, intelligent speed limiters)
- restriction of the negative effects of accidents (accident alarm system, co-ordination of assistance)

There are also developments afoot which could have a negative influence on the driving behaviour and driving performance (i.e. the car use as office, including telephone and fax. It is necessary that safety assessments on such developments be made, which could perhaps lead to regulations. Over and above, this there should at least be a code of practice, a checklist such as exists

in England whereby possible negative consequences can be established. Furthermore, from the point of view of the user, the acceptance of all these developments is of importance and equally the comprehensibility (man/ machine interaction especially in an ageing society.

Governments and representatives of road users should closely and more carefully follow telematic developments and applications (individual and collective systems as well), make assessments at management level and-if necessary-try to make corrections. Of course, this should be done on an international basis.

In most cases, intelligent transport system applications in Africa are focused on: traffic monitoring using CCTV (Closed Circuit Television) cameras, automatic number plate recognition systems, automatic vehicle location systems, and variable traffic management systems.

“CCTV Traffic Monitoring System” or “CCTV Traffic System” means any system or device that enables continuous or periodic recording, observing or monitoring of the Municipal Road Allowance. The information collected through the CCTV Traffic System will be routinely overwritten

The telematics in the essential way improve safety and reliability of transport systems, enables optimizing cargo motion routes and reduces the costs. Telematics is currently the important parts of transportation infrastructure. The key question in transportation system safety and reliability is its ability to gain the output products (information), generated by the participating in transportation process, and then integration for quantity and quality evaluation, and processing to output products useful in the decision process.

2.7. Burundi case study

Burundi has made road safety one of its priorities, although instruments are lacking required for the implementation of a policy and a plan effective action plans and for the establishment of an able to achieve the objectives in this area (Table 4). The police forces are responsible for investigating accidents and to save the data concerning them; however, statistics are not compiled at national level. The Burundi, are considered to be victims of the road the dead people at the scene of the accident. The required data concerning road accidents and the fleet of vehicles were not disclosed.

There is no training or driving test standardized across the country. Obtaining the permit driving is based solely on practical training and on the testing of drivers. In a general way the laws in force relating to the wearing of the helmet and the belt as well as the speed of movement make strictly enforced. There is no such thing as drunk driving legislation and use child restraints.

Activities concerning infrastructure security roads and awareness of the dangers of the road, such as that road safety campaigns are not systematic way. Vehicle safety is limited to one compulsory annual technical inspection for vehicles particulars, semi-annually for road transport vehicles. And quarterly for public transport vehicles.

The budget devoted to road safety not clear from the annual budget of the Ministry of Transport. Road Fund does not provide resources allocated to road safety. The intervention system emergency medical and relief in place in the country covers most major cities.

Table 4. Profile of Burundi [9]

n.a.: not applicable; -: data non-available

NATIONAL LEGISLATION	
Speed limits set at the national level	Yes
Local authorities can set lower limits	Non
Maximum speed allowed in urban areas	60km/h
Application	0 1 2 3 4 5 6 7 8 9 10
Legislation relating to driving while inebriated	Yes
Allowed blood alcohol threshold-general population	0,1g/dl
Allowed blood alcohol threshold-young drivers or new drivers	0,1g/dl
Breathalyzer tests and / or random police checks	Yes
Fatal road accidents involving alcohol consumption	70%
Application	0 1 2 3 4 5 6 7 8 9 10
Motorcycle helmet legislation	Yes
Applies to the driver and passengers	Yes
Mandatory standards for helmets	No
Helmet wear rate	-
Application	0 1 2 3 4 5 6 7 8 9 10
Seat belt legislation	No (to the local level)
Applies to all passengers	n.a.
Seat belt wear rate	95% in front 0% at the back
Application	0 1 2 3 4 5 6 7 8 9 10
Child restraints legislation	No
Application	n.a.

VEHICLE STANDARDS	
No automobile industry	
VERIFICATION OF ROAD SAFETY	
Mandatory official verification of new road infrastructure	Yes
Regular verification of existing road infrastructure	No
PROMOTION OF ALTERNATIVE MEANS OF TRANSPORT	
National policies for walking or cycling	No
National policies for transport means	No

SUPPORT AFTER ACCIDENT	
Official system of prehospital care accessible to the population	No
National number of universal emergency call	n.a.

3. Conclusion

In most countries in the region, official road traffic injury data are vastly underreported. There is a need to strengthen the reporting and quality of traffic data in order to provide evidence based information for policy makers.

Telematics, using techniques such as informatics optoelectronics, automatics and telecommunications, helps to reduce costs of transportation potential management, improves the security and reliability of the transportation service and the decision process automation. Modern telematics methods offer a huge application potential in teleservicing, having impact on most engineering disciplines.

There seem to be no options available for simple, large-scale, new and effective measures which can further promote road safety. On the contrary, we should focus on the problems and measures that have already been recognized and adopted. The better implementation of well-known measures, leading to larger and longer-lasting effects at less expenses, is more appropriate than searching for new universal remedy. A large number of countries are currently focusing on three areas of priority: driving under the influence, speeding behavior and the insufficient use of seat belts and helmets. Furthermore, attempts are being made to improve road for high-risk groups (young drivers) and vulnerable road users (pedestrians, children, the elderly).

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