

A NEW STRATEGY to ENHANCE TRAFFIC SAFETY in DEVELOPING COUNTRIES

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ABSTRACT

The rapid expansion of motor vehicle use in developing countries resulted in a sharp rise in road traffic-related deaths and injuries. The UN General Assembly recognized road deaths and injuries as a global epidemic since 2003. More than 90% of the 1.2 million people who die each year in traffic related crashes are from the developing countries in which more than 51% are vulnerable road users.

The Kurdistan region in Iraq has been chosen for this study where the number of registered vehicles has increased exponentially in the last decade, and the official number of fatalities in 2013 was 1,114. This number, however, is highly underreported; the actual figure of fatalities is estimated to be 100% more than the reported number according to World Health Organization. Pedestrians in the region are not separated from vehicles even on high speed roads, in front of schools, bus stops, parks and commercial areas. In addition, driving education and risk assessment is poor among drivers. A pre-study showed that only 5% of the current drivers in the largest city in Kurdistan, Erbil, know how to use a roundabout. Moreover, 0%, 1% and 12% could read and were knowledgeable about the signs of "One-way", "Give-Away" and "No-Entrance" respectively. The driving test and training systems are inadequate and inconsistent in the cities of Kurdistan. The test are performed in an isolated and controlled environment separate and far away from the everyday traffic. Moreover, the road network is non-standard and is lacking alignment and signs.

This study evaluates current traffic safety conditions in Kurdistan, and then proposes a new strategy to change the current driving license test system to a more realistic and educational test that is fair and promotes safe traffic flow. The new approach, in this study, is based on a new standard driving test and training system based on the 4 E's model which stands for: Engineering, Education, Enforcement, and Encouragement. The new proposed tests will be conducted on a limited, predefined, standardized and heavily monitored route within existing traffic environment.

This new testing system will focus on educating large groups of university students how to operate their vehicles more efficiently and safely. Moreover, the route within the existing road infrastructure that will be upgraded to standard and heavily monitored also allows licensed drivers, optionally or through an enforcement program, to retrain and experience driving on standard routes gradually leading to an improvement in drivers' awareness. The standard route can also be used as a model and starting point to successively standardize the current road network and when constructing new roads.

Keyword: Traffic Safety, Driving License, Developing Countries, Traffic System

INTRODUCTION

The rapid expansion of motor vehicle use in developing countries resulted in a sharp rise in road traffic-related deaths and injuries [1]. The UN General Assembly recognized road deaths and injuries as a global epidemic since 2003 [2]. Nevertheless, resources devoted to assist effected countries to address the problem is still inadequate. Although more than 90% of the 1.2 million people who die each year in traffic related crashes are from the developing countries in which more than 51% are vulnerable road users [2]. Even efforts by the developing countries in the high income group, with a fully funded national road safety strategy, were unsuccessful at improving traffic safety and to implement advanced workable safety programs. In Saud Arabia, for instance, despite a fully funded program, traffic death almost doubled from 3500 in 2000 to 6500 fatalities in 2009, while the target was an annual reduction by 3%. Meanwhile, a similar national road safety strategy in France halved fatalities on the roads from 2001 to 2010 [3]. This attests that providing resources and replicating interventions of good practices that are implemented in countries with effective safety programs, will fail to yield sustainable results. Apart from political will to commit resources, a sustainable solution must consider institutional capacity weaknesses, social obstacles and best intervention practices based on scientific evidences [1]. Moreover, research is required to determine optimum standards before adopting elements of good practice observed in the developed countries.

In the Kurdistan region of Iraq, which is the scope of this study, registered vehicles increased exponentially over the past decade. The increase is still going on and is leading to more fatalities on the roads annually; in 2014, the number of registered vehicles was 1 250 000, an increase by 10%, compared to 2013. The official number of fatalities in 2013 were 1,114 [4]. This number, however, is highly underreported, the actual figure is estimated to be 100% more than the reported [3], especially when the country has no eligible death registration data.

An institutional framework together with a strong political will are the main factors that affect traffic safety conditions on the national level [5]. The framework is to, among others, organize national policy, set manageable goals and sub-goals, coordinate activities, and cooperation with international organizations.

The mechanism of road accidents is related to a number of explanatory factors which are deeply rooted and interrelated [6]. The most common being human errors, where deficient road design and planning will often have contributed to or compounded these errors [7]. Inadequate training and testing programs together with insufficient enforcement of traffic and transport regulations greatly affect road users' attitude and behavior [8]. In Kurdistan, the driving tests and trainings, which have direct influence on human errors, are applied differently in the cities of the region. The inconsistent driving tests are partially based on different modules used in developed countries. In addition, the tests, in practice, are not performed in the existing traffic environment, but rather in an isolated and controlled environment separate from other drivers. This limitation is due to several obstacles such as inadequate driving test systems, a nonstandard road network and the great danger of operating by the driving regulations on an uncontrolled road where the other drivers ignore many of the regulations. Thus, to improve traffic safety in Kurdistan, a comprehensive traffic safety system is essential. In particular, a new driving test model to gradually improve road users' behavior is required. Moreover, exploiting the model to successively upgrade the safety aspects of the road networks' standards in the region.

AIM OF THE STUDY

The aim of this study is to evaluate current traffic safety conditions in the Kurdistan Region of Iraq, and then propose action plans to change the current system to a more fair and safe traffic flow. The action plan includes causal explanations of the persistence of poor traffic safety conditions in Kurdistan as well as long and short term strategies and approaches of improvement.

CURRENT TRAFFIC SAFETY SITUATION

A comprehensive evaluation of the current traffic safety situations in Kurdistan is based on main factors that influence the safety level including data collection, political will, institutional framework and development goal, driving test system, human behavior, infrastructure, and vehicle factors.

Data Collection: Providing reliable data is important to review the mobility and traffic safety status which is to be used in development of any strategic plan. Kurdistan does not have an adequate system for data collection. The lack of reliable data is one of the most serious obstacles to conducting proper analysis. The limited available data is either incomplete or skewed, which creates great problems in the analyses. Hence, analyses of the factors, mentioned above, that affect traffic safety will be based on available data, visual evaluation and/or experiences. The available limited data will be used as a rough approximation of the real figures. Accident data as the most important indicator of traffic safety is unreliable, and only absolute numbers of fatalities exist. The official number of fatalities in 2013 was 1,114[4]. This number, however, is highly underreported, the actual figure is estimated to be 100% more than the reported [3], especially when the country has no eligible death registration data. An important measure to improve analyses is to adopt accident and/or fatality rate, instead of an absolute number independent of rate of change, which is the number of fatalities/ accidents per vehicle or person per kilometer. However, the data for distance travelled by people is unavailable. Hence, only absolute number of fatalities in relation to population and vehicles can be used. Thus, considering only registered deaths, Kurdistan has more than 22 fatalities per 100 000 population, while this figure is less than 3 fatalities in the safest countries. Fatality rate per 10 000 vehicles is 20 times more than in the safest developed countries, that's despite longer travelled distance and more vehicle trips in the developed countries.

Political Will: Decision makers in all countries agree and there seems to be a political will to decrease traffic road deaths [2]. Kurdistan is no exception as the highest authorities in Kurdistan, including the Regional President and the Prime Minister, announced and decided implementation of the necessary measures to reduce traffic accidents. However, no further nor concrete steps have been taken on the ground as a matter of fact. That is because accidents have not been considered by the society as public health problems similar to contemporary illnesses such as mad cow disease and bird flu. Hence, the society does not require special attention from the state to solve the problem.

Additionally, public policy makers point towards shortcomings in electricity and housing as major problems that need to be acknowledged by the state. Thus the state took great and expensive actions to solve the electricity and housing problems. Therefore, improving traffic safety is not among the region's developmental priorities. The main focus of traffic policy is to optimize mobility and flow of vehicles without proper plans to include traffic safety.

Institutional Framework and Development Goal: Kurdistan has not any institutional framework for coordinating activities and setting a practical goal to reduce fatalities and injuries on the roads. There is no fund from the national budget to improve road safety. Moreover, the region lacks a national research center to improve traffic and road safety. The roads and traffic are responsibilities of several departments without any department for traffic safety as in many other developing countries. The Interior Ministry has the main responsibility for the traffic safety in Kurdistan. Hence, traffic police stands for the poor traffic safety performance and its legal consequences. However, several other ministries are directly involved in the traffic safety performance without being responsible legally for the safety outcomes on the national level. The involved ministries are: The Ministry of Municipality that is responsible for planning and organizing urban roads and streets; Housing and Reconstruction Ministry deals with constructing, operation and maintenance of the main roads between the cities; Ministry of Transport and Communications is responsible for the administration and management of all areas of communications, including public transportation; other concerned Ministries are Education, Health and Planning.

Driving Test System: The driving test and training systems are inadequate and non-consistent in the cities of Kurdistan. The test are performed in an isolated and controlled environment separate and far away from the everyday traffic. The obstacles to perform the tests in the existing environment consist of a lack of experience by the traffic police and a non-standard road network in terms of alignment and signs. Moreover, the difficulty to perform driving tests according to the standards of uncontrolled roads where many regulations are ignored by licensed drivers and where the traffic environment is chaotic. The drivers learn the practiced driving by their own, friends or parents before or after acquiring driving license. In addition, the driving license is used for formalities and legal issues only. The common question to find out whether somebody drives is: "Do you drive?" and not "Do you have a driving license?" Which indicates the big gap between the driving test and the actual driving environment. There is a large number of unauthorized drivers using the roads before having a driving license. In addition to that, it is possible to obtain a driving license

through private connections without doing the test. Another serious deficiency is that there is only a slight difference, in practice, between tests for private vehicles and trucks. Truck accidents are more serious and cause greater damage which means that operating trucks demands different knowledge and experience.

Human Behavior: Individuals, in their nature, do not expect that they will be involved in accidents. They overestimate their ability and consider accidents as human errors made by road users without direct effect on them [9]. Human performance in terms of traffic safety is very weak in many aspects and includes a high number of road users. Driving education and risk assessment is poor among drivers. A pre-study showed that only 5% of the current drivers in the largest city in Kurdistan, Erbil, know how to use a roundabout. Moreover, 0%, 1% and 12% could read and were knowledgeable about the signs of “One-way”, “Give-Away” and “No-Entrance” respectively. This indicates a serious lack in the driving test system and current road design and signposting. Even the traffic police do not seem to have enough knowledge in regard to organizing the traffic and investigating accidents. A traffic police officer with the lowest rank only goes through 40 days of training while an officer has completed 6 months of training. This short education, however, is mostly about disciplines and the use of weapons. Serious human errors are noticed in many cases, but there is no research or data collection to figure out the size of the problem. The main human errors are mentioned below and include:

- One of the main human errors in traffic is the fact that pedestrians are not separated from vehicles even on high speed roads, in front of schools, bus stops, parks and commercial areas. Moreover, the pedestrians very often choose to walk on and along the high speed streets in the direction of driving. Furthermore, roadwork is carried out without signposting on high speed roads. Opposite to what is stated in the traffic law, drivers do not stop at stop signs to allow pedestrians to cross the streets. The drivers and pedestrians have developed informal ways to divide space between them. The drivers have the priority of spatial appropriation where pedestrians by many drivers are considered as second class citizens. The reason behind this attitude is that most pedestrians are perceived as poor, while people from the middle and upper class are believed to be able to travel by car.
- Speeding is another major problems which also occurs in residential areas. The speed cameras are often not placed on the accident-prone roads to make driving safer on these roads. They are usually placed where the layout of the roads encourage speeding. Dangerous overtaking is very frequent on two lane rural roads even in the presence of oncoming traffic.
- A third common human error concerns the use of seatbelts. A few years ago, drivers and passengers were asked to show their identification card at the security checkpoints if they had fastened their seatbelt. Wearing the seatbelt was a clear indication that the traveler was not from the region. Enforcement of seatbelt use has changed the picture now, and a great improvement has been noticed in this area. However, wearing a seatbelt is still not common among passengers and child restraints are equally quite uncommon. To avoid using a seatbelt, there is even a cheap separated seatbelt buckle device in the market to turn off the acoustic signal of the seat belt reminder in case the driver or passenger do not wear the seatbelt. Other dangerous practices, which do not lead to action taken by traffic police, are riding passengers in moving truck beds, hanging out of sunroofs and vehicle windows.
- Unfortunately, drinking and driving is common, and an uncountable number of drivers drink and picnic along the roads outside the large cities.
- Helmet wearing is rare for both motorcyclists, moped drivers as well as cyclists.
- Parking and stopping on the roadway and in other dangerous places are frequent.
- Wrong side driving to shorten trips occur frequently.
- Driving despite red lights is not uncommon.
- Chaotic driving in roundabouts is also a common human error.

Infrastructure: The way residential areas and the connecting roads are built have a direct effect on the nature of traffic conflicts and traffic accidents. The environment is dangerous for all road users, in particular vulnerable road users like pedestrians and cyclists. The roads are built to allow maximum mobility and traffic flow. The streets lack proper sidewalks for pedestrians or they are occupied by the neighboring residential or commercial buildings which compels pedestrians to share the roads with vehicles. Moreover, uncontrolled urban growth and irregular land use have promoted dangerous sidewalks, or absence of sidewalks at all, adjacent to main and high speed roads. This increases the number of conflicts between vulnerable road users and vehicles. Moreover, street

widening is often made at the expense of sidewalks. The vulnerable road users have to face heavy vehicle traffic due to urban social networks being disturbed. A biographic survey showed that in the 1960s and 1970s non-motorized transport modes such as walking and bicycle usage were competitive to motorized vehicles in the largest city Erbil in Kurdistan. The rate of bicycle commuters in the city, however, diminished dramatically starting from the early 1980s along with the increasing motorized travel modes. Though, the number of private vehicles increased by more than 1000% in the 1980s compared to the 1970s. While the increase, the last two decades, was 40000% compared to 1970s, from approximately 1000 private vehicles to more than 400,000 in 2014 [10]. The results of the survey showed that the rate of bicycle use has declined to 0.05% although the city has an excellent flat topography for cycling and a generous climate most days of the year. More specific deficiencies in regard to infrastructure are:

- Pedestrian crosswalks on high speed roads with heavy traffic roads. Moreover, the drivers hardly ever stop for pedestrians who want to cross the street using the crosswalks. Moreover, using the pedestrian crosswalks are dangerous due to broad roads, heavy traffic on the roads and the high speed of the vehicles. There are pedestrian crosses on 10 lane roads where the speed limit is 80 km/h with even higher actual operation speeds, so the pedestrians face a hard task to wait for all 10 lanes to be safe to cross. 10 experiments were conducted where a pedestrian waited 15 minutes at 3 pedestrian crosswalks during the rush hour without any success to cross the street. The few walkers who take the risk, usually cross the streets by crossing one lane at a time while vehicles at high speed pass the pedestrians on both sides.
- Building U-turns on roads where the speed limit is 80 but where the actual speed is greater than 100 km/h. The U-turns lead to blocking overtaking lanes in both driving directions followed by frequent incidents and serious accidents. That is because U-turns lead to a mix of high and low speed vehicles on heavily trafficked roads. On smaller roads, with 4 or 6 lanes, vehicles block half of the lanes, or the whole street while they are waiting to make a U-turn.
- Road lighting and alignment is another problematic aspect. Newly built roads are usually opened and used without completing lighting and alignments. Moreover, most of the two-lane rural roads are without edge and midline alignments to limit and separate opposite driving direction lanes. The roads lack roadside reflector posts which is very important when driving at night. Operation and maintenance of the existing lighting and alignments are additionally inadequate.
- Speed bumps, as a cost effective injury prevention measure, have widely been installed on the roads. However, poor signing prior to the high speed bumps becomes a serious hazard if it is not discovered well in advance by the driver. Moreover, the speed bumps are sometimes installed for one direction of the traffic which encourages drivers to drive on the wrong side of the road to avoid the speed bump.
- Most of the accident-prone existing roads lack roadside crash barriers. The newly built roads, however, include crash barriers but the appropriate operation and maintenance actions of the roads are not followed.
- Operation and maintenance of the roads are not followed by proper actions leading to quick physical failure and dangerous traffic states.
- Construction materials on the roads, coinciding with the new constructions of buildings and roads, are serious physical hazards on the roads. Moreover, poor temporary diversion of the roads and lack of information prior and during the diversion result in serious accidents and bad traffic flow.
- Many illegal markets, restaurants, houses and peddlers on the roads also lead to conflicts between high and low speed traffic including vulnerable road users.

Vehicle Factor: There are more than 1,250,000 registered vehicles in Kurdistan with an increase of 10% annually. The increase in developed countries, for instance Sweden, is 2% only. Vehicle conditions are good in general as they are equipped with relatively new passive and active safety devices. There are annual advanced vehicle controls. The problem, however, is the lack of qualified technicians to maintain the advanced systems. Another serious problem is, similar to deactivating the seatbelt warning system, that quite a few drivers deactivate the airbag system in order to keep their car from damage associated with the deployment of airbags.

METHODOLOGY OF THE NEW STRATEGY

Many efforts by individuals and organizations have been conducted to create the political will to improve traffic safety on the national level. These efforts consisted of traditional approaches such as the political will to commit resources, establishing an institutional framework to coordinate activities concerning traffic safety, developing goals and sub-goals, gathering scientific evidence of the magnitude of the threat, identifying deficiencies in the current traffic safety system, and developing a social strategy for organizing effective interventions. However, the efforts were unsuccessful in affecting the decision-making process and the existing policy to prioritize traffic safety and to consider the problem as a public health issue. This lack of success is partly because public acknowledgment for the reasons of the problem range between seeing accidents as fatalistic, unavoidable outcomes of development, or simply placing the blame on the drivers. While it is clear that the current strategy for improving road safety in the Kurdistan Region is largely ineffective, certain aspects of the above mentioned interventions could still contribute in part to the long term goal and strategies to improve road safety in the region.

The new approach, in this study, is to develop a new driving test and training system based on the 4 E's model which are: Engineering, Education, Enforcement, and Encouragement. The current road network in the region lacks important features of safe driving and does not meet standards and regulations. Thus, a standardized route on a section of public roadway which includes the required road safety features, is required to conduct a safe driving test. This is the core of the methodology in this study. This study proposes that a limited route within the existing road network, no less than 10 kilometers and with moderate traffic density, be defined and upgraded according to the standards. The route should include important features of traffic flow and safety such as traffic signs, U-Turn, round about, lane-keeping, traffic light, give-away, primary-road, pedestrian crosswalks, alignments, residential area, etc. Further, the controlled route should be heavily monitored to limit traffic violations and enforce legal driving on this portion of the roadway.

The next step is to adapt the driver test and training, including a theory test, at a university as a part of the education program for a limited number of final year students. Further, it is important to publicize in the media the new strategy and goals of the controlled portion of the roadway prior to conducting the driving test. The aim of the test is to carefully evaluate the effectiveness of the new method and improve the model based on feedback from the test, which is important for untested assumptions. After an initial implementation, evaluation must be carried out on the effectiveness of conducting driving test on the controlled portion of roadway. From this evaluation, the new strategy can be adapted and generalized into a new method for driver education which can be applied in other cities as a part of the education program for final year student at all universities. The number of graduated students in Kurdistan in 2014 was 27,275 students. Therefore, the implementation of the university education portion of the project is a very large scale program. Many professional examiners and driving schools need to be prepared for both the training and driving tests to be conducted.

In this way, the new proposed system will teach a large group of the most educated class how to properly operate their vehicles more efficiently and safely. Moreover, the route allows licensed drivers, optionally or through an enforcement program, to retrain and experience driving on standard routes which may lead to a gradual improvement in drivers' awareness. The standard route can also be used as a model and starting point to successively standardize the current road network as new roads are constructed.

CONCLUSIONS AND RECOMMENDATIONS

The political power is making motor vehicles the dominant mode of transport followed by extensive road building program. Moreover, the main focus in building the roads is to optimize mobility and flow of vehicles without proper plans to include traffic safety. Worsening traffic safety year after year is an indication that the practiced methods are not affective. Nonetheless, traditional views and approaches are still dominating. While the traditional strategy to improving road safety is ineffective, it is difficult to change from the top due to economic and political challenges. The rapid increase in the use of private car transport, upgrading old roads and constructing new roads that do not meet safety standards, and the lack of driver education led to increasing traffic accidents. Clearly, the traffic safety knowledge of drivers and the social environment were not prepared for the rapid changes leading to an increase in traffic accidents. Road safety in general, and the problems with vulnerable road users in particular, are not prioritized in updating the old road nor in constructing the new ones. Therefore, as new roads are built or old roads updated that

do not meet safety standards, they are building mistakes into their rapid growing road network which will require large amounts of money in the future to correct them. The blame of the poor safety performance, however, is mainly placed on the drivers. Based on the traffic safety research performed on developed countries, the main cause of accidents is human factors or automobile operator error. However, it is taken for granted that the developed countries already have a good road infrastructure, signing, and good vehicle condition.

Improving traffic safety in Kurdistan requires a strong political will, institutional framework to coordinate activities, feasible goals, funding from the national budget and interventions based on scientific evidences. The decision makers haven't prioritized traffic safety, despite more than 1,114 road deaths in 2013 and increasing fatalities annually. Thus, Kurdistan is 45 years behind developed countries when considering that road fatalities in the developed countries started to decline in the beginning of 1970's.

The suggested strategy in this study is based on the results of the survey which showed that licensed drivers do not know how to properly operate their vehicle according to driving regulations and were unable to correctly read road signs. The core of this method is to include an evaluated driving license tests in the universities final year program. This may gradually lead to an increased knowledge about the seriousness of the traffic safety problem among the public and politicians enabling them to rightly consider road deaths as a public health problem.

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