From Theory to Reality, Road Safety in Colombia

Álvaro M. Mejía
Universidad Antonio Nariño
Facultad de Ingeniería Civil
Sede Pereira, Colombia

Diego A. Escobar
Universidad Nacional de Colombia - Sede Manizales
Departamento de Ingeniería Civil
Facultad de Ingeniería y Arquitectura, Colombia

Carlos A. Moncada
Universidad Nacional de Colombia - Sede Bogotá
Departamento de Ingeniería Civil y Agrícola
Facultad de Ingeniería, Colombia

Abstract
During the last year, accident rates in Colombia have decreased significantly, and the efforts that the state has made in the matter have had effect: with the creation of the National Road Safety Agency, strategies that affect the reduction of human losses as a consequence of traffic accidents have been channeled. On the other hand, because direct actors in this issue, such as the driver and the pedestrian, do not seem interested in the seriousness of the situation, there have been more victims what the armed conflict in our country has left. This research addresses, the opinions of theorists, national and international institutions, from a specialized literary review, relating it to programs and policies that have been implemented to mitigate the impact of the high degree of accident rate that the statistics show and what is evident in the reality and in the day to day.

Keywords: road safety, accident, audits, risks, strategies, citizen, pedestrian, companion
1 Introduction

To deal with road safety, traffic must be addressed first, and then accidents caused by vehicles on roads built without taking into account some national and international regulations that present flaws in their designs [11]. Vehicle traffic is a growing phenomenon that with the increase of vehicle use has caused large-scale problems related to safety, congestion, energy consumption, polluting emissions, land use associated with a never satisfied demand of public roads [21]. Among the causes that have influenced its continuous expansion, it can be mentioned that citizens, for the most part, associate cars with concepts as prized as those of prosperity, mobility and freedom [4]. The growing use of the automobile means billions of journeys, which will generate an increase in global energy demand, which will grow by more than a third. Likewise, according to the World Health Organization [33], said increase is causing 1.25 million deaths/year (similar to those caused by diabetes and trachea or lung cancer) and more than 50 million seriously injured, and by 2030 it is expected to reach the figure of 2.5 million deaths/year, as the fifth cause of death worldwide, mainly due to injuries caused by traffic in the group of 15 to 29 years of age [14]. Injuries due to traffic accidents are the cause of a high number of death and, in the case of low and middle income countries, deaths are caused by traffic accidents and 90% of the hospital emergency services corresponds to traffic accidents. Figure 1 shows that Africa leads the death rate by this factor with a 26.6 while Europe registers the lowest index with a 9.3, the 19.9 of Asia and Oceania corresponds to countries with a large population and medium income, such as the cases of India, Pakistan, Oceania and the Pacific Islands [33].

The burden that traffic accidents represent to our society is very high, implying the use of human, financial and infrastructure resources that could be directed to other priorities. In addition, future projections are not very optimistic [14], as evidenced in Figure 2. Therefore the WHO, in its road safety plan (which member countries must adopt), performs the following projections, which are very encouraging in terms of the reduction expected in relation to the loss rate, falling from 1.3 million people in 2011 to 850,000 for 2020 and another very pessimistic projection to pass 1.3 million people died in 2011 to 1.75 by the same year. To reduce the number of deaths and injuries due to traffic accidents, it is necessary to adopt a safety system approach in order to guarantee a safe transportation system for all road users.

Once the current situation and the rates of violent deaths given the accident in transport are analyzed, it is necessary to understand the meaning of road safety (RS). RS is based on rules as well as management and control systems that seek to reduce the likelihood of injuries, shocks, etc., and their consequences. For Valverde (2015), the RS's main objective is to protect the lives of human beings and assets by mitigating the elements that may cause a loss or at least reduce its severity, taking into account the rules and laws that exist around circulation and mobilization of people and automobiles, through the streets, roads and cycle routes.
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Figure 1. Mortality rate due to road transport accidents per 100,000 inhabitants according to region. Source: Made by the authors from the EEVV data of the DANE Ministry of Health and Social Protection (2018) and Global status report on road safety (2015).

Other authors use the term traffic safety of transport under different conceptions, for example, road safety covers all types of traffic, air, rail, water or road and is defined as the most important system of each traffic operation and basic components required in the safety measurement of each transport used [16]. It is also established that transport safety is the most important principle of each operation of the transportation system as such and is a basic component of all measures that avoid the risk of accidents [15]. At an individual level, traffic safety is related to the absence of danger and the safety experience [8]; however, the traffic system is considered a system of dynamic and complex interactions between the following factors: road infrastructure, user, road and vehicle [12].
Another conception of transport security is related to the use of safety indicators by which all interactions are placed on the same scale with safe variables at one end and (fatal) accidents at another [3].

The accident figures reported carry direct and indirect costs that not only cover the state and insurers but also falls on the families of the victims. Additionally, indirect effects of accidents that seem to have more deadly consequences are added, in addition to the increase of other costs such as the loss of functionality of those involved in the accident that may lead to unemployment, economic instability and insecurity, among others. This global panorama raises a review about the methods of primary prevention [30] to avoid traffic accidents, an analysis of the psychological capabilities necessary for proper performance while driving a car but also be made, showing that the possible mechanical failures in Colombia have an appropriate and functional regulation [28]. The main purpose of the state is to work jointly with all government and academic bodies to reduce accident rates in the country. For this reason, the National Road Safety Agency (ANSV) and the strategies proposed by the State have been put in place. Therefore, it continues to be a topic of permanent reflection, both in governmental entities, as well as in public policies and in the academy. In this sense, this document aims to analyze how road safety policies have been developed after the creation of the ANSV in Colombia, and how these policies have been passed on to the real context.

2 Main variables in road safety

Road safety must be conceived as a system and its properties should therefore be analyzed as a whole, in a global and integrated way. The system comprises a variety of activities or processes in which different actors interact in physical environments through the use or not of means of transport. It is important to note that, ideally, it is necessary that this social system has a free of conflicts and contradictions dynamic, since its purpose is the prevalence of people's lives, in addition to the optimal maintenance of infrastructure [20, 27]. For the Pan American Health Organization (PAHO) and the World Health Organization (WHO), road safety is an appropriate and effective instrument to prevent traffic deaths and injuries, and the ministries of health, in coordination with other sectors in each country, have the responsibility of directing policies to comply with the objectives of prevention and control of damage to health [23]. On the other hand, for Cabrera (2009), road safety is the set of actions and mechanisms that ensure the proper functioning of traffic circulation through the use of laws, norms, and regulations of conduct, whether as a pedestrian, passenger or driver, in order to correctly use the public road preventing traffic accidents. The way drivers or pedestrians act on roads is determined by the degree of education or road instruction received during the different stages of life [26]. Hence, if there is a better road education of the population, there will be lower health expenses due to traffic accidents.
2.1 Road safety education

The increase in the severity and mortality rate due to traffic accidents worldwide is a warning to the need to dedicate greater efforts to education in road safety [25] until reaching a road culture according to the current road dynamics. There are fundamental causes that originate accidents such as humans, different vehicles and their technical conditions and road infrastructure. Likewise, the main protection measures currently taken to guarantee people's lives are: the safety belt, the airbag and the protections for children, the use of the helmet and reflective vests on motorcycles and bicycles, the use of protective barriers against collisions in the central area of high-speed roads and covering of rigid objects on the sides of the road [25].

2.2 Current approach to traffic accidents as a public health problem

Each year, more than 20 million people suffer serious injuries or death on the roads of the world. The incidence is greater in developing countries, where it will continue to increase due to the rapid expansion of the vehicle fleet. In addition to the direct costs associated with road injuries and deaths, the increase in the number of vehicles and the maintenance of certain transport policies have other serious health impacts as well as broader social, economic and environmental effects [13]. In some countries, air pollution attributable to road transport causes even more fatalities than traffic accidents [17]. In addition to the direct effects it has on respiratory and coronary diseases, motorized transport produces approximately a quarter of the anthropogenic emissions of gases responsible for climate change [9]. These "hidden epidemics" receive relatively little national or international attention compared to that of the major communicable and noncommunicable diseases. It has been found that automobiles have much greater lethal effects in developing countries than in those with high motorization rates; in some cases the difference is of the order of 200 times [19]. Since the car fleet tends to increase rapidly in developing countries, roads are becoming significantly more dangerous. Just as an increase in the use of vehicles can be expected, it is also possible to predict an increase in deaths and injuries among vulnerable road users [32].

2.3 Road safety policies

Technical progress and lifestyle changes in humans, including travel, cause changes in mobility patterns, which translate into an increase in the volume of traffic and the number of kilometers driven per year, that is, the increase in traffic directly increases the number of traffic accidents. Since 1962, the social concept of road safety, understood as the prevention of events and effects due to road accidents, as well as the dynamics of its epidemiology, have been objects of global interest with special leadership from the WHO [22]. Recognizing that injuries caused by traffic accidents are a public health problem and one of the leading causes of death and injury worldwide, with significant health and socioeconomic costs, in 1974, the
WHO World Assembly adopted resolution WHA 2759 to declare traffic accidents as a relevant issue in public health and call on its member states to implement the recommended actions to address it [31]. Before the pandemic of road accidents, which accumulated an estimated 25 million deaths until 1997, WHO established a department for the prevention of injuries and violence to develop, among others, a specific strategy with activities to prevent traffic accidents [7, 24]. In successive resolutions adopted since 2003, the General Assembly of the United Nations has been drawing attention to the global road safety crisis and the need to apply good practices. In its resolution 58/289 of 2004 on the improvement of road safety in the world, it invited the World Health Organization to coordinate road safety issues within the United Nations system, in close collaboration with the regional commissions. The World Health Assembly accepted that invitation in its resolution WHA 57.10 (2004), after which the World Health Organization facilitated the creation of the United Nations Collaborative Group for Road Safety [33].

Finally, road safety was one of the topics included in the 2030 Agenda for Sustainable Development that the UN approved in September 2015. One of the goals aims to halve the number of deaths and injuries caused by traffic accidents in the world by 2020, and another target, set for 2030, is set to provide access to safe, affordable, accessible and sustainable transport systems for all and improve road safety, in particular by expanding public transport, paying special attention to the needs of people in situations of vulnerability, women, children, people with disabilities and the elderly [6].

3. Road safety in Colombia

According to preliminary information from the National Road Safety Observatory between January and November 2017, a total of 5,833 deaths and 34,968 injuries were recorded. These figures reflect a reduction of 5.9% (363) in the deceased and 8.5 (3,268) in the injured compared to the same period in 2016. It is important to note that the reductions are recorded in a generalized manner for each of the types of road actors, with the exception of the deaths of cyclists that do not register variation and of the passengers and companions of other types of motor vehicles that increased by 2.8% (See Figure 3) [2]. As shown in Figure 4, between January and November 2017, motorcycle users were the main victims of traffic events, representing 50.4% of the total number of deaths and 56.8% of the injured. They are followed by pedestrians, representing 26.7% of those killed and 19.2% of those injured in traffic events. It is also worth noting that, as of 2017, 37% of the pedestrians killed were hit by a motorcycle, a figure that rises to 49% in the case of pedestrians injured in traffic events [2].
Figure 3. Percentage change in victims of traffic events according to the condition of the victim. Colombia. January - November, 2017 p - 2016 *.
Source: Made by the authors based on data processed by the National Observatory of Road Safety (ONSV) based on information from the National Institute of Legal Medicine and Forensic Sciences (INMLCF).

Figure 4. Who are the victims in traffic accidents in Colombia. Source: Data processed by the National Observatory of Road Safety [2], based on information from the National Institute of Legal Medicine and Forensic Sciences (INMLCF).

These worrisome figures of road accidents urged the National Government to seek the breaking of these records with campaigns and the signing of inter-administrative agreements with departments and cities that want to work on the prevention of these accidents. This is not a small matter if one takes into account that, after the homicides, the greatest number of Colombians who die violently corresponds to those who die on streets and highways throughout the country driving, as passengers of a vehicle or as pedestrians. Although any reduction is positive on this issue, there is still a long way to go, if one takes into account that Colombia's goal
is to reduce the number of deaths in road traffic by 8% by 2017, compared to the
total figure of 2016, which was more than 7,000 deaths. And by the year 2021, this
fall should be 27%, according to information from the ANSV, the state entity in
charge of overseeing the policy to achieve these ambitious tasks.

3.1 The institutionality and management of road safety in Colombia

In Colombia, the attempt to apply road safety policies begins with the definition
of the legal provisions of Law 100 of 1993 that regulates the operation of compulsory
insurance for traffic accidents and Law 105 of 1993 by which basic provisions on
transportation are issued, competences are redistributed between the nation and
territorial entities, and planning is regulated. On the other hand, these efforts have
been supported through Law 1450 of 2011, generating a development plan that
established road safety as a priority for the government. Additionally, it was learned
that the World Health Organization suggested that the nations of the world elaborate
strategic road safety plans that promote the protection and preservation of human
life. Consequently, in December 2015, the operation of the ANSV was launched,
in order to reduce the high accident rates. Although in 2017 there was a reduction
in deaths due to traffic accidents compared to 2016, it is still worrisome that the
second cause of violent deaths in the country is traffic accidents.

Road safety policies are made up of multiple sectoral actions that, in order to
manage them effectively and efficiently, must be observed as a set called Road
Safety System: drivers' training, compliance with the rules, defense of the rights of
road users, transportation system, infrastructure, vehicles, victim assistance, etc.
There are several actors that participate in the scenario of road safety in Colombia,
both at a national level, in a multisectoral manner, and at a territorial level. The
Ministry of Transport has the leadership and coordination of the National Road
Safety Policy in the country. For the design of policies and approval of the
regulatory framework, for the application of standards and for the management of
measures, various administrations of the state and territorial scope intervene: the
ministries, the governorates and the mayorships, ordered according to the five
pillars recommended by the World Health Organization.

3.2 Regulatory framework

Regarding the regulatory framework on road safety in Colombia, it is very broad
and varied and therefore of great complexity, which generates limitations in its
application by the competent authorities, whose management would be easier if
they had a framework of comprehensive, clear and effective provisions, against the
exercise of the different competences and the regulatory conditions of each one of
the aspects of road safety. It is important to mention that the creation of a Leading
Agency for Road Safety corresponds to the development of various constitutional
and legal precepts, which impose respect for the axiological values of the state and
the duty to guarantee certain rights, clearly related to road safety. Thus, first there
are some dogmatic postulates of a constitutional nature, such as Articles 1, 2, 24, 79, 365 and 366 of the Political Constitution, in which the commitment of the Colombian state to adopt the measures that are numbered to guarantee their inhabitants’ right to move safely is evident. In the National Development Plan 2014-2018, it was determined that road safety in Colombia is a state policy, and it was estimated that it proposed to reduce deaths from traffic accidents by 8% and, by 2021, the goal is a reduction of 26%. In Colombia, organizations, companies or public or private entities must register the Strategic Road Safety Plan before the transit agency or whoever takes their place. In case of not having a transit agency in the municipality, it must be done before the Municipal Mayor's Office. When dealing with companies, organizations or entities of the national order, the registration must be made before the Superintendence of Ports and Transportation which is a guide for companies to design their Strategic Road Safety Plan (PESV\textsuperscript{1}) [18].

3.3 Strategies to improve road safety

According to the report of the World Health Organization, injuries due to traffic accidents are avoidable and therefore governments must adopt measures to address road safety in a holistic manner. Effective interventions include the design of safer infrastructure and the incorporation of road safety elements in planning land use and transportation; the improvement of the safety devices in the vehicles and the attention to the victims of traffic accidents; the establishment and application of standards relating to the main risks; and the increase of public awareness. WHO, together with the member countries, is working to improve road safety and its objective is to support the planning and implementation of road safety policies [34].

Four specific strategies are clearly defined to improve road safety in Colombia:

- Definition of a governing body that has the capacity to assess the problem, policies and institutional areas; prepare a national strategy and action plan; allocate human and financial resources to address the problem; execute specific actions and support the development of national capacity and international cooperation; define objectives; improve legislation and insurance coverage for the most vulnerable people; and effectively deal with public spaces (such as streets and roads) that respond to the needs of the people and ensure the attention of the victims. It is the specific strategy of the National Government.

- Interaction between researchers and professionals: The main interests of political decision makers in terms of road safety lie in understanding the social and public health problems associated with traffic accidents. They will require to know, among others, the impact of injuries and deaths caused by traffic, in relation to other problems, and to have knowledge (theories, models) to analyze and successfully reduce these problems through appropriate policies. The theories and models in a broad sense related to road safety are thus shown as very useful ingredients for the political level to facilitate their task [1].
Activities to promote road safety: The document Decade of Action for Road Safety 2011-2020 focuses on the types of initiatives that countries and organizations can undertake, which are based on five fundamental pillars: road safety management; more secure transit and mobility routes; safer vehicles; more secure users; response after accidents.

Definition of the Strategic Road Safety Plans as a planning tool for actions, mechanisms, strategies and measures, which must be adopted in a mandatory manner by different public or private entities, in order to avoid and reduce the accident rate of the members of their organizations and reduce the effects of traffic accidents.

4 Discussion

When reflecting on road safety, one should try to obtain a solid idea that allows establishing and understanding the guidelines it has, and at the same time to decipher the confusion that can be generated by identifying threats and vulnerabilities that facilitate the calculation of risk levels on streets and highways. It is required to obtain a comprehensive knowledge, that is, to take into account the different perspectives and characteristics that make up road safety. These characteristics are based on three essential elements that are directly related to the prevention and preservation of life [5].

The discussion focuses on three main elements: a) the first is multidisciplinarity, the need to work with the different areas and actors that are directly involved in the development of road safety, including health, transport, education, public works, urban and environmental development, to achieve success and efficiency in road safety interventions, which in most cases is ignored in the projects that are developed in the country and more directly in the cities; b) the second is sustainability, achieving an effective impact in the long term. Instead of fleeting results, efforts are made to ensure that road safety interventions can be preserved and reproduced, that is, that the proposals, actions and their effects are lasting; c) the third is the different roles that are represented by all the actors in daily life such as the professional, personal, social and global role. These three elements of discussion allow having a broader view of the problem and its possible solutions.

Betting on obtaining multidisciplinarity, sustainability and the importance of the congruence of the roles played daily by the actors on the roads, will allow obtaining a comprehensive overview of the challenge they face, the strategies currently implemented in the country and the opportunities for improvement in order to achieve the goals and objectives of sustainable development and the decade of action for road safety. The reality of road safety in the region has consequences on social and economic development, since low and middle income countries are the most affected by road safety deficiencies, leaving whole families in situations of poverty. Low-income countries have the highest percentage of deaths of vulnerable users by 57%. It is estimated that each year, traffic accidents cost $518 billion globally.
This amount in low and middle income countries represents between 1% and up to 5% of its GDP, equivalent to about $65 billion dollars. According to estimates of the Ministry of Transportation presented in the National Road Safety Plan, annual traffic accidents in Colombia represent the economy close to 1.5% of GDP, that is, more than 6 billion pesos.

Currently, the aim is to change the paradigm under which road safety was conceived, avoiding the use of the term "accidents" and starting to call them "incidents". The reason is that when people talk about accidents they are referring to events that cannot be prevented and happen unexpectedly, while when talking about incidents there is the possibility of referring to the facts as predictable and preventable, which means that they can be avoided. By changing that paradigm, not only the consequences of the injuries caused by the transit can be identified, but also the elements that contribute to their occurrence. Having a comprehensive vision of the problem allows realizing the need to approach the situation from a multidisciplinary approach. Traffic accidents are not causal, they are products of a series of factors that, when interacting with each others, provoke them. Therefore, considering those factors establishes the difference between having fatal consequences or preserving people's lives.

The evolution of road safety, measured as the number of victims per unit of mobility or park unit, has been characterized by a constant improvement since the beginning of the phenomenon of motorization. This phenomenon is observable in all the countries for which information is available. In the most developed countries, the absolute number of victims has declined steadily since the early 1970s [5]. Some of the main problems in road safety research shown by experience would be:

- The unequal quality, with a combination of high and low quality;
- The limited number of qualified researchers in the field of road safety;
- The weak connection between traditional sciences and road safety research;
- The excessive mobility of researchers in the field of road safety.

In general, the learning process and its accumulation in road safety research is not satisfactory, that is why in order to be able to accumulate useful knowledge and use the results to take measures in real life, it is necessary to base the research in theories and models. Precisely, the lack of a theoretical basis unfortunately in road safety has been more pronounced than in other areas of research. Consequently, it is difficult to interpret, integrate, summarize, compare and synthesize the results. At the same time, there have been investigations where when evaluating different cases of engineering treatments in a period of time, such as the one related to measures taken in a period of 14 years (1984-1997) in 50 American states, the results found on the accidents would have been due mainly to demographic factors, passive safety and advances in medical technology [21]. Therefore, people should not only focus on the components but broadly on the behavior of road users.
5 Conclusion

Traffic accidents show imbalances in the social agreements that regulate the forms of creation and occupation of public space. In the same way, they show problems in the design and construction of both the road and urban infrastructure. This makes them one of the problems in which the conflict between the urban space and the society that produces it is most clearly shown. In this context, road accidents must be addressed in a comprehensive manner, involving road safety from the conception and design of projects through a planned and coordinated process that is based both on technical and economic resources to achieve the required standards that guarantee security of each one of the actors involved in the use of the infrastructure. Road accident is a public health problem that requires joint actions by all involved to protect the integrity of Colombians.

From the analysis of the bibliographic information it can be evidenced that road safety policies that Colombia currently has (PNSV, 2011-2016) are consistent and aligned with international parameters, such as the World Plan for the Decade of Action for Road Safety 2011-2030 (WHO) and the 2030 Agenda for Sustainable Development, which are coordinated internationally by the World Health Organization itself and the UN regional commissions that periodically, in the framework of the Collaborative Group for Road Safety, analyze and verify the progress made worldwide towards the achievement of the goals determined in the action plan.

Some of the Colombian strategies that have been applied and that are part of the conclusions as practical tools for the reduction of accident rates in Colombia are:

- The application of Road Safety Audits as a prevention tool, applied in the planning, construction and operation stages of the infrastructure.
- The creation of inter-institutional committees and commissions to promote and apply policies on road safety.
- The generation of security strategies that must be applied from the national level to the local level.
- The need to have municipal plans for road safety and the regulations and resources required to make them effective.

The strategies above must be specified through action plans that allow them to be implemented and, once structured, identify the resources necessary for their application.

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