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Safety analysis of transportation chain for dangerous goods: A case study in Colombia

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Abstract

In recent years, the accident rates of freight transportation in the towns of Colombia have increased. The risk related to the transport of dangerous goods and its impact on transport chain is not well-known for the companies or the national authorities. Municipalities do not have a specific legislation for the transportation of these materials inside urban areas and is the Ministry of Infrastructure and Transportation that regulates this type of freight movements in road national network, including roads across urban areas. The main objective of this research was to develop a methodology focused on identifies the key variables that would allow us to propose a set of strategic and operational indicators to integrate road safety in the transport chain of major dangerous products transported by road in Colombia. The methodology assessed the degree to which road safety is within the strategic and operational planning by the stakeholders of the transport chain as well as the identification of compliance with the law by freight generators, carriers and drivers carrying HAZMAT in urban areas in Colombia. The research is aimed to contribute to the analysis to integrate road safety into strategic and operational planning of transportation chain and to implement public policies in order to improve the transport chain of HAZMAT in Colombian cities, along with specific indicators to enhance the performance of the transport chain by the organizations involved.

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Keywords: Freight Transport; Dangerous Goods; Supply Chain; Safety; Indicators; HAZMAT

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1. Introduction

Deaths from traffic accidents are a public health problem worldwide and are the ninth leading cause of morbidity, which generates high social and economic costs for countries. According with the statistics of the World Health Organization-WHO, Latin America showed the highest mortality rate with 26.1 deaths per 100,000 inhabitants (WHO, 2004).

The Ministry of Infrastructure and Transportation regulates the transportation of dangerous goods in Colombia, including urban areas. In Colombia there are no restrictions for the transportation of this type of materials inside towns and cities. General regulation defines HAZMAT as "materials, substances or articles that have potential risk to the health, property or the environment" (Mintransporte, 2008), but in this research we did not find official and specific statistics for accidents of vehicles carrying HAZMAT in the country nor in urban areas. However, based on information collected for this study, it was found that during 2012 in Colombia there were 194,221 accidents and 6,152 fatalities in traffic accidents (Mintransporte, 2014), the road accidents related to freight transport were 27,012 for the country and 18,697 in the urban areas (Mintransporte, 2013a).

In 2012 were transported by road more than 162 million tons of goods and 21 million tons were dangerous goods. 87% of dangerous goods correspond to flammable liquids and 9% to gases. However, there is no specific information on the number of traffic accidents or incidents with vehicles carrying dangerous goods. The transport of dangerous goods in urban areas in Colombia represents a greater risk, because there are not exclusive lanes or routes for this type of transport, i.e. the vehicles can pass through any area or any urban road.

This research aims to propose a methodology to integrate security into the strategic and operational planning of the supply chain of major hazardous products transported in the country, specifically in the distribution part of transport chain.

The paper is divided in five parts: part one includes a summary of secondary data, which allowed the definition of main dangerous goods transported by road in the country. In the second part, the research methodology was defined: sample design; methods for surveys to main stakeholders: drivers, carriers, and managers; and in step three, the analysis of the results of surveys was performed.

The fourth part proposes an approach to integrate security into the strategic and operational planning of the transport supply chain for the main types of dangerous goods in Colombia with a set of KPI (Key Performance Indicators) to manage safety performance. Finally in part five the discussion of the results, conclusions and recommendations of the research are presented.

2. Background

According to the research conducted in 2009 by WHO, 5,409 deaths in Colombia are related with traffic accidents, of which 17.2% are driver/passenger four-wheel vehicles; 36.1% driver/passenger two and three-wheel; 7.7% cyclists; 33.6% pedestrians and 5.5% are unspecified (WHO, 2009). The number of accidents in Colombia in 2010 shows that of 76,336 serious accidents, 68,862 were in urban areas. The number of road accidents that occurred in 2012 was 194,221 accidents and 6,152 deaths, with a 5.6% increase in the number of accidents and 5.5% in the number of deaths over the previous year (Mintransporte, 2014). At present in Colombia there are no official statistics for accidents involving dangerous goods vehicles in urban areas.

The main national road network in Colombia has 100,419 kilometers. The number of trucks is 350,961 (3.6% of total motorized vehicles): 257,190 medium trucks; 62,513 trailers, 31,235 dump trucks and 417,668 people are licensed to drive trucks (Mintransporte, 2014).

In 2009 were transported by road 21.5 million tons and 893,000 trips were made. Transportation of dangerous goods is equivalent to 13% of goods transported in Colombia. 79% of the dangerous goods are transported in trailer vehicles and 10.9% in 2-axle conventional trucks (Mintransporte, 2013b).

The transport of dangerous goods is regulated by Decree 1 609 of 2002, whereby is defined the management of land transport of dangerous goods by roads. In this decree the classification of dangerous goods defined by the United Nations Organization (UN) is established.

In Colombia according to origin-destination freight survey of years 2002 to 2009 and the UN classification, the main dangerous goods transported by road are Class 3: Flammable Liquids (87.4%) and Class 2: Gases (8.7%),