

Infrastructure in the transport of goods by road in Colombia; A comparative analysis in the framework of the Pacific Alliance¹

Julián Peñuela Betancur
julianpenuelabetancur0724@gmail.com

Karina Romero Serna
karinaromeroserna@hotmail.com

María Elisa Olivar Hernández
mayoliza-1997@hotmail.com

International Business
Institución Universitaria Esumer
Medellín - Antioquia
2020

¹ This text presents the results of the research: What effects does the road infrastructure have on the transport of goods in Colombia, carried out in the year 2020 as a requirement for the degree of International Negotiator of the Esumer University Institution.

Abstract

Through a comparative analysis, this article takes a look at the road freight transport infrastructure faced by the countries of the Pacific Alliance, a descriptive comparative relationship of the roads that each country has paved and in good condition, according with the kilometers and surface of each one, its investments in infrastructure and losses due to theft in the transport of merchandise by road caused by road insecurity. Presenting a logistical perspective on the situation faced by Colombia and the challenges posed by alliances and trade agreements

Keywords

Infrastructure, roads, investment, costs, logistics, theft, road insecurity

Introduction

Road transport is an important sector for international trade and the movement of goods (Rojas, 2014). Therefore, the road infrastructure of each country becomes an important element for optimal performance in the transport of goods, understanding that most countries, and especially Latin American countries, do not meet the expectations of that performance, which is usually in the eyes of the rest of the world, because in terms of investment these countries are still attractive, (Guzmán, 2015).

Road infrastructure in Latin American countries does not stand out for having the best road network, but it is an important point to examine because it has a direct influence on logistics, imports and exports of goods in each country, which makes it relevant to study this issue, reviewing some aspects, which according to various authors, not only logistics would be involved, but also the influence on competitiveness (Guzmán, 2015), from this affirmation, the question arises, how is the road infrastructure and the theft of goods in the transport of load in the framework of the countries that conform the Alliance of the Pacific?

This study is based, in addition to this introduction, on a review of the theory on road infrastructure and its relationship with logistics. It aims to compare the roads and road network of the countries

belonging to the Pacific Alliance, examine the investment of the Gross Domestic Product (GDP) in road infrastructure of the same countries and show the losses due to cargo theft in land transport in Chile, Peru, Mexico and Colombia. In addition, it briefly outlines the methodology for the preparation of this article, and ends with the conclusions.

1. Theoretical framework

Each country, in accordance with what identifies it in commercial matters before the others, faces, according to its circumstances, challenges that in one way or another are present when one enters to compare them. The great challenges that Colombia has tried to face are the insecurity in the transport of goods and its deficient road infrastructure in terms of highways, important factors, more so when it is an importing country and its ports are relatively far from the cities where production and trade are more concentrated, In addition, it is also part of trade treaties and alliances, with which it may be in a better or worse situation in terms of losses caused by transport theft and cost overruns due to its precarious road transport infrastructure, a situation that is analyzed below from the perspective of several authors.

Acevedo (2009) maintains that the Colombian road infrastructure suffers from a backlog, especially in those areas where exports leave and where imports arrive, the Andean Zone of the country. Acevedo affirms that the country exhibits a topography that completely challenges productivity and competitiveness in the international arena, which are only overcome with a good development in road infrastructure.

Competitiveness and productivity, in addition to economic investment, are part of what the author in his article aims to envision what perhaps Colombia could become in this sector, or better, what the country in terms of infrastructure should do, to avoid further delays in the international arena. Part of his argument is specific in the assembly and construction of variants and double carriageways, improvement and expansion of roads, among others, and all in order to be able to slightly amend the deficit in competitiveness that, according to the author, the country has.

In another context not far removed from the previous one, when countries enter into negotiations for some goods, the costs that may be generated are reviewed and analyzed in order to be able to mobilize them from the country of origin to their destination. Normally, in this review the experts realize that the cost of transport is one of the most influential in the purchase and sale of goods. Authors like Krugman (2012, págs. 44-45), has reviewed the impacts that this may have on economies due to the influence on the final costs of products, analyzes the possibility of producing or buying it, and concludes that it is better to produce it due to high transportation costs, this being, paradoxically, positive by forcing the national company to produce it, but on the other hand it reduces competitiveness in products that necessarily have to be brought from abroad.

In accordance with the above, it is important to inquire a bit regarding what has happened in Colombia in terms of highway infrastructure, since as mentioned above; it is a factor that the country must face. That is why, in his article De la Puente Pacheco (2012), affirms that part of the deficit in highway infrastructure is due to the restriction and the little investment that governments have granted to this sector, which produces a loss of competitiveness and more in terms of commercial alliances.

De la Puente Pacheco (2012), In his article, analytically, he deepens and reiterates that the greatest impact of the low investment and the restriction for road infrastructure effects that the Colombian government has, will be reflected in the development of the country's economy; Part of this situation, perhaps involves one of the reasons why Colombia, within the Pacific Alliance trade bloc, fails to equalize itself in infrastructure issues with its trade allies.

Continuing, Zamora Fandiño & Barrera Reyes (2012), Zamora and Barrera note that Colombia has a significant backwardness in terms of road infrastructure, emphasizing that there are no bridges, tunnels, roads, among others, which, together with the time factor, increasingly detracts from the country's productivity , which once again reiterates, represents damages for the economy. The authors indicate that for this situation to improve, human, technical, financial, political, and operational ties should be aligned and integrated into transparency, and, of course, the resources available to the country can be used optimally.

For his part, in the 44th Engineering Magazine of the Universidad de los Andes, Ospina Valle (2016) It also mentions that, not only is a good road infrastructure important in terms of main roads, but it also highlights the need for communication through secondary roads, which connect municipalities and rural areas, since these help to collect goods with greater precision without running the risk of them being lost or, in effect, not being able to make certain investments or carry out business in the absence of roads in good condition.

Land freight transport is very dependent on road infrastructure, now, is this dependence so deep that it involves the competitiveness of the country? Although it has already been said that the economy is impacted by the road infrastructure that each state has, in their thesis, Cetina Ordoñez & Parra Velandia (2017) show how important road infrastructure is in Colombia and how it influences the country's competitiveness, and that it is in some way at a disadvantage compared to those countries that are allies of the trade blocks or alliances, including the Pacific Alliance, since as mentioned before, road systems directly influence the transport of goods entering or leaving the country, generating little positive impact on the trade sectors.

Ordóñez and Parra analyze the state of road infrastructure in the country, to identify possible improvements and increase Colombian competitiveness. Also, in the same sense Rojas López & Ramírez Muriel (2018) indicate that it is important to prioritize investments in new routes, since 80% of the country's cargo is transported by road, so ensuring improvement and new investments would guarantee a more competitive economy.

Opening up the context of the previous authors a little more, it is possible to observe what is perceived, not only in Colombia, but also in the other members of the Pacific Alliance, with respect to road infrastructure and losses due to theft in the transport of goods. In its principle, it is emphasized that the Pacific Alliance, within everything, has an important role for all those countries that form it, as is the reduction of transport costs between the regions, and in this way to take advantage of what each one of them has to contribute. This promise, however, tends to be difficult, as these countries themselves have infrastructure with multiple levels of development and all make their investments and implement their road projects differently as expected.

For example Chile, according to the web portal EMB Construction (2008), has managed a good profile with respect to road infrastructure, since they are committed to improvement and its evolution, and even claim that compared to the rest of the Latin American countries, they have good infrastructure, however, it adds that, due to Of course there is much to improve and invest in order to strengthen this entire sector.

Mexico also aims at investment, the improvement of road highway infrastructures and the connection between its strategic areas. In an article in the Magazine of Transport and Territory number 13 (Florez, 2015), The different investments that governments have made over the years and their long and medium-term purposes for highway road infrastructure projects are mentioned, with the aim that at some point, Mexico may be located in one of the 20 countries with the best index of infrastructure competitiveness carried out by the World Economic Forum.

In the case of Peru, road infrastructure has had similar approaches to those described by various authors for Colombia, given that even more than Colombia, Peru faces significant challenges in the road infrastructure sector, and several authors associate the competitiveness of this country with the vague infrastructure they have. This is the case of Carrasco (2009), who in his thesis associates competitiveness with the national road infrastructure, a subject that was mentioned earlier, however, makes a note, where he states that investment in Peru for road networks are not the most optimal, and that although projects are made to improve them and make the most of what they have, there is much to be invested in Peru.

It is necessary to emphasize the coincidence in the theoretical review carried out, that from any perspective by which the road infrastructure and road insecurity are appreciated, the conceptual consistency of the previously described theories and their direct relation with international trade, competitiveness, productivity and investment of each country, to finally impact the economic development, becomes evident; having a common objective in the midst of thousands of challenges that involve each country, such as its population, geographical location, access to ports, governance, main economic activities, among others, it becomes imperative to achieve optimal conditions for the transport of goods and this article aims to give that perspective, where you can make an analytical comparison of the most recent years of these countries on the issue of losses due to

theft in the transport of goods and in the area of road infrastructure of roads and thus analyze their improvements, their significant investment among the Pacific Alliance, reflecting the results that are intended to reach as a trading block.

2. Methodology

The research carried out for this article is of a qualitative nature, and aims to visualize in an analytical and comparative way the roads that each country has paved and in good condition, according to the kilometers and surface of each one, their investments in infrastructure and the losses due to theft in the transportation of goods by road in Colombia and the member countries of the Pacific Alliance. These variables are supported by theoretical references, which coincide conceptually because of their impact on transport logistics, which is a key to the competitiveness of Colombia's international trade.

It is worth noting, that the information of the indicators mentioned above is extracted from sources and institutions of Colombia, such as the Ministry of Transport, National Association of Infrastructure - ANI, Colombian Chamber of Infrastructure, National Institute of Roads -INVIAS; international sources such as the World Bank, World Economic Forum -WEF, Inter-American Development Bank -IDB; and of course, national sources of each country researched.

The data that is extracted from the sources mentioned above, will allow, to present the results found and generate the different comparisons related to road infrastructure.

3. Results and/or findings

3.1. Infrastructure - roads and road network.

In previous paragraphs we have mentioned the term road infrastructure, its definition from the perspective of Vallverdu (2010), who in a special web portal EMB Construction, says that the road infrastructure "is the means through which the country is given land connectivity for the transport of people and cargo, allowing productive activities, services, entertainment and tourism" (Vallverdu, 2010). This definition allows us taking the context of what Colombia and the

countries of the Pacific Alliance seek for their own state, from the point of view of the transport of merchandise or goods.

The present article works with this definition of infrastructure, since it highlights the fact that it is the means by which road transport is connected. However, it is important within everything, to know how they are distributed in quantity, the road infrastructure of both Colombia and the other member countries of the Pacific Alliance. This information is found in the following table:

Kilometers in road network	
Country	Total of Kms
Colombia	205.937,00
Mexico	582.174,81
Peru	168.473,10
Chile	85.220,86

Table 1 Kilometers on the road network Year 2018

Source: Own elaboration, with data extracted from the CCI (Bitácora de la Infraestructura, 2020), *Info-transportes México* (2018) , *Subdirección de Desarrollo – Dirección Nacional de Vialidad de Chile* (2017)² and *Ministerio de Transportes y Comunicaciones* (2019) .

According to the table above, it can be detailed that of the four countries, the one that has more kilometers of roads in general terms is Mexico, however, it is not the country with the best road infrastructure, since of each extension that roads occupy in the countries described above, it reflects a percentage of primary, secondary and tertiary roads, which can be defined according to the INVIAS (2016), entity that indicates that primary roads are "those trunk roads, transversal roads and accesses to departmental capitals that fulfill the basic function of integrating the main production and consumption areas of the country and of this with the other countries", secondary roads are "those roads that join the municipal headwaters with each other and/or that come from a municipal headwaters and connect with a primary road" and finally tertiary roads, are "those access roads that join the municipal headwaters

² Compared to the other data, this one is from the year 2017, as it was the most recent information found in the research.

with their sidewalks or join sidewalks with each other"; In this order of ideas, the distribution of the road network in Colombia and the rest of the countries of the Pacific Alliance is shown below.

Road network distribution in Kms				
Roads	Colombia	Mexico	Peru	Chile
Primary	18.516,00	171.346,92	27.109,60	11.430,01
Secondary	45.137,00	340.287,17	27.505,60	15.489,51
Tertiary	142.284,00	70.540,72	113.857,90	58.301,34

Table 3 Road network distribution in km. 2018

Source: Own elaboration, with data extracted from the CCI (Bitácora de la Infraestructura, 2020), *Info-transportes México* (2018) , *Subdirección de Desarrollo – Dirección Nacional de Vialidad de Chile* (2017) and *Ministerio de Transportes y Comunicaciones* (2019) .

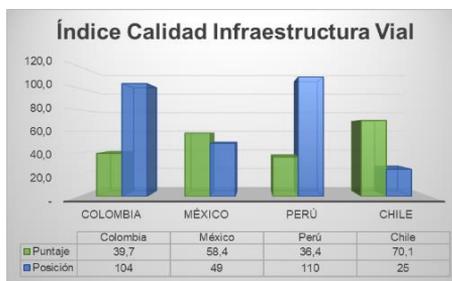
Analyzing the information in Table 2, it can be stated that, despite the fact that Mexico has the most extensive infrastructure network, the distribution of its roads is mainly centered on secondary roads, occupying 58.45% of its road infrastructure, much higher than Peru and Chile, which occupy 16.33% and 18.18% respectively, and in Colombia secondary roads occupy 21.92%. However, the scope of Colombia's infrastructure is no better than that of Mexico and Chile, since, despite the fact that each country has a different extension and more in terms of the distribution of its infrastructure networks, Mexico, according to the Global Competitiveness Index (2019), on the general transport infrastructure indicator, it leads the 4 countries, with a score of 57.4 (score of 0-100), and in the ranking of 141 countries studied it occupies position 51, being well above Colombia, (43.8 score; position 92/141), and Peru, (42.4 score; position 97/141), but not far behind Chile, which has a score of 56.6 and is in position 54 of 141 countries.

Although it has been mentioned that competitiveness is influenced by road infrastructure, there are factors that allow the connection between these two indicators to be a little more involved, since in the Global Competitiveness Index (2019), Chile surpasses Mexico in score and ranking, but this situation is due to the fact that there are a variety of indicators that participate in the elaboration of the report and can produce these types of results. Beyond the above, it is possible to visualize that, although in the transport infrastructure index, Mexico's figures are above Chile, in the road connectivity and infrastructure quality index, Chile stands out much more than

Mexico, Colombia and Peru and can be contrasted in the following graphs:



Graph 1



Graph 2

Source: Own elaboration, with data extracted from WEF (World Economic Forum, 2019)

As a result of these results, a hypothesis appears, which is not resolved in this work, but which leads to the question: why has Colombia not managed to achieve the recognition that Chile has? It is shown below that, in various periods, Colombia invests much more, as a percentage of GDP, in road infrastructure than Chile, and, even so, the latter has been above Colombia in ranking and scores on this important factor.

On the other hand, it is possible that the differences in these indexes are due to the roads, their effect and the number of paved roads, their condition and their durability over time, since Chile has a wide coverage of its paved roads in good condition, since even those that are not paved with asphalt are in a "basic" condition, since they are passable and have a good stability for the network; The case of Peru is different, since of the four countries it is the one with the lowest scores both in road connectivity and in the quality of infrastructure, it needs a lot to even equal Mexico, which has an extensive network of very low quality. It is clear for these countries that they have to work to get a quality road infrastructure, like Singapore, which is the best reference; it takes a lot of investment with good management. These are better understood with the information in the following table:

Condition of the road network in Kms						
Roads	Mexico		Peru		Chile	
Condition	Paved	Not Paved	Paved	Not Paved	Paved	Not Paved
Primary	50.519,92	120.827,00	21.434,00	5.675,61	9.353,96	2.076,05
Secondary	101.924,17	238.363,00	3.623,09	23.882,46	7.838,70	7.650,81
Tertiary	31.064,00	39.476,72	1.858,87	111.999,04	3.390,66	54.910,68

Table 3 State of the road network in km. 2018

Source: *Ministerio de obras Públicas Chile* (2017), *Info-Transporte México* (2018), *MTC Perú* (Ministerio de Transporte y Comunicaciones, 2019)

The data in table number 3, shows in detail the roads in Mexico, Peru and Chile in their state of paving with respect to the number of kilometers that each state has, at this point, the question arises, where is Colombia, although a recent report has not come out of the information of the primary secondary and tertiary roads that details the kilometers paved, newspapers and websites, indicate that by 2018, Colombia needed to increase its investment and percentage of infrastructure, since, with its access to the OECD, it is essential to show the increase in development in this field. On the Pan American Highways website, (Saez, 2019), reference that of 100% of the main roads are paved and only 13.62% are in good condition, the rest are in a bad or regular state, which leads to the quality of infrastructure being degraded, and hence Chile and Mexico surpassing Colombia in the Competitiveness Indexes, because it must be understood that it is not the fact that the road infrastructure is only paved but in optimal conditions, which allows the transport of goods in a safe and reliable way, and of course, as far as possible, helps the goods to reach their point, without risks of theft, pollution or high costs.

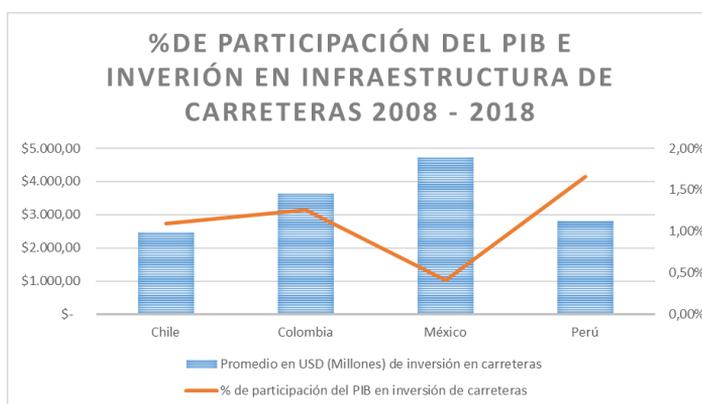
As a final appreciation of this indicator, it is valid to note that, as will be reflected in the GDP investment history in the following indicator, Colombia still has great challenges, in terms of road infrastructure, it still needs to improve a lot, it has a large road surface, which as far as possible, the paving, maintenance and good conditions must be covered in an optimal way so that at some point in history, road transport ceases to be the greatest concern of the logistics sector not only in the country, but also in its commercial partners, and of course reflects on a large scale the commitment to the development of the country in general.

3.2. Gross Domestic Product in the Pacific Alliance and investment in road infrastructure

The Latin American countries have been under the observation of the great world powers because of the constant growth they have had during the last few years. This interest of the world towards the Latin American countries is based on the possibility of opening up commercial transactions even more, so that the pressure to overcome the performance, year after year, of the countries in the periphery is ever greater if they want to succeed in a generation that is changing the way of doing business with the arrival of a new commercial leader such as the People's Republic of China.

In accordance with the previous appreciation, it is important to analyze other indicators of competitiveness, key to improve the results of national and international marketing.

In the following graph, the relationship between the percentage of participation in road infrastructure investment in the national GDP and its equivalent in millions of dollars can be seen.



Graph 3

Source: Own elaboration with data from INFRALATAM.

Based on the data in Figure 3, it can be seen that Colombia was second in terms of GDP investment in road infrastructure for the periods 2008 - 2018. At first sight, it is an encouraging panorama showing that in comparison with the other countries of the Pacific Alliance, a significant percentage is being invested in Colombia in relation to this attribute and considering that the other countries have an important development advantage, since Colombia's growth

has been going on for only 20 years when the efforts to fight the internal conflict began to bear fruit and it was possible to aspire to a greater internationalization of its economy to be in line with the other countries of the Alliance

In the Global Competitiveness Report (The Global Competitiveness Report 2019), where a wide variety of attributes are studied in the performance of each of the countries included (141 countries evaluated), Colombia is ranked 57th and is predicted to grow more in 2020, consistent with the improvement it had with the 2018 report where it was ranked 60th.

In comparison with the other countries of the alliance, a result like this was obtained:

Country	Rank of 141
Singapore	1
Chile	33
Mexico	48
Colombia	57
Peru	65

Table 4

Fuente: Own preparation with data from the (The Global Competitiveness Report 2019)

This information shows that, although Colombia has had an acceptable performance, it still has a long way to go in terms of international competitiveness, directly impacting the attributes with the greatest lack in the country. Also according to the global competitiveness report, within the attributes evaluated in infrastructure, there is "Quality of road infrastructure" the quality of road infrastructure where a position in the ranking of 104 was obtained with a score of 39.7/100. The results in this same attribute of the other countries of the alliance are:

Country	Score	Rank of 141
Singapore	100	1
Chile	70,1	25
Mexico	58,4	49
Colombia	39,7	104
Peru	36,4	110

Table 5

Source: Own preparation with data from the (The Global Competitiveness Report 2019)

It is clear that there is an important gap between Colombia and Mexico in the quality of road infrastructure and an even greater gap with Chile, which is the country with the best performance both in general competitiveness and in road quality, clarifying a bit why within the participation of GDP in road infrastructure investment it is not so representative since it has advanced a lot and its future investments would be to positively overestimate its performance while in Colombia and Peru, investments should be to achieve an improvement in performance that today is deficient and as a priority is to bring it to an acceptable performance.

Another attribute of the Global Competitiveness Report that provides compelling information regarding progress in economic development is road connectivity, according to the World Bank, the Latin American region is investing an average of 2.8% of GDP in infrastructure (water, energy, telecommunications and transport), that is, an even lower percentage is allocated to the development of roads that connect mainly the productive sectors.

According to the Global Competitiveness Report in the attribute of road connectivity, the ranking is as follows:

Country	Score	Rank of 141
Chile	95,8	9
Mexico	90,3	22
Colombia	65,4	97
Peru	64	107

Table 6

Source: Own preparation with data from the (The Global Competitiveness Report 2019)

Considering that, at a global level, Colombia is located in the 57th position of competitiveness, it would be necessary to improve the optimization, expansion and improvement of roads in Colombia, remembering that at an international level it is an emerging economy, with shortcomings in connectivity with productive sectors, such as agriculture, which precisely because of the deficiency of the roads, it is difficult for efficient distribution locally and globally.

Finally, the fact that Colombia's percentage of infrastructure investment as a percentage of GDP is generally higher than Chile, Peru and Mexico, does not mean that the result is better than theirs, which invites us to review other factors, corruption, for example, to improve the results described above. In that sense, another important indicator is evaluated below, the millionaire losses due to theft in the transportation of goods, is also related to the development of this important sector for the country's economy. It will be, again, focused for Colombia and the other countries of the Pacific Alliance.

3.3. Cargo Theft Losses.

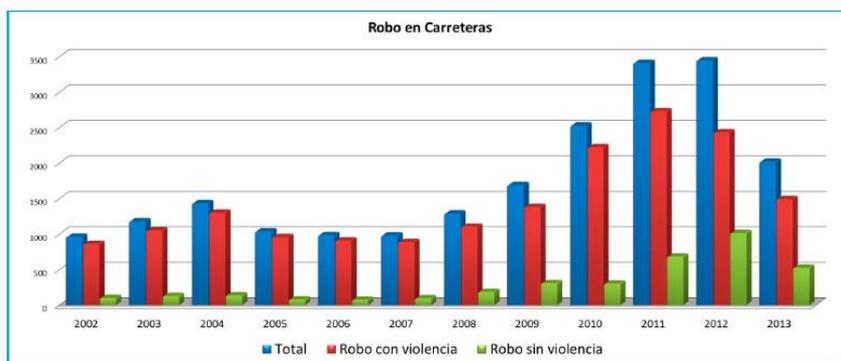
It is essential to take into account the road insecurity in the transport of goods, since it is associated with the competitiveness of foreign trade and the increase in export and import costs. Within the insecurity in the transport of merchandise, we find "asphalt piracy" or "land piracy", that is, the theft of merchandise on its way to its destination. It should be noted that combating this crime has been of great importance for the sustainability of the companies and of the country. Land piracy according to Sierra (2018) is a criminal activity related to the theft of cargo transport vehicles or the theft of transported goods, by means of different modalities, either during the movement of the vehicles or when they are parked. Land piracy is one of the main causes of the disruption of the logistics chain in the transport of cargo.

In the first place, this crime has been affecting the Colombian economy for several years, therefore, we will mention some cases from history that refer to the losses caused. It should be noted that, due to the situation year after year, companies began to implement various solutions to counteract this problem. Since 2004, they started to use electronic and computer technology to fight crime. The results when reviewing figures show the positive effects of such implementation, in 2003 there were 1578 cases registered, 928 cases in 2004 and 715 cases of piracy registered in 2005. In the same vein, according to the

newspaper Portafolio of March 23 (2007), initiatives to combat land-based piracy by means of GPS and technological devices, showed improvements and a decrease in cases, with 518 recorded in 2006, leaving losses of 16,188,539,510 pesos, although the losses generated for companies and their impact on the country's overall competitiveness are still a matter of concern.

For more recent situations, Leal (2019) finds that in 2018 there were 364 cases of land-based piracy, an average value of \$10.07 million in losses, and in the first quarter of 2019, there were \$2.96 million in losses. In other words, despite the actions taken to combat this crime, Colombia continues to suffer significant losses to its businesses and economy.

Another country that is affected by the crime of land piracy in the transport of cargo is Mexico, since the high incidence of theft on the roads has reduced the logistical competitiveness of the country due to economic losses and delays in the supply of products generated by this crime. Companies are being affected in their production and economy, since they lose their most valuable asset, which is merchandise, and they lose part of their capital in terms of money



Fuente: Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública 2013

Graph 4 Mexico

In this graph, is the statistics of theft on highways in Mexico from 2002 to 2013, of which, there is a very high peak in 2011 and 2012 with more than 3000 cases of theft of goods in transport to their destination.

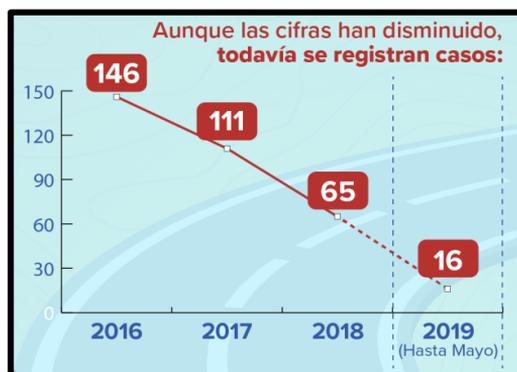
According to Lastiri (2018) in 2017, 4,030 robberies were recorded on the roads, highlighting losses of \$31.35 million, an increase of 127% over the previous year, since in 2016 there were 1,773 cases and an increase of 266% over the 1,102 robberies in 2015. Therefore, the year 2017 was a quite serious cycle for Mexico, because, according to T21MX (2018), Cargo transport activity contributes 4.5% to the country's Gross Domestic Product.

Continuing with the analysis for Mexico, according to León (2019), in 2018 the total cost of losses due to insecurity on the roads was estimated at 31.12 billion dollars which, although a lower value compared to the previous year, in terms of the number of thefts, was an increase of 15%. This is quite a high value and an incalculable damage representation for all the companies involved.

The third country affected is Chile, since this type of crime is the weakest point in the country's logistics chain, since it is generating problems for plaintiffs and insurance companies and high losses in the value chain. According to the figures handled by the National Confederation of Truck Owners (CDNC), in 2015 decreased the theft of trucks with cargo compared to previous years, since it was reached to have an average of 1.3 cases recorded per day, (Logistec Supply Chain & Fullfilment, 2016), of which, it turns out to be a positive point compared to previous years that the average statistics recorded 3 cases per day. According to Alarcón (2017), Chile in 2013 debuted its practices of control and high elimination of looting on the roads, therefore, as said before against the cases of theft per day, the practices carried out to counter this crime were showing results. By 2015, the National Chamber of Commerce (CNC), estimates losses at US\$240 million, according to figures reported by insurance companies. To continue confirming the positive results of Chile's practices against this crime, (Logistec Supply Chain & Fullfilment, 2019) reports that between 2014 and 2017 this type of crime decreased by 69.3%. In other words, according to the records found, these three years were fruitful and encouraging for the country.

However, according to (Logistec Supply Chain & Fullfilment, 2019) In 2018, this "positive" streak was broken as 378 goods were stolen from the roads, 25 more than in 2017 (353). Therefore, the Confederation of Freight Transport, reports that there are 3 truck thefts per day, in other words, a value that fluctuates between approximately 23.68 and 33.83 thousand dollars per day for losses from this crime.

Faced with the situation of Peru, it is a country quite reserved for its information; therefore, the statistics are few and reduced to make the comparison of countries.



Graph 5

Source: (Arango, 2019)

If we refer to see the number of cases per year, we find that there is a great decrease throughout the period according to Ruano (2017) Technological advances, such as GPS systems, satellite tracking, among others, have helped decrease the number of robberies per year. It could be specified that when using these means there have been positive results. There is no confirmed value compared to the annual losses generated by this crime, but this fact can be related to the few cases that are registered in the image, since their records of cargo thefts compared to other countries do not generate an alarming indicator. In 2016, robberies for \$ 350,000 were registered, with telephone merchandise. In the same year, a theft of a truck containing 1,000 tablets worth \$ 200,000 was reported. According to these two reports, a total of \$ 550,000 (Andina Agencia Peruana de Noticias, 2019)

Thefts of \$ 290,000 were reported in 2017, intercepting a truck that contained 433 boxes of clothing. In the same year, another theft valued at \$ 400,000 of lots of video game equipment. According to these reports it is a total of \$ 690,000 in losses for theft (Andina Agencia Peruana de Noticias, 2019).

In 2018, the merchandise theft report was valued at \$ 450,000. (Andina Agencia Peruana de Noticias, 2019).

To finish this indicator, it is important to specify a few things. As mentioned above, this crime negatively affects the competitiveness of each country, and being associated with marketing, it is a variable that disturbs the arrival of new products and the reduction of prices for consumers, because of the losses generated by this crime, companies must increase prices to try to recover lost capital or companies simply pay high cost insurance for the transport of merchandise that does not allow products to be priced cheaply or reduce their value.

The countries of the Pacific Alliance in the 2018 Global Competitiveness Report

País	2018		Diferencia respecto a 2017	
	Puntaje	Puesto	Puntaje	Puesto
Chile	70,3	33	+ 0,9	+ 1
México	64,6	46	+ 0,5	- 2
Colombia	61,6	50	+ 0,1	-3
Perú	61,3	63	+ 0,2	- 3

Table 7

Source: (Pontificia Universidad JAVERIANA, 2018)

The previous table shows Chile as in the first place according to the ranking of the countries of the Pacific Alliance, this rating against this indicator of losses due to theft in the transport of merchandise, clarifies that Chile with its preventive measures, control and elimination of looting helps to have an image of competitiveness and to improve the development of the country. Instead, Mexico fell 2 places in 2018 compared to 2017, a negative point for the country. Colombia compared to Chile does not have an alarming difference in terms of the cases registered annually, but it does have a difference in terms of the value lost annually for this crime, because, in 2018, Colombia registered 10.07 million dollars and Chile registered a value that fluctuates approximately between 23.68 and 33.63 thousand dollars, therefore, it is a big difference in capital and production losses for companies in the Colombian country. In summary, the lack of

security in the logistics chains also affects the image of the countries, reduces tax revenues, and discourages entrepreneurship and private investment, which also increases the prices of goods.

4. Conclusions

With the investigation, it can be concluded that the economic development of a country is directly related to the state of highway infrastructure and road safety. (Ortiz, Jiménez, & Cruz, 2019). They are factors that are part of the logistics chain for the transport of merchandise, of which, it is evident that it is a fundamental objective for Colombia to benefit from alliances or free trade agreements and thus obtain an increase in competitiveness and productivity.

One of the main objectives of the Pacific Alliance is to achieve greater competitiveness at the international level, but it should be noted that, with the results of each indicator, it is evident that the countries that are part of this block are not in the same range of Competitiveness, that is, they are not in tune with the same objectives that each country must carry out to fulfill the main objective proposed in the Alliance.

In terms of the infrastructure and road network indicator, Colombia has very low competitiveness results worldwide and in the Latin American region. The performance in the development of infrastructure, instead of being positive, is reducing the competitiveness of the national economy. According to the 2018 national logistics survey, the barriers to logistics operation are concentrated at 44.9% due to high transportation costs and a 10.3% to deficiencies in infrastructure (Camara Colombiana de Infraestructura, 2019). The distance between the producer and consumer sectors is not closing, which translates into a more expensive product due to the increase in the transportation sector, which makes greater investment imperative to expand connectivity and reduce barriers and distances for trade, conclusion also supported by the infrastructure log. (Camara Colombiana de Infraestructura, 2019)

In reference to the investment and with the development of the comparative of the gross domestic product in relation to the percentage of investment in road infrastructure of the same, Colombia has invested an acceptable percentage when compared with the other countries of the Pacific Alliance, however, it would be expected that the investment was greater than the others considering the disadvantage that Colombia has, if its priority is economic development, more should be invested in road infrastructure since its relationship is direct.

*“The multiplicative impact of the fraction that agroindustry contributes to GDP with the growth of infrastructure (AGROIND * GI) seems to have a positive and significant impact on national economic growth; This indicates that road construction and the provision of energy and other public services enhance the expansion of agribusiness and positively impact economic growth.” (Ortiz, Jiménez, & Cruz, 2019)*

Theft statistics show that Colombia in merchandise losses in 2018 registered a higher value compared to Chile. Therefore, it can be seen that Colombia still needs to prioritize security in the transport of goods to contribute to a good reliable logistics development, through the improvement of all critical points in the logistics chain, entering the group of countries that they stand out in the rankings, making themselves visible to new investments.

The growth and gradual opening of the market have allowed Colombia to improve its infrastructure. Today, even with the low results of the indicators described in the article, it can be interpreted as an opportunity to improve the current conditions of the national road infrastructure, and that each investment made responsibly should bring positive results for the competitiveness of Colombia.

Bibliography

Acevedo, J. (2009). Resumen del libro: El transporte como soporte al desarrollo de Colombia. Una visión al 2040. *Revista de Ingeniería*(29), 156-152.

Alarcon, R. L. (2017). *EL LIBRO BLANCO SOBRE EL ROBO DE CARGA*. ALSUM. Recovered from https://issuu.com/alsum/docs/libro_blanco_sobre_el_robo_de_carga

Andina Agencia Peruana de Noticias. (05 de 12 de 2019). *Desarticulan banda dedicada al robo de contenedores con mercadería valiosa*. Recovered from Desarticulan banda dedicada al robo de contenedores con mercadería valiosa: <https://andina.pe/agencia/noticia-desarticulan-banda-dedicada-al-robo-contenedores-mercaderia-valiosa-777343.aspx>

Arango, B. M. (12 de 06 de 2019). Estas son las zonas del Perú donde ocurren más asaltos en carreteras. *RPP NOTICIAS*, pág. 1.

Camara Colombiana de Infraestructura. (28 de Mayo de 2019). *Camara Colombiana de Infraestructura*. Recovered from https://issuu.com/camaracci/docs/20190529_bitacoramayoy

Cámara Colombiana de Infraestructura. (2020). *Bitácora de la Infraestructura*. Recuperado el 16 de Abril de 2020, de Bitácora de la Infraestructura: <http://www.infraestructura.org.co/bitacora.html>

Carrasco, O. A. (ABRIL de 2009). *REPOSITORIO INSTITUCIONAL PIRHUA* . Recovered from INFRAESTRUCTURA VIAL NACIONAL ASOCIADA A LA COMPETITIVIDAD:

https://pirhua.udep.edu.pe/bitstream/handle/11042/1990/MAS_ICIVL_007.pdf?sequence=3

Cetina Ordoñez, K. S., & Parra Velandia, V. J. (2017). *Infraestructura de transporte vial: un factor de atraso para competitividad de Colombia en la Alianza Pacífico*. Universidad de la Salle. Bogotá: Universidad de la Salle.

De la Puente Pacheco, M. A. (2012). Inversión pública y restricción presupuestaria en la infraestructura de transporte en Colombia: 1960-2011. *Revista de Economía del Caribe*(10), 162-164.

Dirección de Viabilidad - Ministerio de Obras Públicas. (2017). *Red Vial Nacional Dimensión y Características*. Chile: Dirección de Viabilidad - Ministerio de Obras Públicas.

EMB Construcción. (2008). Infraestructura Vial en Chile , Un largo camino por recorrer. *EMB Construcción*, 1. Recovered from <http://www.emb.cl/construccion/articulo.mvc?xid=979&ni=infr aestructura-vial-en-chile-un-largo-camino-por-recorrer>

Florez, R. J. (2015). Infraestructura carretera: construcción, financiamiento y resistencia en México y América Latina. *Revista de Transporte y Territorio*(13), 122-148. Recovered from <file:///C:/Users/Elisa/Documents/UNIVERSIDAD/NEGOCIOS%20E SUMER/Trabajo%20de%20Grado%201/Dialnet-InfraestructuraCarretera-5252069.pdf>

Guzmán, B. A. (05 de Diciembre de 2015). *UDPE [HOY]*. Recuperado el 24 de Mayo de 2020, de La red vial es imprescindible para el desarrollo y crecimiento de un país: <http://udep.edu.pe/hoy/2015/la-red-vial-es-imprescindible-para-el-desarrollo-y-crecimiento-de-un-pais/>

Info-Transportes México. (17 de Diciembre de 2018). *México supera los 580 mil km de carreteras, caminos rurales y vialidades*.

Recovered from México supera los 580 mil km de carreteras, caminos rurales y vialidades: <http://www.info-transportes.com.mx/index.php/categoria-infraestructura/item/8546-mexico-supera-los-580-mil-km-de-carreteras-caminos-rurales-y-vialidades>

Instituto Nacional de Vías - INVIAS. (29 de Septiembre de 2016). *Instituto Nacional de Vías - INVIAS*. Recuperado el 17 de Abril de 2020, de Clasificación de las Carreteras:

<https://www.invias.gov.co/index.php/informacion-institucional/2-principal/2706-clasificacion-de-las-carreteras>

Krugman, P., Obstfeld, M., & Melitz, M. (2012). *Economía internacional: teoría y política* (9° ed.). Madrid: PEARSON EDUCATION S.A.

Lastiri, X. (20 de 06 de 2018). *¿QUÉ HAY DETRÁS DEL ROBO AL TRANSPORTE TERRESTRE DE CARGA?* Recovered from *¿QUÉ HAY DETRÁS DEL ROBO AL TRANSPORTE TERRESTRE DE CARGA?*: <http://t21.com.mx/logistica/2018/06/20/que-hay-detras-robo-transporte-terrestre-carga>

LEAL, A. A. (12 de 08 de 2019). Aumentan robos a vehículos de carga en las zonas urbanas. *PORTAFOLIO*, pág. 1. Recovered from <https://www.portafolio.co/economia/aumentan-robos-a-vehiculos-de-carga-en-las-zonas-urbanas-532498>

Leon. (17 de 09 de 2019). *A diario se pierden 17 mdp por robo a transporte de carga*. Recovered from MILENIO 2020: <https://www.milenio.com/politica/comunidad/robo-camiones-carga-genera-perdidas-17-mdp-transportistas>

Logistec Supply Chain & Fullfilment. (13 de 12 de 2019). *ROBOS DE CAMIONES EN RUTA, EVOLUCIÓN DE LAS ZONAS ROJAS Y EL MODUS OPERANDI EN LA REGION METROPOLITANA*. Recovered from *ROBOS DE CAMIONES EN RUTA, EVOLUCIÓN DE LAS ZONAS ROJAS Y EL MODUS OPERANDI EN LA REGION METROPOLITANA*:

<https://www.revistalogistec.com/logistica/freight-management-2/2460-robos-de-camiones-en-ruta-evolucion-de-las-zonas-rojas-y-el-modus-operandi-en-la-region-metropolitana>

Logistec Supply Chaing & Fullfilment. (08 de 12 de 2016). *INDUSTRIA DEL TRANSPORTE DE CARGA: CON LOS OJOS ABIERTOS ANTE LA DELINCUENCIA*. Recovered from INDUSTRIA DEL TRANSPORTE DE CARGA: CON LOS OJOS ABIERTOS ANTE LA DELINCUENCIA: <https://www.revistalogistec.com/index.php/logistica/freight-management/item/2607-industria-del-transporte-de-carga-con-los-ojos-abiertos-ante-la-delinuencia>

Ministerio de Transporte y Comunicaciones. (2019). *Inofrmes y Publicaciones Transporte*. <https://portal.mtc.gov.pe/estadisticas/transportes.html>: MTC - OGPP - Oficina de Estadística.

Ortiz, C., Jiménez, D., & Cruz, G. (2019). El impacto de la infraestructura en el crecimiento económico colombiano: un enfoque smithiano. *Lecturas Económicas*, 110, 116.

Ospina Valle, G. (2016). Papel de las vías secundarias y los caminos vecinales en el desarrollo de Colombia. *Revista de Ingeniería Universidad de los Andes*(44), 20-27.

Pontificia Universidad JAVERIANA. (04 de 12 de 2018). *El Índice de Competitividad Global*. Cali: Centro de Estudios sobre la Cuenca del Pacífico. Recovered from El Índice de Competitividad Global.

Portafolio. (23 de 03 de 2007). La seguridad se abre camino y deja atrás la piratería terrestre. *La seguridad se abre camino y deja atrás la piratería terrestre*, pág. 1. Recovered from <https://www.portafolio.co/economia/finanzas/seguridad-abre-camino-deja-pirateria-terrestre-416068>

- Rojas López, M. D., & Ramírez Muriel, A. F. (2018). Inversión en infraestructura vial y su impacto en el crecimiento económico: Aproximación del análisis al caso infraestructura en Colombia (1993-2014). *Revista Ingenierías Universidad de Medellín*, 17(32), 109-128.
- Rojas, R. (28 de Febrero de 2014). *MBA & EDUCACIÓN EJECUTIVA*. Recuperado el 24 de Mayo de 2020, de La importancia del transporte en la cadena logística: <https://mba.americaeconomia.com/articulos/reportajes/la-importancia-del-transporte-en-la-cadena-logistica>
- Ruano, A. (27 de 02 de 2017). *Sertrans servicios de transporte*. Recovered from Sertrans servicios de transporte: <https://www.sertrans.es/trasporte-terrestre/como-prevenir-el-robo-de-camiones/>
- Saez, E. (23 de Enero de 2019). *Carreteras Panamericanas*. Recuperado el 25 de Abril de 2020, de Colombia solo tiene el 13.61% de la red vial primaria en muy buen estado: <https://www.carreteras-pa.com/noticias/colombia-solo-tiene-el-13-61-de-la-red-vial-primaria-en-muy-buen-estado/>
- Sierra, A. C. (2018). Coyuntura Actual de piratería terrestre en Colombia. *FASECOLDA*, 21- 25. Recovered from file:///C:/Users/Karina%20Romero/Desktop/7-Texto%20del%20art%C3%ADculo-10-1-10-20180206%20(1).pdf
- T21MX. (13 de 02 de 2018). *CUIDADO AL CIRCULAR POR ESTAS AUTOPISTAS Y CARRETERAS*. Recovered from CUIDADO AL CIRCULAR POR ESTAS AUTOPISTAS Y CARRETERAS: <http://t21.com.mx/terrestre/2018/02/13/cuidado-circular-estas-autopistas-carreteras>
- Vallverdu, A. (2010). Pavimentos en infraestructura vial - Avances y desafíos. *EMB Construcción*, 1.

World Economic Forum. (2019). *The Global Competitiveness Report 2019*. Geneva Switzerland: World Economic Forum. Recovered from http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf

Zamora Fandiño, N., & Barrera Reyes, Ó. L. (2012). *Diagnóstico de la infraestructura vial en Colombia*. Universidad EAN. Bogotá: Universidad EAN.