

DEVELOPMENT AND ROAD IMPROVEMENT: HOPE DURING POST-CONFLICT IN COLOMBIAM. F. SERRANO-GUZMÁN^{a*},D. D. PÉREZ-RUIZ^BD. A. GARCÍA-CUELLAR^B

Abstract. Colombia, middle income country, experienced the internal conflict for nearly six decades and once the peace treaty was signed, it is up to the government to recover the regions that were economically affected by the insecurity and violence that unfolded in a delay in development evidenced by different factors, among them, the quality of the roads. The information related to the quality and quantity of primary and secondary roads is much more precise than this available for the tertiary roads, which are responsible for uniting rural communities. The descriptive study emphasizes the importance of advancing a road inventory that allows to really knowing the needs of the communities; further corroborates that the post-conflict involves actions that the government must maintain as investment policies to continue with the recovery and construction of roads, in particular, the tertiary roads responsible for connectivity between communities.

Keywords: connectivity; low income; planning; postconflict; tertiary roads

JEL Codes: D74, R58, R59

1. Introduction

The speed of human evolution is increasing exponentially (Hoyos, 2017), and in that way is the consumption of resources. Due to this, good planning in the recovery of an area affected by war ensures that the resources available for the works required in the different regions must be optimized (Burkle Jr & Noji, 2004). All wars cause mostly negative effects including the dehumanization of human relationships and the breaking of the social feelings (De Zubiría Samper, 2015). It is a fact that worldwide, around 65.6 million people have suffered forced displacement due to violence (The Millenium Project, 2017) and those who are part of the population of Colombia, a developing country, are affected by specific characteristics of the socio-economic, political and cultural dynamics produced by the state of war (González Gil, 2015). The signing of the Peace Treaty in 2016 gives to Colombia a condition of new country under the connotation of post-conflict, a fact that affects the population settled in rural areas that corresponds to 60% (Suárez, Arias-Arévalo, Martínez-Mera, Granobles-Torres, & Enríquez-Acevedo, 2018), which are usually mobilized through main roads to which they access through tertiary roads (Lozano & Restrepo, 2015).

The main goal of this paper is shown that conflict period in Colombia caused series delay in the development of this country and because of that is imperative to focus the investment for the recuperation doing infrastructure works, principally those related with connectivity. The methodology followed for getting the information is describe in Figure 1.

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Figure 1. Methodology



2. Road connectivity in Colombia

Colombia has a primary network made up of highways that run by the Nation; a secondary network whose responsibility is the Departments and the tertiary network of inter-city roads, which are municipal domain (Botero, 2017). According to the Ministry of Transportation, the road network of the country is made up of 206,708 kilometers, of which the tertiary road network has an estimated length of 142,284 kilometers, 19.4% is in charge of the Nation, 9.8% in charge of the departments and the remaining 70.8% is the responsibility of the municipalities (España, 2017).

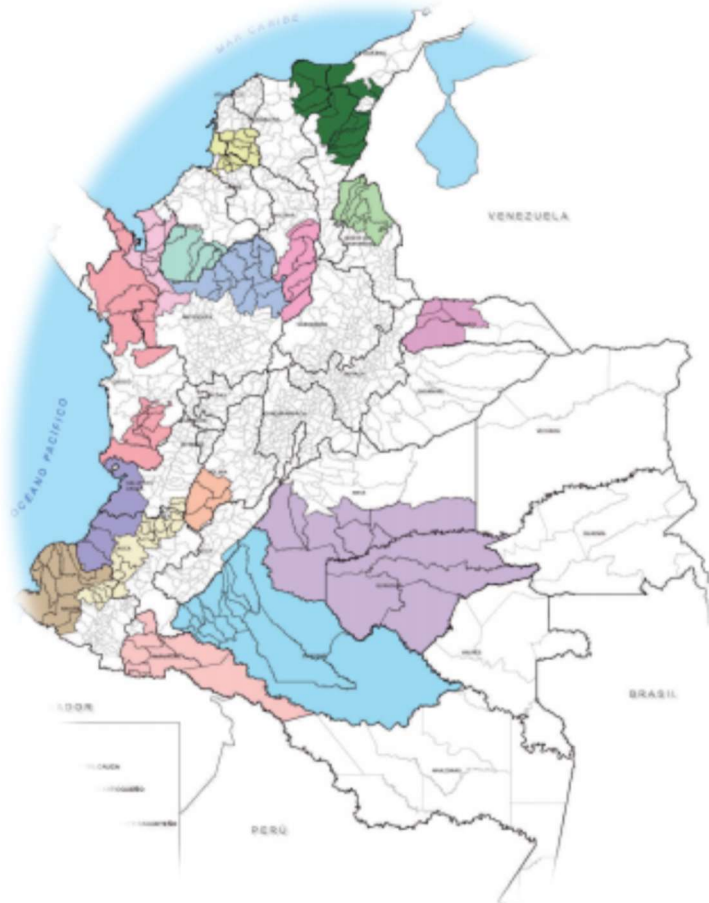
The tertiary roads of the country correspond to 68.84% of the total national roads. According to the National Planning Department (DNP), 70% of the network of tertiary roads has some type of asphalt, which is mostly in a very regular situation. The others are on land and in conditions not suitable for transit (Perea Bonilla & Pava García, 2018).

Severity Index of armed Conflict (SIC) and its impact on the Internal Product of Colombia

Although the impact of the armed conflict in Colombia before the nineties became latent in rural areas, with the running of time and due to the desire of drug trafficking to reach new "markets", it spread to large cities (Bejarano A., Echandía, Escobedo, & Queruz, 1997), (Medina, 2005) (Vélez, 2001). Because of this fact, the existence of the armed conflict has had an impact on economic costs that can be quantified considering different perspectives, such as social difficulties, as well poverty, lack of health and education, etc. (García González & Quiroga Carrillo, 2017), and due to that fact begins to require directing of funds for defensive activities carried out by the military division, which leads to the disregard of other sectors, a situation that triggers lower economic growth. Although there is an apparently relationship between the decrease in investments in relation to spending in the municipalities and departments of the country, it is not correct to assume that the end of the conflict will bring economic prosperity to the country (García González & Quiroga Carrillo, 2017).

To advance this study, the severity index of the conflict proposed by (García González & Quiroga Carrillo, 2017) was used, and the municipal performance index and the corresponding level of department performance index (DPI) regarding development rating proposed by the National Statistics Department (Departamento Nacional de Estadística, DANE by its acronym in Spanish). (García González & Quiroga Carrillo, 2017) used the typology by municipalities of the armed conflict of the Resource Center for Conflict Analysis (CERAC) and the database of the Agricultural and Non-Agricultural Production Unit and the scale proposed is that 0 represents a department with a minimum level of conflict and 1 a municipality highly affected by the Colombian armed conflict (Figure 2).

Figure 2 Post-conflict department included in road rehabilitation program



Source: (Agencia de Renovación del Territorio ART, 2019) adapted from http://www.renovacionterritorio.gov.co/librerias/media/pdf/municipios_pdet_MAPA_textos.pdf

On the other hand, DANE classified the development performance index according with the DPI as: risk when $40 \leq \text{DPI} < 60$; vulnerable when $60 \leq \text{DPI} < 70$ and,

sustainable when $70 \leq \text{DPI} < 80$. As a particular issues, the following analyses can be made:

- In the qualification of incipient development, reference can be made to the condition of the department of Amazonas that presented the lowest severity index of the conflict (SIC) and vulnerable conditions of fiscal performance; while Arauca, with a higher SIC, had a DPI with sustainable rating.
- In the qualification of intermediate development the conditions of higher SIC for Caquetá with risky DPI and Guainía with a DPI of sustainable stand out.
- Finally, in sustainable development are Valle del Cauca and Vaupés with severity index of 0.146 and 0.11 respectively. As can be seen, the correlation between the level of development, the departmental fiscal performance index and the severity of conflict index becomes paramount, since, paradoxically, there are departments with a high SCI but a level of sustainable development.

However, according to (Ruíz Díaz, Galeano Raquejo, & Gil Mateus, 2015), are expected the post conflict period brings an increase in direct foreign investment, a decrease in military spending and an increase of 1 to 2 points in the country's gross domestic product. The previous conjectures are based on the experience of the first negotiation table in 2002, where, for example, there was a saving of 3.16% in military spending and an increase of 0.43% in foreign investment (Ruíz Díaz, Galeano Raquejo, & Gil Mateus, 2015). It should be noted that for 2017 it was proposed, under reasonable assumptions, that the impact of the peace agreement on SIC growth would be an additional 0.4% over a 5-year horizon. What is significantly positive is the notorious reduction in the intensity of conflict and the positive effects that are being perceived in the economy and in the Colombian productive activity (Equipo de Investigaciones Económicas del Grupo Bancolombia, 2017).

Repercussions of the armed conflict in the road development of Colombia

It can be affirmed that the armed conflict in Colombia took more than 50 years to be resolved (Molina Arias, 2018). A negative impact of this scourge has been the delay in the Colombian road-network situation that is having an impact on the country's competitiveness (Consejo Privado de Competitividad, 2017) (System Initiative on Shaping the Future, 2017). About 56% of the total rural area (65.3 million Ha) of the country is located more than three hours of land travel and only 25% less than an hour (Lozano & Restrepo, 2015), and tertiary routes interconnect these populations.

In this regard, it is important to note that according to the Global Competitiveness Index (GCI), in the period 2017-2018 Colombia fell 5 positions worldwide compared to that reported for the 2016-2017 period, holding at this time the 66th place with a GCI in infrastructure of 3.8 over 7 points and a global index of 4.29 (System Initiative on Shaping the Future, 2017). One of the causes is the lack of connectivity and therefore mobility that limits the commercialization and reactivation of the economy, as well as administrative aspects. As it is recognized, the GCI provides the countries with decision criteria to improve the problems that are causing economic

detriment. It is undeniable that the development of road infrastructure, and especially when it comes to improving the lining of roads, contributes to socio-economic benefits for society (Klarenberg, Muñoz-Carpena, Campos-Bescós, & Perz, 2018).

Since 2006, Colombia had projected that by 2032 it would become the third most competitive country in the Americas (System Initiative on Shaping the Future, 2017). Given the current levels of competitiveness (Consejo Privado de Competitividad, 2017), it is up to this country to proceed with the formation of alliances of the public-private sector for the reactivation of different sectors of goods and services (System Initiative on Shaping the Future, 2017). Besides, colombian's government must continue making large investments in infrastructure of roads and ports in order to improve the logistic performance of the country that, for today, is low and is characterized by the absence of multimodal transport (Consejo Privado de Competitividad, 2017). On the other hand, the step towards multimodality requires an institutional strengthening that allows planning, prioritizing and structuring projects from public entities for the development of other modes of transport (Consejo Privado de Competitividad, 2017). Likewise, Colombia needs the construction of access roads to the ports and the promotion of sufficient incentives for the modal interchange. (Consejo Privado de Competitividad, 2017).

3. Findings

More than 60 years lasted the internal conflict that hit Colombia, where various actors were linked, among which guerrillas, paramilitaries, drug trafficking and state forces stand out, and logically where civil society was seriously affected (Molina Arias, 2018). The direct costs generated by the armed conflict in Colombia are represented in the damage to physical infrastructure, cattle rustling, extortion, forced displacement, attention to people affected by antipersonnel mines, defense and security; while indirect costs are represented in loss of productivity (Gómez Guillen, 2015). That means that reducing economic costs could trigger the economic recovery of the region during the post-conflict period (Santa María Salamanca, Rojas Delgadillo, & Hernández Díaz, 2013).

In addition, the presence of armed groups, mainly in rural areas, impeded the mobility of its inhabitants, leaving people in conditions of extreme vulnerability with the consequent repercussion for loss of productive activities [4]. Between 1985 and 2004, the unique registry of victims (Registro Único de Víctimas RUV in spanish) in Colombia reported 6,739,978 people affected by forced displacement, which reflects, in addition to the physical and psychological human losses, the economic decline of the region inhabited by these people. This fact has also caused changes in the territory (Rueda Rincón, 2014).

As well as the lessons learned in Iraq showed that it is not possible to generalize the interventions (Burkle Jr & Noji, 2004), likewise it happens in Colombia since the recovery of each region is particular and is accompanied by both road projects and other types of infrastructure works. For this reason, the Development Plans with Territorial Approach (PDET by its Spanish acronym) have pillars that involve the aspects that have affected the communities: social ordering of rural property, economic reactivation and

agricultural production, rural education, housing, right to food, reconciliation and peace, infrastructure and land adaptation (Colombia renace postconflicto, 2019). In that way, the Territorial Renewal Agency (ART by its Spanish acronym) is coordinating the participatory planning processes and controlling investment in small infrastructure projects, and promotion of economic development alternatives in areas seriously, affected by the violence (Agencia de Renovación del Territorio ART, 2019)

Precisely in order to properly prioritize inversions have been defined some a methodology that includes attributes and their qualification. In the case of the rehabilitation of the roads in regular and in poor condition, the attributes of spatial, economic and social dimension considered have been, whose weight factors are 40, 25 and 35, respectively (Botero, 2017). The subfactors that are part of the spatial dimension are connectivity and access with 30 and 10 points, respectively (Table 1). The economic dimension considers the infrastructure and rural logistics subfactors valued with 5 points and productive chains with 20 points. This analysis allows the granting of five additional points to those routes that are part of the Ministry of Agriculture and Rural Development program, which in turn is based on program guidelines Colombia Siembra for the prioritization of the tertiary roads to be intervened.

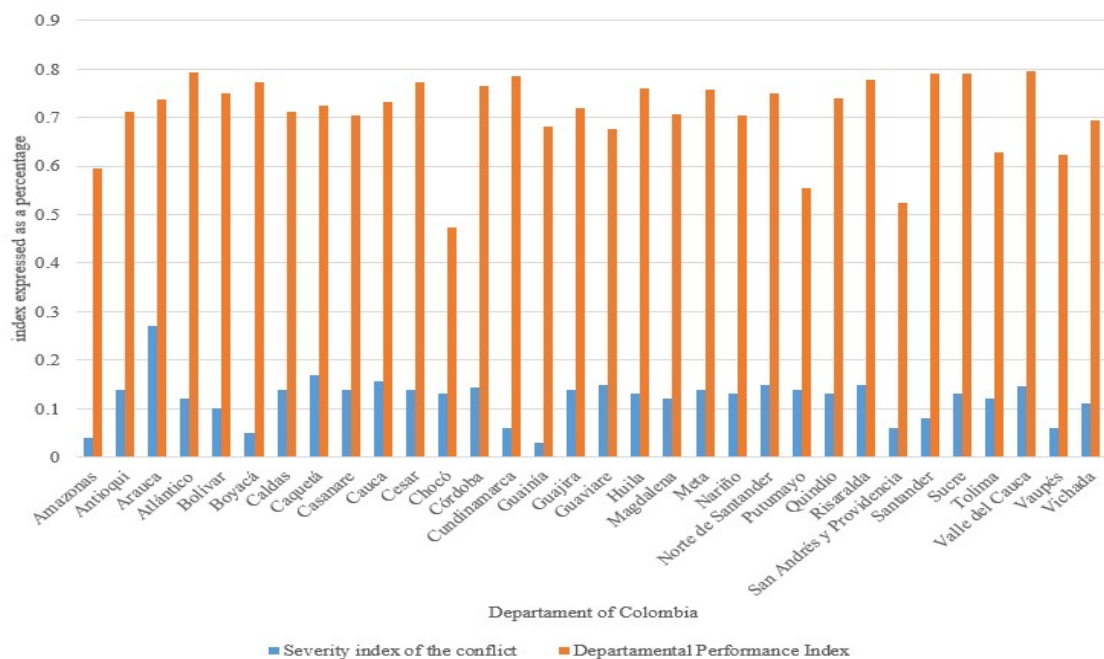
This methodology for investment prioritization will be initially tested in the Pacific region and Nariñense Border which present high rates of armed conflict and poverty directly related to road connectivity and regional structure. Through joint work with the Transparency Secretariat, that is part of the anti-corruption policy, the network criterion is fostered and contributes to the consolidation of peace territories. The funds to carry out the works of the National Plan for Regional Integration (PNVIR by its Spanish acronyms) will come from the National General Budget, the General System of Royalties, Legislative Act No. 4 and with the funds created for the post-conflict and multilateral credit. (Ministerio de Transporte, 2018).

Post-conflict vial actions to improve the road sector at Colombia

In order to recover the regions and boost the economic development of the municipalities, road infrastructure projects advanced have been done with which mobility improved has been in 12 departments (Figure 3) of Colombia (Perea Bonilla & Pava García, 2018).

Around \$ 1.3 trillion in investments were allocated by the National Government to rehabilitate nearly 3,000 kilometers of tertiary roads and modernize around 11,000 kilometers throughout the territory (España, 2017). One of the initiatives indicated in the 2017-2018 National Competitiveness Report is the implementation of the Plan 50/51 (Consejo Privado de Competitividad, 2017). This plan was born in 2017, during the first 100 days of the Final Peace Agreement, as a strategy of the National Government to intervene and improve sections in the 50 municipalities most affected by the armed conflict, poverty, institutional weakness and crops of illicit use (Agencia de Renovación del territorio, 2017).

Figure 3 Behavior of Severity index of the conflict and Departamental Performance Index



Source: prepared with information of (García González & Quiroga Carrillo, 2017) and DANE data

This plan proposes:

- The improvement of 50 kilometers of tertiary roads in each of the 51 prioritized municipalities (Agencia de Renovación del territorio, 2017).
- The transfer of resources from the National Royalty Fund to the Territory Renewal Agency. A total of \$ 50 billion will be destined for Tertiary Ways for Peace Plan 50/51. Of this amount, \$ 5 billion correspond to the auditory whose execution will be in charge of the National Instituto of Roads (Inviás Instituto Nacional de Vías, in Spanish) (Agencia de Renovación del territorio, 2017).

Some of the benefits of the communities favored by the vials projects during the post-conflict have been:

- The trip by land between Granada (Meta) and San José del Guaviare, of 200 kilometers, took an average of 13 hours, because the road, in some sections, seemed more like a trail.
- After the intervention of 44 kilometers, in the last stretch -corridor of Las Palmeras-, this journey was reduced by 10 hours and operating speeds went from 1 mile / h to 50 miles / h (Perea Bonilla & Pava García, 2018).
- At present, there are 8,300 km of rural roads intervened, represented by 5 million dollars of the 30 million dollars allocated for the development of the country's

infrastructure. Comparatively, the kilometers intervened are equivalent to the distance between Mexico and Chile, a measure that illustrates the magnitude of the damage and justifies the investment made. In addition to this rehabilitation, other works should be considered such as 600 kilometers of footprint plate, which serve for the passage of light and medium weight vehicles; 400 kilometers of paved roads; 1,739 kilometers of improved and rehabilitated sections; 98 kilometers of second roads and 87 completed bridges (Perea Bonilla & Pava García, 2018).

- In addition to the Plan 50/51, which, as stated, aims to favor 51 municipalities affected by the conflict, there is a second stage where a maintenance of approximately 11,700 km will be carried out in 119 municipalities of Colombia (Acosta Ariza & Alarcón Romero, 2017).

4. Discussion

Around two thirds of the key biodiversity points worldwide have experienced the effects of armed conflicts (United Nations Environment Programme, 2018). That shows the negative impact of armed conflict status in the environmental conditions without including other sectors of the development in the community.

Particularly, in the case of Colombia, the municipal performance indicators show that the Department of the Amazon is classified at risk and has an incipient development with a SIC of 0.04, which shows a low level of conflict as San Andrés and Providencia, department with a low SIC, with the difference that the last one presents a robust level of development. Both departments have a great diversity and can be sectors of great tourist attraction, but in the case of the Amazon, the accessibility conditions (logistics) are less favorable than San Andres, as well as the hotel offer in the area where the existing one can be attractive for native and foreign people.

Consequently, it is interesting to note that, in the case of the Department of Putumayo despite having benefits derived from royalties from hydrocarbon exploitation, it has an intermediate development level and a SIC (0.14) that is above the national average (0.12). Likewise, the Department of Arauca, also benefiting from revenues from different mining activities, has the highest SIC in Colombia, with a level of incipient development and a level of sustainable performance.

Moreover, the department of Chocó, with an SIC of 0.13, has an incipient level of development due to the lack of execution of infrastructure works. In summary, to fully understand the level of affectation and the needs of each municipality, as already mentioned, it requires a careful study of each sector looking for prioritization alternatives that can guarantee a timely intervention to the priority sectors. Undoubtedly, one of these sectors is the improvement of the road infrastructure with which, in addition to the possibility of interregional communication, the alternative development of other types of projects will be allowed.

On the other hand, although it is true that the road infrastructure improves the socioeconomic conditions of the communities and in particular, in post-conflict countries, the investments for this type of projects are prioritized (Suárez, Arias-Arévalo, Martínez-Mera, Granobles-Torres, & Enríquez-Acevedo, 2018), it is also true that the

lack of project planning can lead to environmental and economic disasters for the regions (Klarenberg, Muñoz-Carpena, Campos-Bescós, & Perz, 2018). Therefore, it is imperative that at the level of governmental institutions effective control mechanisms be exercised to identify the real needs and prioritize with non-political and instead rational mechanisms, the investments that must be made for the well-being of the inhabitants.

Although Colombia currently lives a post-war state, which (Kappler, 2018) would be classified as quasi-colonial due to the numerous interventions that must be done in a very short timeframe. (Kappler, 2018), this is an opportunity that the country has to progress, advance and developing and show the world that peace has great economic repercussions, in addition to the already known social and environmental benefits, if infrastructure works that favor the community and improve quality life of the inhabitants are executed. In addition, it is reinforced that the consolidation of peace during the post-conflict gives advantages to focus on solutions at the local level (Kappler, 2018) that, finally, as a whole, they benefit in national way. What is also observed is that 170 municipalities of the 1122 existing ones will benefit from rehabilitation and maintenance in a part of their tertiary road network (Acosta Ariza & Alarcón Romero, 2017).

The complex social and economic problems of the regions directly affected by the armed conflict demand an adequate development strategy in which the incipient development conditions of some communities show that they will require greater accompaniment than those communities that have a robust development. That means that corresponds to the State to prepare appropriate public policies to improve the current situation. The situation that can be generalized at the country level is that these policies should be directed to the proper use of public finances, looking for different sources for the programs that the post-conflict requires in order to achieve sound macroeconomic conditions for the country, that includes education (De Zubiría Samper, 2015) besides infrastructure works. In addition, other strategies must be strengthened to maintain low rates of homicide, kidnapping, extortion and loss of human lives of both the public force and innocent civilians in the communities that are being rebuilt (Equipo de Investigaciones Económicas del Grupo Bancolombia, 2017). On the other hand, it must be recognized that each community has been affected to a different extent, which is why the solutions proposed can not be universalized (Álvarez Riascos, 2015).

Even so, the signing of the Peace Agreement in Colombia becomes an opportunity to move forward regions affected by the conflict. Although it is true that the recovery plans are aimed at favoring 51 municipalities directly affected, the prioritization strategy (matrix of attributes with factors and subfactors) will allow for a more equitable allocation of available resources. However, it is noted that the coverage of this plan should be extended to other communities so that development can take place at the country level (Suárez, Arias-Arévalo, Martínez-Mera, Granobles-Torres, & Enríquez-Acevedo, 2018); and also, is required a better planning of this kind of projects because does not do it, cause environmental and economic disaster for these places (Klarenberg, Muñoz-Carpena, Campos-Bescós, & Perz, 2018).

5. Conclusion

The way in which infrastructure projects continue to be proposed in the zones affected by the conflict has repercussions on the peace dividend that will require additional public spending that must be financed by different sources, guaranteeing the sustainability of public finances. This fact is a key piece to achieve a macroeconomic development of the country. This element will be essential for the country to continue having a sound macroeconomic environment, which will make it possible to take advantage of the economic opportunities that will undoubtedly arise in the post-conflict.

Each region has a development that is limited by both quality and quantity of resources and by the good use made of them, and for different economic activities that allow them to derive their livelihood. Usually, human activities require connectivity that guarantees the exchange of products, goods and services. Post-conflict countries, as Colombia, must prioritize investments in such a way that those works that communities need to thrive are truly executed. Although the matrix of attributes defined in Colombia for the prioritization of municipalities is very useful, concrete goals must be established more quickly with road infrastructure projects that improve the connectivity of rural areas that are mainly mobilized by tertiary routes.

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