

Environment and armed conflict in Colombia: terrorist attacks against water resources and oil infrastructure in Norte de Santander (2010-2020)

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Abstract: The aim of this study is to analyse the impact of the armed conflict in Colombia on the environment, and in particular, terrorist attacks on the oil infrastructure and the phenomenon of oil spills in river basins in the department of Norte de Santander. The study covers the last decade, from 2010 to 2019, and is focused on one of the most violent departments in Colombia, through which the country's most important oil pipeline runs, connecting Caño Limón in Arauca and Coveñas in Sucre. Based on governmental and other reports, an attempt has been made to situate these acts of violence with direct consequences for the environment, within the dynamics of the armed conflict, considering different factors, which actually demonstrate the causal and explanatory complexity of this phenomenon. After noting the need for behaviour patterns that should transcend the conflict, a model is proposed that points to the urgency of finding new variables and risk probability factors so that this threat to security in Colombia, currently as unpredictable as it is unresolved, may be effectively managed.

Key words: Norte de Santander, Water Sources, Terrorism, Armed Conflict, the Caño Limón-Coveñas Pipeline

1. Introduction

The following study is contextualised within research analysing the environmental dimension of armed conflicts. Thus, it specifically addresses the way in which the internal conflict in Colombia, and particularly in one of the most violent departments – Norte de Santander – affects the oil infrastructure and, by extension, the region's vast water resources.

In recent years, this department, which stands out for its rainforests, coca cultivation and for being a border region, has gained notoriety as one of the most violent areas in Colombia. Other aspects have also coincided that are interesting for criminal groups. These include a weak institutional framework and the existence of important assets, like the concentration of the oil industry, greatly affected by acts of terrorism, which in turn, affect the region's environmental richness and pose one of the main threats to security. That said, the questions around which much of the argument revolves in the following pages are as follows: strictly speaking, is it possible to analyse a causal relationship? What is the level of impact and the degree of correspondence between attacks against the oil industry and water resources in Norte de Santander? Is it possible to find explanatory patterns?

Therefore, based on an exploratory approach, we have proposed a longitudinal analysis of this phenomenon for the 2010-2019 period, using official reports from environmental authorities and the Ministry of Defence.¹ Using all of this for the purpose of our search has provided figures, concurrent trends and explanatory patterns that help understand the subject of study and make proposals. In addition, third factors or elements are taken into

consideration that also contribute to the understanding of the factors involved in oil spills in river basins in Norte de Santander.

The research is organized in five different parts. First, we start by taking a look at the most prominent literature, which has proliferated in the last few years, in the study of the link between armed conflicts and the environment, incorporating the most noteworthy Colombian perspective in this debate. After presenting the hypotheses and methodological approach on which this study was based, the next section addresses contextualization. The objective is to facilitate the reader's understanding of the most relevant elements that have made Norte de Santander one of the most violent departments in Colombia. Fourthly, the analytical part of the study is developed, organized around the trinomial: armed conflict/oil infrastructure/environmental impact on water resources. Finally, not only do we highlight the most notable study findings in the conclusions, we also note the need for new determining factors to be addressed to shed light on a phenomenon whose causality requires new variables and information sources, usually omitted from the analysis, to be made operational.

2. Theoretical framework and state of the art

We should start by pointing out that the biocentric paradigm in social research gained prominence after the 1970s energy crisis.² Studies based on this approach maintain that the ecological environment is a key element for human development because it provides spatial support for human activities and is the source of our natural resources.

New approaches in these studies introduced the notion of the limits to economic growth and its geographical asymmetry based on the central argument of the depletion of raw materials.³ Consequently, natural disasters were assumed to exacerbate preexisting conflicts and increase conditions of vulnerability.⁴ However, most research on environmental degradation and armed conflicts would suggest that the ecological issue *per se* has sufficient capacity to lead to situations of conflict on different geographical scales.⁵ Thus, as Lavaux⁶ warned, political and economic variables remain outside its analysis.

In other words, adverse environmental conditions increase the threat of systemic violence perpetrated by various groups in contexts defined by the fragile institutional capacity of governments to provide their territories with public services,⁷ as might be expected in Colombia.⁸ Notwithstanding, this statement requires a geographical perspective anchored in the functioning of the global economy, whereby “dependence on limited resources in commodity-based economies is particularly complex in those cases involving the extraction of raw materials with a high value in commercial market circuits”.⁹ Hence, the wealth of peripheral countries depends to a large extent on the export volume of basic commodities and the accelerated depletion rates of these resources facilitate potential scenarios of civil violence.¹⁰

Recent academic debate considering the link between climate change and security has maintained the environmental impact at its epicentre in two aspects: on the one hand, natural resources, and on the other, its ability to erode political capacity by satisfying public demand.¹¹ Thus, variations in biodiversity intervene as a causal factor since they are rendered potential ecological risks, representing an inevitable “source of social pressure”.¹² Accordingly, the scarcity of natural resources encourages the catchment of materials with high added value and, at the same time, displaces marginal social groups towards ecologically

sensitive areas. This dialectic reinforces environmental erosion and increases potential social instability, and, although interstate conflicts are not generally motivated by environmental causes, the violence generated in part by the degradation of the environment has important direct consequences that go beyond the national scope.¹³ Proof of this are large refugee flows, involving international organizations and activating multiple cooperation mechanisms.

Criminal activity takes centre stage among the main factors implicit in mapping current systemic violence. Münkler¹⁴ argued that irregular armed organizations play a constantly predominant role because their permanent scenario is war, while their tactical control exceeds state capacity. The main result of this tendency is the privatization of violence,¹⁵ which leaves an important impression marked by direct hostility due to greater economic access to military equipment and also to many other collateral benefits that may equally occur.¹⁶ That said, conflicts related to control over and exploitation of natural resources are not inevitably violent. Rather, the magnitude of their intensity indicates the degree of hostility since “some conflicts fail to undergo a transformation and remain social issues”.¹⁷ Violence is, therefore, the result of a set of combined causes, although biocentric studies uphold that a significant change in environmental conditions increases the likelihood of a conflict motivated by the fight for control over natural resources. In this respect, Colombia is a paradigm to which we should necessarily pay attention.¹⁸

There is a growing concern among studies focused on political ecology about conflicts arising from the struggle for control over certain natural resources.¹⁹ Nonetheless, the relationship between social agents and ecosystems is not restricted to the exploitation or control of natural resources, even though access to raw materials represents a determining variable in achieving the political goals of insurgencies. The very concept of insurgency, for its part, encompasses the wide spectrum of violent organizations that are not rooted in state agency, and occur in geographically miniscule military environments.²⁰ Whether they are militia, paramilitary groups, guerrilla, or transnational criminal networks, they all result in the notion known as «small wars». Thus, they bring together a series of characteristics that are externalized through violence committed against the civilian population, and they involve heterogeneous groups of stakeholders in which politics and economic are intertwined and boundaries between war and peace are vague. Hence, they end up being located in a specific geographical area, while the dispute involves a specific number of contenders, who develop strategies with short- and long-term consequences.²¹ Their main incentive is economic benefit to the detriment of political prerogatives.²²

Contemporary so-called «small wars» are led by insurgent groups, which have a series of common denominators: a narrative based on socio-political grievances; agile organizational structures; images drawn on legitimizing perceptions of violence, and resistance strategies against counter-insurgency measures.²³ Together, these ideas lead to the identification of behaviour patterns underlying the intersection between violence and the environment, which Malamud defined as follows²⁴:

- a) Wars over natural resources demonstrate the link between the ecological factor and the fight for control over commodities (minerals, water, oil, agricultural land), particularly in polarized societies with a high dependence on primary goods

- b) The ecology of war paradigm, which highlights collateral or unintended damage caused by armed conflicts
- c) The environment as a war objective, which underlines the strategic centrality of the ecosystem in deliberate attacks deployed by any of the contending groups
- d) The intersection between insurgency and the environmental perspective, which highlights the possibility of an increase in the frequency of violence as a result of a deviation in climate conditions

Basically, these four features adhere, in one way or another, to the rhetorical and analytical coordinates proposed in this study. The continuation of conflicts caused by any of these behaviour patterns depends on the degree to which the insurgent group is able to capture income from the exploitation of natural resources and on its legal status.²⁵ This is why some countries are backing the race to optimize their own economic growth and their goal is to “exploit raw material reserves, often located in conflict areas, to the maximum”.²⁶ This restores the old paradigm of prolonged conflict, posited by Azar (1990) three decades ago, to a central explanatory position, as is the case in countries like Colombia.²⁷

Enhancing further the above, contributions such as the study by Malesevic²⁸ describe war based on parameters established in the discipline of sociology to underline its intense nature, which requires a firm social architecture and ideologies that legitimize violence. This approach is similar to the theory put forward decades ago by Michael Mann²⁹ on the relationship between historical sociology, power and territory. This argument enables us to link the environment with the hostility of war, since the problem of material development functions as an operational link between both coordinates. Thus, this relationship often occurs in countries that have, for example, an unequal distribution of agricultural land and institutional difficulties in claiming a monopoly over the legitimate use of violence.³⁰

The link between the degradation of ecosystems, the scarcity of natural resources, fragile economic development and political instability can trigger environmental conflicts described in the specialized literature as «ecological terrorism or green wars». ³¹ In general terms, Homer-Dixon³² narrowed down the shortage of renewable resources to three causes: supply, which imposes a quantitative and qualitative loss in a greater proportion than the natural renewal rate; demand, which seeks to satisfy a sharp demographic increase with higher consumption levels, and lastly, structural shortages generated by unequal access to raw materials. These scenarios represent a potential threat to security at state or regional level, because they trigger forced displacements among the population and interrupt the functioning of basic social institutions by preventing economic activities from being carried out.³³ In the same way, the line drawn by the duality between the centre and the periphery demonstrates certain economic asymmetries, quantified by means of development indicators, which explain divergent state perceptions and demands with regard to commodities. This is why an imbalance in access to and control over natural resources is considered a potentially relevant cause in the conflict-security equation.³⁴

To this end, the scientific literature on environmental security remains framed within the research of the so-called Toronto Group, published in the 1990s. In general terms, their work suggested that the deterioration of the quality of the environment responded to a shortage of renewable raw materials or to drastic progressive alterations to biodiversity, in many cases the result of intentional actions carried out by the actors engaged in armed conflict. This

premise, therefore, acts as an independent variable on other socio-political and economic factors, which, moreover, constitute potential sources of conflict. Thus, the ability of governments to tackle the consequences caused by alterations to the environment and, in parallel, the search for a balance in sustainable economic development, are fundamental factors in managing, if not preventing, the emergence of armed conflicts. Conversely, issues such as low economic diversification and the intensive exploitation of natural resources are elements of risk for institutional life.³⁵

The unequal distribution of agricultural property, the convergence of extractive industries, the illicit economy and the forced displacement of the population have, roughly speaking, dominated the political agenda in Colombia during the post-conflict phase. At the same time, they have revealed the intersection between ecological circumstances and violence.³⁶ Some societies are particularly exposed to civil violence stemming from different structural sources, which, as Malamud³⁷ pointed out, exert external pressure through institutionalized corruption, organized crime, forced migration or illicit economic activities. Thus, this multifaceted phenomenon shapes the interaction between climate change and insurgent groups with sufficient capacity to potentially trigger a cycle of environmental effects and social conflicts, culminating in violent behavior patterns. Trade circuits and the overlapping of geopolitical agendas affect the capacity of ecosystems in countries mired in prolonged domestic armed conflict and dominated by insurgent groups, as Malamud³⁸ pointed out, and the case of Colombia is a paradigmatic example. Changes to the environment intervene as risk multipliers in economies in which the primary sector carries greater weight because “they depend to a large extent on basic products with an extraordinary market value, but with low added value”.³⁹

Nonetheless, the dependence of periphery countries on wealth creation makes them more prone to civil violence and the progressive weakening of the representative political institutions. However, despite the many challenges facing institutional stability during the post-Peace Agreement phase, Colombia has maintained a robust democratic system. In the years following the signing of the Peace Agreement, certain factors have increased the risk of new forms of hostility caused by the vulnerability of the ecosystem, the unsustainable exploitation of raw materials, and other issues such as an increase in the coca-growing area or the target of violence that oil infrastructure in departments like Arauca or Norte de Santander represents.⁴⁰

In this regard, the connection between environmental issues and patterns of violence detected in Colombia following the Peace Agreement signed in 2016 has thrown up new lines of research. Environmental degradation has intervened as a triggering factor in several manifestations of violence in an economy included in the periphery of the World Systems Theory, and new expressions of conflict are based on unequal distribution of agricultural land and the growth of highly lucrative illicit economic activities.⁴¹ These activities play a key role, especially drug-trafficking, which stands out as a dominant issue in the area of security,⁴² and also illegal mining or oil tapping.⁴³ One highly significant indicator is land area dedicated to coca cultivation, and Colombia plays an important role in global cocaine production and distribution according to reports issued by the United Nations Office on Drugs and Crime (UNODC).⁴⁴

The fact is Colombia is faced with an ecosystem weakened by intense extractive activities, especially gold mining, which has provoked unsustainable trends developed by local landowners and multinational companies. The value of illicit gold exports exceeds the value of the cocaine trade. Illegal gold mining and drug trafficking are a source of financing for insurgent groups and criminal organizations. Added to this are the pressure, extortion and kidnapping associated with the oil industry in eastern and north-eastern Colombia, amongst others. A report issued by Global Initiative against Transactional Organized Crime indicated that 87% of displaced persons in Colombian territory came from extractive and peripheral areas⁴⁵ where demographic density and institutional capacity are very frail. This is why violence stemming from the intersection between economy and environmental degradation are a subject of study in political ecology.

The discipline of political ecology does in fact offer the possibility to open new horizons that help explain long-term armed conflicts, such as the one in Colombia. Firstly, for the numerous episodes of violence still in force which have been seen following the Peace Agreement sealed between the Colombian government and a delegation of the armed group FARC-EP in September 2016.⁴⁶ Secondly, due to the erosion of traditional guerrilla strongholds and a decrease in their criminal activities, which have sustained dissident sectors and other armed organizations, such as the ELN.⁴⁷ Finally, Colombia's current situation is no exception because, as Darby⁴⁸ pointed out, countries seeking to overcome long-term armed conflict often experience an escalation of violence that threatens peace processes. Indeed, a climate of insecurity and uncertainty hinders effective reintegration and erodes support for reconciliation. This is why the linked phases in post-conflict processes are marked by constant regressions, and the case of Colombia is proof of this. Now it is time to see if the environmental dimension can be integrated in the above and, at the same time, if the evolution of the armed conflict provides an explanation for possible changes in patterns of behaviour, or if, on the contrary, the armed groups and criminal organizations are inflexible in this regard.

3. Methodology

A mixed methodology has been used to conduct this exploratory research since we have tried, on the one hand, to determine the factors that explain the terrorist attacks against the oil infrastructure and their impact on water resources in the Norte de Santander department, and, on the other, to obtain an explanatory pattern of the likelihood of risk of this phenomenon occurring. Thus, acts of terrorism against critical oil infrastructure act as an independent variable in the same way as hydrocarbon spills or their impact on Norte de Santander water sources intervene as an independent variable. This is the context of the dynamics of violence associated with the internal armed conflict in which different armed groups and criminal structures resort relatively often to a type of terrorist attack that has a direct impact on the department's water resources and river basins.

Based on a first qualitative perspective, the dynamics of the armed conflict in Colombia were analysed to identify and define the actors, objectives and dynamics associated with terrorist attacks against critical hydrocarbon structures. Thus, an initial approach assumed that such attacks, which occurred from 2010 to 2019, against the pipelines running through Norte de Santander responded to the strategic and ideological objectives of armed groups operating in the department, among which the FARC-EP (until 2017), ELN, EPL and FARC-EP

dissidents stand out. Nonetheless, the department's environmental richness and river wealth and their exposure to different acts of terrorism have also been described.

In addition, from a quantitative approach, Pearson's Correlation Coefficient was used to analyse the behaviour of terrorist attacks from 2010 to 2019 within the framework of the internal armed conflict against critical oil pipeline infrastructure, and the oil spills resulting from these attacks. Accordingly, we sought to determine the relationship between the independent and dependent variables. However, and as a complement to the proposed approach, which as will be seen, had some explanatory limitations, the need for a broader model integrating other possible explanatory factors was also proposed to understand the causal relationship between terrorist attacks on oil infrastructure and the resulting spills on water sources. Nonetheless, the starting point for our hypothesis was the following:

H1: The impact of hydrocarbon spills (DV) on water resources is highly and positively correlated with the occurrence of terrorist attacks against crucial hydrocarbon infrastructure (IV).

Yet, based on the results, it would seem likely that other potential determining factors with greater explanatory power can be found besides the number of terrorist attacks against crucial oil pipeline infrastructure and their link to environmental impacts. Whether or not this hypothesis is confirmed, not only can it enable us to further our understanding of this complex phenomenon, as yet little analysed in academic research, but it can also provide criteria for predicting the likelihood of environmental damage from hydrocarbon spills in Norte de Santander water sources as a result of armed conflict and mechanisms to prevent it.

4. Norte de Santander as the scenario for armed conflict

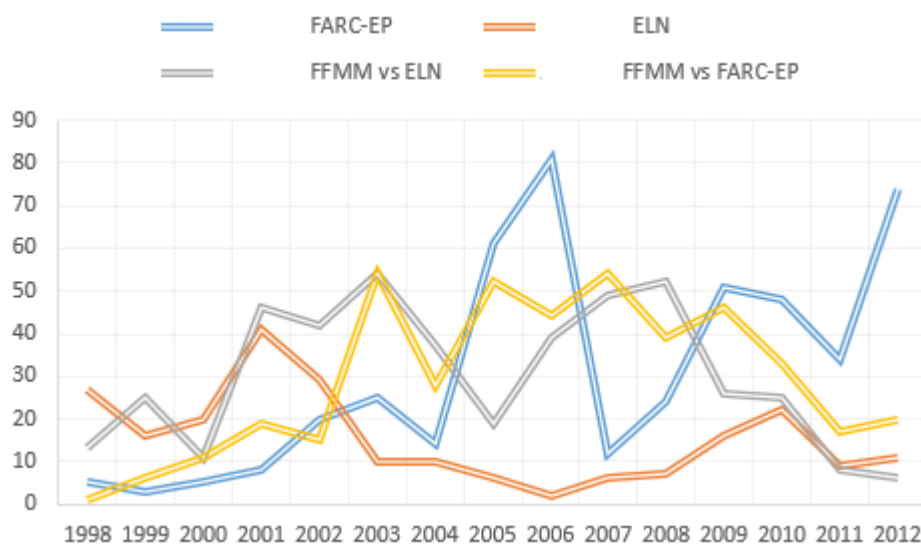
For years, Norte de Santander department has been one of the most prominent enclaves of armed groups and illegal activities.⁴⁹ Due to its border location, rainforests and widespread coca cultivation, it has traditionally served as the perfect shelter for the FARC-EP and ELN guerrilla. However, the intensification of illicit cultivation and the greater operational capacity of the State over departments in the centre of Colombia led Norte de Santander to grow in importance by preserving the two main guerrilla groups in the country and their guerrilla activism.

On the ELN side, we can highlight the Northeastern War Front, whose organization has changed since the early 1980s as the conditions of the conflict evolved. It had four clearly differentiated structures from the 1990s to the beginning of the 2000s. The "Camilo Torres Restrepo" Front operated in the north, while the "Carlos Germán Velazco" Urban Front operated in the capital, Cúcuta. There was also the "Juan Fernando Porras" Front, and the "Carlos Armando Cauca Guerrero" Front operated in most of the department.⁵⁰ Since then, as a result of the Democratic Security Policy promoted from 2002 to 2010 by President Álvaro Uribe, the ELN has been established in Catatumbo with different structures and has ended up operating at a much more local level. This is the case along the border with Cesar Department, with the "Capitán Francisco Bossio" Front, the "*Comuneros*" and the "Óscar Enrique Sánchez" Front. The same has occurred along the north-eastern border of Santander Department, with the "Cien Fuegos" and "Carlos Germán Velazco" Fronts. Finally, the "Héroes del Catatumbo" Front operate in Catatumbo, and to the south on the border with

Venezuela, the “6 de Diciembre”, “Juan Fernando Porras” and “Compañero Diego” Fronts are found.⁵¹

The growth of the ELN in the region is associated, to a large extent, with the discovery of oil in the early 1980s and the construction of the Caño Limón – Coveñas pipeline, which facilitated organizational structures in eastern and north-eastern Colombia. It was in the 1990s when ELN’s guerrilla structure grew considerably and their guerrilla activism was concentrated finally in municipalities of Catatumbo, such as Convención, El Tarra, San Calixto, Sardinata, Teorama or Tibú. Although they were the predominate guerrilla group until 2002, over the years they opted for a strategic withdrawal as a result of greater military pressure against the guerrilla and the decline in armed actions at national level, barely restricted to Norte de Santander, Arauca, Cauca or Nariño.

Figure 1: Evolution of the number of armed actions in Norte de Santander, 1998-2012 (FARC-EP; Nation Liberation Army – ELN; Military Forces – FFMM)



Prepared by the authors based on ODHDIH⁵²

In the case of FARC-EP, the reverse scenario took place. Their presence in the department was far more residual at the beginning and greatly exceeded by the ELN during the 1990s and early 2000s. The main armed structure was the 33rd Front belonging to the “Magdalena Medio” Bloc. As with the ELN, the convergence of secondary structures can be seen. Examples of these are the “Arturo Ruiz” and “Catatumbo” mobile columns, active in the area in question, and to the south on the border with Venezuela, the “29 de Mayo” mobile column, and the “Resistencia Bari” mobile column on the other side, on the border with Cesar Department.

While actions carried out by the ELN obeyed a sort of convex curve, the FARC-EP guerrilla activism, in contrast, showed a growing trend. Thus, from 2002 to 2010, Norte de Santander department and in particular the Catatumbo region, under pressure from the Democratic Security Policy, served as an ideal place to take refuge due to the conditions mentioned above, making it one of the enclaves with greater hostilities and armed activities before the Peace Talks held in Havana and begun in 2012. At any event, FARC-EP had greater room

for manoeuvre in a substantially larger setting than the one surrounding the ELN, mainly present in the coca-growing enclaves of Tibú, Teorama, Sardinata, El Tarra, El Carmen, Convención and San Calixto. By the same token, both groups coexisted remarkably close to oil transportation pipelines and the oil industry present in the department.

We must not lose sight of the concurrence and greater prominence of third armed organizations that have become increasingly important in guerrilla violence perpetrated in the region in recent years. Such is the case of “Los Pelusos”, (self-) conceived heirs and followers of the revolutionary cause supported by the Maoist guerrilla group, the People’s Liberation Army (EPL). This group, created in 1967 in the Urabá region of Antioquia, was demobilized in 1991, although a small contingent of less than 200 guerrilla troops remained in armed activism.⁵³ It has barely kept operational until now, relocating its territorial position to the Catatumbo region, where it has managed to establish itself thanks to enormous revenues from drug-trafficking. In this respect, it was actually on the basis of Ministerial Directive 015, issued by the Ministry of Defence that “Los Pelusos” were denied their guerrilla status to be considered an Organized Armed Group (GAO).

Be that as it may, there is every indication that their operational capacity has been growing in recent years due, to a large extent, to the surrendering of arms by the FARC-EP following the 2016 Peace Agreement. Despite non-compliance,⁵⁴ almost 13,000 guerrilla fighters took advantage of this agreement, although government resistance to implementation, the incapacity and weaknesses of institutions in transforming territories controlled by the defunct guerrilla, and the continuation of vast illicit funding have finally converged in an unchanging geography of violence.⁵⁵ Thus, despite everything, “Los Pelusos” have consolidated their presence in municipalities such as El Tarra, Convención, Tibú, Sardinata, Hacarí, La Playa, San Calixto, Teorama or El Carmen, where they play a key role in the coca business. Likewise, the number of troops have grown in recent years and from 2017 to 2020 almost reached 300, despite the fact that the last two leaders, Víctor Ramón Navarro, “Megateo”, and Luis Antonio Quiceno, “Pácora”, were killed by security forces in October 2015 and September 2019, respectively.

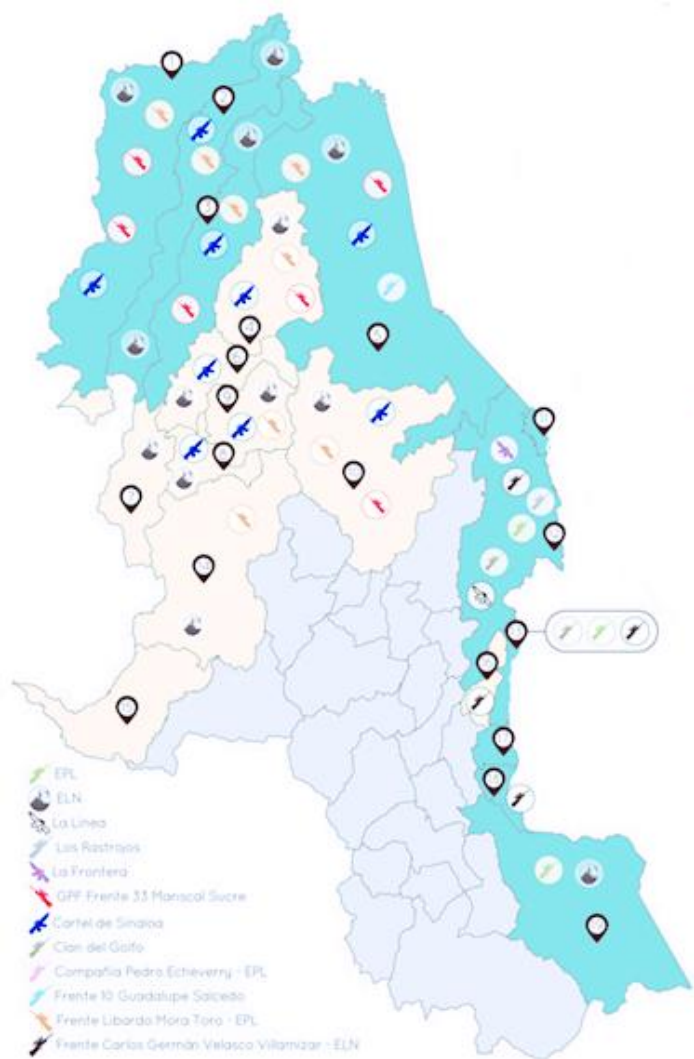
The fact is that “Los Pelusos” have managed to extend their influence beyond Catatumbo, carrying out guerrilla activities in places formerly under the control of the defunct FARC-EP 59th Front, such as Curumaní, Chimichaguas and Pailitas in Cesar Department, and also in the Serranía del Perijá, a key mountain range in the corridor connecting La Guajira with Zulia State in Venezuela. Finally, their presence has also been recorded in the north of Colombia in municipalities formerly controlled by the FARC-EP, such as Corinto, Miranda, Suárez or Toribío, as well as Jamundí, in the Cauca Valley —where the presence of the ELN and their dispute over the territory have also been identified.⁵⁶ Nonetheless, their most powerful armed groups continue to be those operating in Norte de Santander, such as the “Pedro Echeverry” Company or the “Libardo Mora Toro” Front.

It should also be pointed out as a corollary to this brief characterization that the dynamics of violence in the last decade have been seriously affected by changes produced within the internal armed conflict, especially after the failed attempt at dialogue with the ELN from 2015 to 2017, and the demobilization of the FARC-EP in the course of 2017. In the last three years, from 2018 to 2020, the tendency has been for the violence to become fractured and to escalate, making Norte de Santander Department one of the places with greater hostilities in

Colombia, and the point where different armed groups converge to fight over existing resources: the cocaine trade, smuggling, and extractive industries.⁵⁷

Likewise, the power vacuum resulting from the aforementioned surrendering of arms by the FARC-EP has led to criminal bands, heirs of the paramilitary groups, coming to the Department. Although paramilitarism was limited in scope in the 2000s given the particular influence of guerrilla groups, it has currently become notable in the presence of armed structures such as “Los Rastrojos” or the “Clan del Golfo” and other criminal organizations, like the dissident FARC-EP groups, “Mariscal Antonio José de Sucre” 33rd Front or the “Guadalupe Salcedo” 10th Front.

Figure 2: Armed groups present in Norte de Santander, 2020



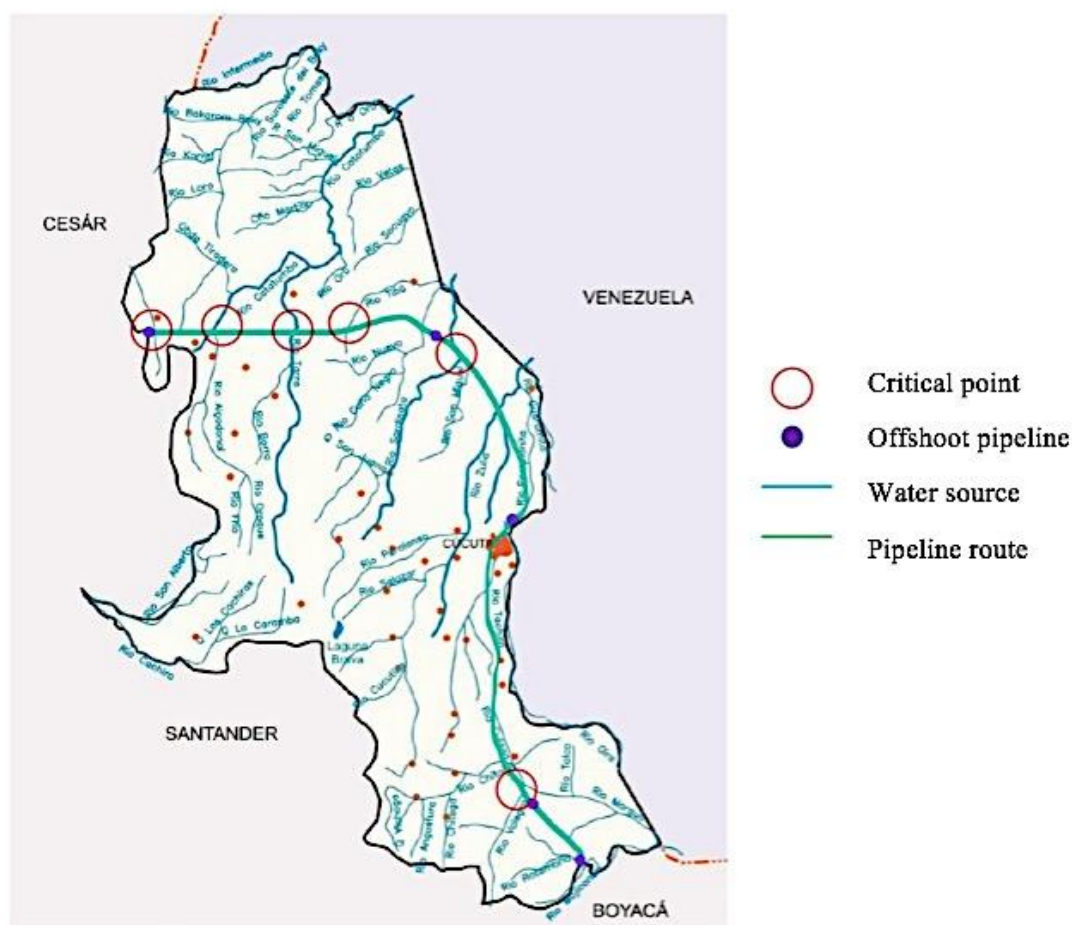
Source: Pares Foundation - in La Opinión (2020)

5. Terrorism, oil infrastructure and the impact on water resources

Terrorist attacks linked to the internal conflict in Colombia have had two main objectives: on the one hand, the Military Forces of Colombia, and on the other, critical infrastructures.

Despite this, the environment, understood from a multiple perspective including water resources, soils, forests and ecosystems, has been affected as a result of the violence perpetrated.⁵⁸ In this respect, certain questions arise in relation to natural resources as a target of actions carried out by armed groups and criminal organizations. That is, whether these resources are the main objective of terrorist attacks or simply bear the brunt of attacks against other primary objectives.

Figure 3. Water resources and oil pipelines in Norte de Santander



Source: Prepared by the authors

In this sense, the FARC-EP, for example, have carried out attacks against essential infrastructures in the water value chain. Gleick⁵⁹ highlighted different incidents of how water has historically held some point of interest for different armed groups in Colombia, such as the explosive device detonated in the Chingaza dam in 2002. Similarly, in 2015, to mention the year prior to the signing of the Peace Agreement, different attacks related to water sources were carried out. For example, on 18 June 2015, the “Teófilo Forero” Column attacked the urban zone of Algeciras (Huila), damaging the water treatment plant and leaving 13,000 people without supply. Just two days later, in Nariño, the “Daniel Aldana” Column attacked kilometre 44 of the Transandino pipeline in the section connecting Pasto with Tumaco. The attack had serious environmental consequences and also left 7,000 people without water

supply. Again, on 22 June, this same Column attacked the same pipeline, affecting the El Pinde creek and the Pianulpi River, causing a massive oil spill. This incident provoked a crude oil spill in the Pacific Ocean and left 150,000 people without water. Finally, on 5 July, an attack with an alleged FARC-EP device on a section of the Cusiana –Cupiagua-Villavicencio gas pipeline near the municipality of Barranca de Upía left the neighbouring towns of Cumaral, Restrepo, Acacías, Granada, Villavicencio and Villanueva without water.⁶⁰

Despite this, and given the current dynamics, it seems that the main objective of the attacks is still critical infrastructure and not so much the water resources themselves. This is debatable given that, to date, no evidence exists of attacks on rivers or water stores with the sole aim of affecting them directly as the main objective. Instead, this type of attack is carried out as the result of other actions, like terrorist attacks on oil pipelines⁶¹ or in relation to the extraction of gold from the water source.⁶²

As previously mentioned, a particular convergence of risk factors takes place in Norte de Santander. Added to the simultaneous presence of different illegal armed groups is border proximity with Venezuela, serving as the ideal refuge from eventual pressure from the Colombian Public Forces. Moreover, weak production systems and lack of investment form a backdrop to which significant deficiencies in governance, institutional capacity and development on the part of the State⁶³ can be added. An extremely high level of hydrocarbon exploitation also exists in the department. However, armed groups have legitimized their violence against the extractive industry by pointing out the absence of positive results, the benefits of which are directed exclusively to large national and foreign business capitals.⁶⁴

In fact, forms of violence perpetrated against this type of oil infrastructure are highly diverse, although they mainly result in acts of terrorism, material damage such as dents or spills, the use of illegal tapping valves as a practice associated with oil smuggling, and other actions of greater importance such as kidnappings, illegal oil reserves, anti-personnel mines, the burning of vehicles, homicides and extortion.⁶⁵ Terrorist attacks against oil infrastructure are the main focus of interest among the diversity of risks threatening the extractive industry. As will be analysed later, they are facilitated by the remarkable ease with which they are carried out, mainly due to the great extension of oil pipelines and their easy access.⁶⁶

Based on the foregoing, it is easy to understand why the Caño Limón – Coveñas pipeline is one of the most affected by terrorist attacks carried out by armed groups and criminal organizations in Norte de Santander given its length of 770.6 kilometres, without even counting the accessory lines that reach it. Its route passes through regions especially affected by the internal armed conflict, such as the Catatumbo region, where, not by chance, a large part of the overall number of terrorist attacks are focused, in line with what was previously indicated. This is the case of Teorama, with 24% of attacks, Tibú (18%) or Toledo (17%). Only in 2018 and 2019, acts of terrorism against pipelines in Colombia amounted to 178 cases, but very specifically in the Catatumbo region, the number of cases reached 81. This is especially significant if we take into consideration that the extension of oil pipelines in the department barely represents 8.1% of pipelines in the country as a whole.⁶⁷

In contrast, the rivers and abundant water resources in Norte de Santander have enormous environmental value due to their ecosystem wealth (Regional Autonomous Corporation of the Northeastern Border n.d.). The amount of crude oil that ends up being spilled is cause for

concern, and once spills reach Columbian water sources, they extend to Venezuela, especially due to the impact on the Catatumbo River. Nonetheless, to understand the level of exposure, Figure 3 shows the water sources that run close to the trajectory of different sections and lines of the Caño Limón – Coveñas oil pipeline.

Figure 4. Water sources and their convergence with areas through which oil pipelines run in Norte de Santander

Oil Pipeline Section	Distance	Nearby Water Sources
Ayacucho (Cesar)-Orú	145 km	Catatumbo River, Marillo Distributary (Catatumbo River tributary), Tiradera Creek (Catatumbo River tributary), Oru River (Catatumbo River tributary), Algodonal River (Catatumbo River tributary), Orroque River (Catatumbo River tributary), Frío River (Catatumbo River tributary), Tarra River (Catatumbo River tributary), Borra River (Tarra River tributary), La Llana Creek, Santa Inés Creek, Los Cedros Creek, El Loro Creek, El Cobre Creek, La Perdida Creek, Chambacu Creek, La Mendrosa Creek, Tibú River, Tibúticito River, El Carmen River, Veinte Distributary, Cacesin Distributary, La Batea Distributary, Cinco Distributary, Luna Distributary, Victoria Sur Distributary, Samaña River, Nuevo River, Caño Negro River.
Orú-Oripaya	134 km	Sardinata River, San Miguel River (Sardinata River tributary), San Juana Creek (River tributary), Miraflores Creek, Campo Alegre Creek, Zulia River, Peralonso River (Zulia River tributary), Salazar River (Zulia River tributary), Laguna Brava lake (Zulia River tributary), Cucutilla River (Zulia River tributary), Pamplonita River.
Oripaya-Toledo	118 km	Pamplonita River, Táchira River, Colorado River, Las Margaritas Creek, Culaga River, Chitaga River (Culaga River tributary), Arauca River, Cubugón River, Saranito River, La Piazoa Creek, Cedeño Creek, El Unque Creek, La China Creek, Grande Creek, Pedregal Creek, Angostura River (Chitaga River tributary), Vichaga Creek (Chitaga River tributary), Valegra River (Culaga River tributary), Talco River (Culaga River tributary).
Toledo-Samoré	83 km	Mojicones River, Negro River, Rotambria River, Margua River

Prepared by the authors

As mentioned before, all this variety of water resources has been seriously affected by the dynamics of the armed conflict, which, moreover, has intensified in recent years, especially in Norte de Santander.⁶⁸ Examples of this impact include the Ecoparque de los Patios, San Luis, la Barca and Brava lakes, and three National Natural Parks, such as Catatumbo-Barí, Tamá and Sisavita, as well as the Estoraques Unique Natural Area. Some official reports, such as the ones issued by the Regional Autonomous Corporation of the Northeastern Border (n.), have highlighted the particular impact on the department's flora and fauna, a significant part of which is especially vulnerable. This is the case in terms of flora with the *frailejón de chitagá* (*Espeletia insignis*), the common cedar, the *guanábano de monte* (*Magnolia hernandezii*), the mahogany, the *ceiba tolúa* (*Bombacopsis quinata*), the walnut, the Colombian pine, the *pachira quinata*, the oak, the *salvia pamplonitana*, the rosewood, the

nazareno (*Peltogyne purpurea*), the Banana Passionfruit, the *palo cucharo* (*Myrsine guianensis*) or the Colombian mahogany. Likewise, and in relation to fauna, we can highlight the risk to endangered species such as the spectacled bear, the soche deer, the crab-eating fox, the *jibirú*, toucans and parrots, the humming bird, terns, *caracaras* or White and Blue herons. All this without counting another 17 types of lizard species, 47 snake species, 6 turtle species, 19 amphibians, and 77 fish that inhabit this particular ecosystem in especially vulnerable conditions.⁶⁹

The natural wealth has been seriously threatened by the convergence of the internal armed conflict with the exploitation carried out by extractive industries. In fact, in the course of this study period, from 2010 to 2019, it was estimated that 32 out of a total of 62 existing water sources were directly affected by acts of terrorism committed against the oil infrastructure. This corresponds to 52% of water resources, but the percentage is even higher if we consider that many of the affected water sources are tributaries, which in turn affect third sources. The section of pipeline that has had the greatest environmental impact on water resources has been the Ayacucho-Orú section, affecting 62% of the resources in its vicinity. Similarly, attacks on the Oripaya-Toledo section have caused oil spills in 52% of the water resources along its route, as shown in Figure 4.

Figure 5. Water sources in Norte de Santander affected by acts of terrorism against oil pipelines

Oil Pipeline Section	Distance	Affected Water Resources
Ayacucho (Cesar)-Orú	145 km	Catatumbo River, Tiradera Creek (Catatumbo River Tributary), Tarra River (Catatumbo River Tributary), La Llana Creek, Santa Inés Creek, El Loro Creek, El Cobre Creek, La Perdida Creek, Chambacú Creek, La Mendrosa Creek, Tibú River Tibúticito River, El Carmen River, Cacesin Distributary, La Batea Distributary, Cinco Distributary, Luna Distributary, Victoria Sur Distributary
Orú-Oripaya	134 km	Miraflores Creek, Campo Alegre Creek, Las Margaritas Creek
Oripaya-Toledo	118 km	Culaga River, Arauca River, Cubugón River, La Piazola Creek, Cedeño Creek, El Unque Creek, La China Creek, Grande Creek, Pedregal Creek
Toledo-Samoré	83 km	Negro River, Margua River

Prepared by the authors

6. Determining factors that explain the phenomenon in Norte de Santander

Even though the official Colombian government website claims to offer open information and data on the scope and impact of terrorist acts against essential energy infrastructures in Colombia, and specifically on their impact on the soil and water sources, nothing could be further from the truth. We have only been able to gather data and information regarding attacks against pipelines and their environmental consequences from Ministry of Defence annual reports for the 2010-2019 period. However, systematic reports were provided by the National Agency for Environmental-services Tenders for the 2010-2017 period and replaced and enriched for 2018 and 2019 by other reports such as those issued by the Ideas for Peace Foundation⁷⁰.

That said, when it comes to understanding the dynamics that explain the crimes against natural resources and the environment, stemming from acts of terrorism perpetrated by different actors and criminal organizations involved in the internal conflict, it should be noted that, at first glance, they would appear to respond to individual patterns. That is, initially, no relationship has been noted among the tendencies typical of the armed conflict, as shown in Figure 5. The same occurs with attacks on critical infrastructure – which, broadly speaking, include attacks on oil pipelines – since the years in which violent acts perpetrated by the FARC-EP and the ELN decreased substantially, such as in 2013 or 2014⁷¹, were years in which, notwithstanding, the volume of attacks greatly increased. Likewise, the years in which the violence appeared to escalate and become reestablished, following the difficulties and breaches of the Peace Agreement from 2017 to 2019⁷², were years in which this type of terrorist act did, however, decline.

Figure 6. Comparison between environmental crimes and acts of terrorism against critical infrastructure

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Crimes against natural resources and the environment	3.441	1.995	5.166	4.985	2.502	3.168	5.028	4.367	4.826	4.383
Attacks against critical infrastructure*	116	196	279	405	208	129	72	67	125	76

Prepared by the authors based on figures issued by the Ministry of National Defence of Colombia⁷³

These divergent trends could be due in particular to the fact that the data on attacks against critical infrastructure include not only attacks against oil pipelines, but also other attacks against bridges, roads or transmission towers, which are usually more common. However, of all of these attacks, the most likely to affect the soil and water sources are acts of terrorism against oil pipelines. Be that as it may, at aggregate level, a similar phenomenon occurs. That is, the longitudinal evolution of attacks against oil infrastructure does not correlate with either the figures of environmental crimes or attacks or with the different degrees of intensity of the violence generated by the internal armed conflict.

Figure 7. Comparison of terrorist attacks against Norte de Santander pipelines

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Attacks against pipelines	3	5	12	21	11	10	7	9	55	26
Attacks with oil spills in water sources	1	5	7	20	8	10	7	6	8	6

Prepared by authors based on the National Agency for Environmental-services Tenders

Yet, it was possible observe certain behaviours and trends associated with this particular subject of study. First, from 2010 to 2017, a high correlation could be observed between attacks committed against pipelines in Norte de Santander department and their causality regarding impact on water sources. This trend has changed substantially since 2018 when the number of attacks increased considerably compared to previous years and, even when attacks resulting in oil spills in water sources remained constant compared to the past, percentage-wise they occupied a much lower position than in the 2010-2017 period. Using a Pearson

correlation for this eight-year period, the resulting value was 0.944, with a 2-tailed significance of 0.00. That is, a very high level of correspondence was observed between attacks on Norte de Santander pipelines and oil spills in the department's water sources, as shown in Figure 8.

Figure 8. Pearson's correlation. Attacks on oil pipelines and attacks on oil pipelines with an impact on water sources, Norte de Santander (2010-2017)

		Attacks Santander pipeline	Attacks_Sant Water Sources
Attacks_N_Santander pipelines	Pearson's correlation	1	.944**
	Sig. (2-tailed)		.000
	N	8	8
Attacks Water Sources_N_Sant	Pearson's Correlation	.944**	1
	Sig. (2-tailed)	.000	
	N	8	8

****.** The correlation is significant at the 0.01 (2-tailed) level. Prepared by authors with SPSS

The fact that an identical cycle of violence characterized the presidency of Juan Manuel Santos during this period may provide much of the explanation. His presidency began in 2010, and although it lasted until 2018, it effectively ended in 2017, as 2018 was a year of transition to the new government with elections starting in March. Similarly, it was between 2012 and 2016 when the Peace Talks with the FARC-EP took place, as did a parallel process with the ELN from 2015 to 2017. Both guerrilla groups were the main actors in the armed conflict in Norte de Santander during that period and the approach of guerrilla activism also responded to a logic of low intensity and continuity. However, this would not explain the further escalation of attacks against oil pipelines, especially from 2012 to 2015, although it would explain not only the territorial pattern of armed actions, mostly restricted to the Catatumbo region, but also the link between these acts and oil spills in water sources.

More obviously, the change in violent behaviour patterns since 2018 in relation to the above can be explained. With the implementation of the Peace Agreement, against a difficult backdrop marked by pitfalls and government resistance, the situation of violence was notably redefined and Norte de Santander stands out for being the scenario where different armed groups, such as "Los Pelusos", the ELN or the FARC-EP dissidents, particularly the heirs of the former 33rd Front, proliferated and competed for the territory. The department's dense rainforests, mountains, coca cultivation and border proximity in addition to the weakness of its institutions and the appeal of its oil industry were sources of attraction that led this department, and not others, to be where the violence and confrontation to claim the political space after the demobilization of the FARC-EP increased the most. All of these attractions coincided in an ideal scenario not only for dispute but also as a greater target for acts of terrorism. Terrorist attacks have grown substantially in number while at the same time the proportion of attacks with oil spills in water sources has changed considerably. Thus, when using the same Pearson's correlation as before, but adding the years 2018 and 2019 to the longitudinal analysis, a very different result is produced.

Figure 9. Results Pearson's correlation for 2010 to 2019 between attacks on Norte de Santander oil pipelines and on pipelines with an impact on water sources

		Attacks Santander pipelines	Attacks water sources Sant
Attacks_N_Santander	Pearson's correlation	1	.263
	Sig. (2-tailed)		.463
	N	10	10
Att water sources_N_Sant	Pearson's correlation	.263	1
	Sig. (2-tailed)	.463	
	N	10	10

Prepared by authors using SPSS

Hence, despite the increase in terrorist attacks on Norte de Santander oil pipelines from January 2018 to December 2019, the impact on water sources does not appear to have differed from the accumulated impact for the 2010-2017 period. This is why the result calls for special analysis, mainly because of the heterogeneity of the resulting correlations. Nonetheless, the terrorist attacks that have had an impact on water sources in Norte de Santander cannot be explained based solely on either the number of attacks or on the intensity of the internal armed conflict, much greater since 2018.

This situation contrasts with arguments put forward by Young⁷⁴ for whom probability distributions can be used to assume that, if conditions do not change, they can be inferred and be decisive when understanding future events such as, in this case, acts of terrorism against oil pipelines. Thus, this situation implies that the changing dynamics of the armed conflict do not allow any stable behaviour patterns to be affirmed. Given the results of the correlation, the hypothesis proposed at the beginning would only be accepted in part, valid for the 2010-2017 period, but lacking in explanatory power if 2018 and 2019 are added. Thus, any future analysis attempting to integrate the link between the armed conflict, attacks on oil infrastructure and their impact on water resources must necessarily consider other qualitative ordinal variables.

To this end, the distance of the place of the attack from a water source is one possible factor to highlight as an aspect to consider. Likewise, whether the oil is being transported through the pipeline in question at the time of the attack needs to be taken into consideration. In other words, different criteria exist for whether oil is being transported or not, such as oil production and storage capacity, or pipeline availability depending on whether tasks such as maintenance and repair are being carried out. This means that pipelines are not being used at all times, so on this basis, terrorist attacks do not always have the same impact on the environment. In contrast, pipeline monitoring or surveillance by the Public Forces could be ruled out as a factor to be considered. Only when security support operations really endanger the position of the armed group can they have any degree of relevance. However, generally this is not the case and, moreover, when they are carrying out surveillance it is the members of the Public Forces who almost always end up on the receiving end of acts of terrorism committed by different armed groups.

To conclude, and given the conditions mentioned above, it could be said that the determining factors leading to damages occurring in water sources in Norte de Santander act as a function explained by, amongst others, a terrorist attack against critical infrastructure, the convergence of said attack with the moment of oil transportation, and the degree to which illegal armed actors seize the opportunity to carry out the attack. Thus, the determining function would be represented by:

$$D(afh) = (V, K(iv), P(aic), P(tp), P(cf h))$$

Where $D(afh)$ are the factors that determine an attack against water sources, V the risks associated with the oil pipeline, including explosion, and $K(iv)$ the coefficient of the intensity of violence. Likewise, $P(aic)$ is the likelihood of an attack on critical infrastructure based on probability distribution, given recent conflict dynamics. $P(tp)$ is the likelihood that oil is being moved through the pipeline and $P(cf h)$ is the likelihood that the attack occurs at a point near a water source. In short, these factors determining the impact on water sources in Norte de Santander would permit us to give some kind of response to the initial proposal. What does become clear, however, is that apart from the difficulties in explaining the phenomenon, the environment (in this specific case, water resources) continues to be a consequence of the impact that the terrorist attack has on oil pipelines. At the same time, different elements come into play that make it difficult or almost impossible for the attack to be prevented or anticipated by the state authorities.

6. Conclusions

The analysis of the phenomenon of terrorist acts committed within the framework of the armed conflict in Colombia, and in particular, their impact on water sources in Norte de Santander, cannot be explained *per se* based on trends associated with the evolution of the conflict itself. At first glance, neither the attacks against the environment in general nor acts of violence perpetrated against critical oil infrastructure coincide with moments of greater intensity of the armed violence. In fact, rather the opposite seems to be the case. However, it has been observed that attacks on pipelines in Norte de Santander, at least from 2010 to 2017, were committed in the same type of location and, likewise, the same proportion resulted in oil spills in water sources. To put it another way, a strong correlation can be found since the dynamics and probability distributions demonstrate a high degree of correlation. That said, from 2018 to 2019, a considerable increase in conflict intensity and especially against the oil pipelines in Norte de Santander point to the need for other determining variables to be incorporated in order to understand the likelihood of a terrorist attack with an impact on water sources.

The foregoing can be partly explained by the fact that the logic of violence was being redefined at the time, due especially to the proliferation of criminal organizations and armed groups, which, on a local scale, were fighting to gain a monopoly over the department's illicit resources and aspiring to exercise hegemonic power in the area. Notwithstanding, it is essential to explore new variables that help to understand the environmental impact caused by acts of violence against the oil industry. Although this research has not resolved this issue, it does invite us to better specify factors related to risk, the intensity of the conflict in the

region, the probability distribution of attacks on crucial infrastructure, and the likelihood of the proximity of a water source and of oil being transported in the pipeline at the time of the attack.

Arriving at these considerations has been far from an easy task, given the limitations on data provided by government authorities, who recognized the right to free access, but in practice this did not prove to be the case. Similarly, data logging has required detailed systematization with reports from the Ministry of Defence overlapping with reports from environmental authorities such as the National Agency for Environmental-services Tenders, and completed with reports from other foundations and reference centres.

Be that as it may, based on these reflections, future research should focus on new variables that are decisive in explaining the impact of attacks against the Caño Limón- Coveñas pipeline on water sources in Norte de Santander. That is, it is necessary to look beyond the dynamics of the armed conflict and the presence of its main actors in the territory. At the same time, we should not ignore the need to seek mathematical relationships between these variables in order to aim for efficient mechanisms to ensure critical points in oil pipelines and protect water sources, both in Norte de Santander and in Colombia as a whole.

Notes

¹ Ministry of Defence, “Logros de la política”

² Catton and Dulap, “Environmental Sociology”

³ Lavaux, “Degradación ambiental”; De Esteban and Antonovica, “Los orígenes de la sociología medioambiental”; McKinney, “Entropic Disorder”

⁴ Harris et al., “When Disasters”

⁵ Rettberg et al., “Different Resources, Different Conflicts?”

⁶ Lavaux, “Degradación ambiental”

⁷ Barnett and Adger, “Climate Change, Human Security”

⁸ Ríos, “La periferización del conflicto”

⁹ Malamud, “The Environment as a Factor”, 248

¹⁰ Humphreys, “Natural Resources”

¹¹ Lavaux, “Degradación ambiental”; Werrell and Femia, “The Responsibility to Prepare and Prevent”; Malamud, “Climate Change and Violence”

¹² Tang et al., “A framework designation”, 389

¹³ See note 6

¹⁴ Münkler, “Viejas y Nuevas Guerras”

¹⁵ Lessing, “Making Peace”

¹⁶ Arjona, “Rebelocracy”

¹⁷ Malamud, “The Environment as a Factor”, 247

¹⁸ Massè and Le Billon, “Gold mining in Colombia”

¹⁹ O’Lear and Tutton, “Environment and Conflict”; Malamud, “The Environment as a Factor”; Kerr, “Assessing Gang Risks”

²⁰ Borum, “Seven Pillars”, 35

²¹ Korf, “Resources, Violence and the Telluric”

²² Kaldor, “Old Wars, Cold Wars, New Wars”, 492

²³ Borum, “Seven Pillars”, 37-41

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- ²⁴ Malamud, “Environment as a Factor”, 251
- ²⁵ Le Billon, “Natural Resources Types”, 19
- ²⁶ Klare, “The Race for What’s Left”, 12
- ²⁷ García Pinzón and Trejos, “Las tramas del conflicto”
- ²⁸ Malesevic, “The Sociology of War and Violence”
- ²⁹ Mann, “The Sources of Social Power”
- ³⁰ Malamud, “Climate Change and Violence”
- ³¹ Lavaux, “Degradación ambiental”
- ³² Homer-Dixon, “On the Threshold”
- ³³ Lavaux, “Degradación ambiental”, 16-17
- ³⁴ Ibidem, 14
- ³⁵ Malamud, “Climate Change and Violence”, 54
- ³⁶ Ibidem, 56
- ³⁷ Malamud, “The Environment as a Factor”; Malamud, “Climate Change and Violence”
- ³⁸ Malamud, “The Environment as a Factor”, 253
- ³⁹ Malamud, “Climate Change and Violence” 53
- ⁴⁰ Ríos, “¿Una paz fallida?”
- ⁴¹ Malamud, “Climate Change and Violence”; Kerr, “Assessing Gang Risk”
- ⁴² Ríos, “La periferización del conflicto”; Malamud, “Economías ilícitas en la Amazonía”
- ⁴³ See note 18
- ⁴⁴ UNODC, “World Drug Report”
- ⁴⁵ GIATC, “El Crimen Organizado”; Ríos et al., “Departamentos de frontera”
- ⁴⁶ Ríos, “Historia de la violencia”
- ⁴⁷ Kerr, “Assessing Gang Risk”
- ⁴⁸ Darby, “Violence and Reconstruction”
- ⁴⁹ See note 46
- ⁵⁰ Echandía, “Dos décadas de escalamiento”, 60
- ⁵¹ Echandía and Cabrera, “Madurez para la paz”, 68
- ⁵² ODHDH, “Síntesis de la violencia”
- ⁵³ Villamizar, “Las guerrillas en Colombia”
- ⁵⁴ See note 40
- ⁵⁵ Aguilera and Perea, “violencias que persisten”
- ⁵⁶ Indepaz, “Conflictos armados focalizados”
- ⁵⁷ See note 46
- ⁵⁸ Patiño et al., “Medio ambiente”
- ⁵⁹ Gleick, “Water and terrorism”
- ⁶⁰ Ombudsman’s Office, “Vigésimo tercer informe”
- ⁶¹ Barrios and Miller, “Green Passion Afloat”
- ⁶² Díaz et al., “Mercury pollution in Colombia”
- ⁶³ Ríos, “Departamentos de frontera”
- ⁶⁴ Vélez, “FARC-ELN”; Sancho, “Colombia enferma”
- ⁶⁵ Ortega, “Los conflictos culturales”; Ideas for Peace Foundation, “Verdad y afectaciones”
- ⁶⁶ Rezazadeh et al., “Applying game theory”
- ⁶⁷ Delvasto and Echeverría, “Documento compilado”
- ⁶⁸ See note 63
- ⁶⁹ Lizcano et al., “Dia de la Biodiversidad”; Andrade, “Estado del conocimiento de la biodiversidad”

⁷⁰ Ideas for Peace Foundation, “Verdad y afectaciones”

⁷¹ See note 46

⁷² Ibidem

⁷³ See note 1

⁷⁴ Young, “Risk and the Theory of Security”

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