

**WATER GOVERNANCE IN COLOMBIA: THE CASE OF THE CAUCA RIVER AND  
THE PESCADERO - ITUANGO DAM**

A Thesis Presented to the Faculty of Architecture, Planning and Preservation

COLUMBIA UNIVERSITY

In Partial Fulfillment  
of the requirements for the Degree  
Master of Science in Urban Planning

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May 2024

## **Abstract**

“Water Governance in Colombia: The Case of the Cauca River and the Pescadero-Ituango Dam” explores the relationship between water governance, energy transition, and the well-being of communities in Colombia by examining the Pescadero-Ituango Dam on the Cauca River.

The primary goal is to identify opportunities for integrating local knowledge into governance frameworks, thereby ensuring equitable and sustainable water management in the midst of the energy transition.

The Pescadero-Ituango hydroelectric project, which has the potential to supply 17% of Colombia's energy, has sparked extensive debates due to its socio-environmental implications. Opposition from local communities, NGOs, and stakeholders is rooted in concerns about the project's disruption of traditional practices and displacement of local communities.

For these reasons, this research proposes specific strategies for redesigning water governance frameworks to enhance community participation and ensure sustainability for people and nature. The study also addresses the challenge of balancing energy generation, economic growth, and environmental sustainability, as it underscores the importance of incorporating local knowledge and strengthening governance frameworks for sustainable water management and community well-being, particularly in large-scale infrastructure projects.

Keywords:

*Territorial Planning Tools, Participation Mechanisms, Water Governance Frameworks, Hydroelectric Projects, Hidroituango, Colombia*

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## Acknowledgments

I want to thank my thesis advisor, Professor Tom Slater, for his invaluable time and knowledge, for guiding me, and for always being endlessly curious about this research. Also, I want to thank Professor Douglas Woodward for his support and advice during my graduate studies and Professor Javier Lopez for accepting being my reader for my thesis and my professor in climate justice matters.

This gratitude is extended to all my professors, instructors, teacher assistants, and students at Columbia University who were part of this journey.

This research could not have been possible without the support and belief of all the people that I met, talked to, and interviewed. Their openness, honesty, and valuable opinions and knowledge made this research an open chapter to continue working for a better Colombia.

Lastly, my greatest gratitude is to my family and friends who, with patience and love, supported this process and these wonderful years at Columbia University. This thesis is dedicated to the memory of my grandfather, who inspired me to dream a better future on the roads of non-violence and knowledge.

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# Abbreviations

ACIC	Colombian Association of Construction Engineers
ANLA	National Environmental Licensing Authority
AUNAP	National Authority of Aquiculture and Fisheries
CAR	Autonomous Regional Corporations
CORANTIOQUIA	Autonomous Regional Corporation of the Antioquia Province
CRA	Regulatory Commission for Water and Sanitation
CREG	Regulatory Commission for Energy and Gas
CRS	Corporate Social Responsibility
DAA	Environmental Diagnosis of Alternatives
DANCP	Office of the National Authority for Consultation
DGIRH	Integrated Water Resource Management Office
DNP	National Planning Department
EADE	Antioquia Power Company
EIA	Environmental Impact Assessment
EPM	Energy Company of Medellín
IDEA	Antioquia Development Institute
IDEAM	Institute of Hydrology, Meteorology, and Environmental Studies
JAC	Community Action Boards
MADS	Ministry of Environment and Sustainable Development
MDM	Municipal Performance Measurement
MVCT	Ministry of Housing, City and Territory
NGO	Non-Governmental Organization
OEF	Energy Obligations of Firm
POMCA	Watershed Management and Planning Plan
POT	Land Use Plan
RPG	Role Playing Game
SNPAD	National System for Disaster Prevention and Response
UNGRD	National Unit for Disaster and Risk Management
UPME	Mines and Energy Planning Unit

# 1. Introduction

## 1.1 Background of the Problem

This research thesis explores the complex nexus between water governance, energy transition, and the well-being of communities in Colombia. It seeks to identify opportunities for incorporating local knowledge and strengthening governance frameworks to ensure equitable, just, and sustainable water management for people and ecosystems in the face of the energy transition.

A case study analysis will examine the Pescadero—Ituango hydroelectric project in the Antioquia Province of Colombia to achieve this purpose.

Pescadero—Ituango, also known as Hidroitango, has been the subject of extensive discussions in the country both for its importance as a mega infrastructure project aimed to be the largest in Colombia with the potential to supply 17% of the country's energy (Deputy Minister for Energy, Orlando Cabrales, 2014) and its social and environmental implications in the territory.

Hidroitango is not just an engineering megaproject, but a long-term commitment intersecting at different scales (national, regional, and local) and dimensions (social, environmental, and economic). It is an indicator to the vision of several decades, designed to be feasible for a specific geographic area of the county where the Cauca River serves as the primary river system flowing through the western region of Colombia.

Since its inception, the project has been part of the political, economic, social, and environmental contemporary history of the Antioquia Region. Hidroitango has been subject to social and environmental disputes from local communities, nonprofit organizations -NGOs-, and

associations due to its economic implications, livelihoods, and environmental impacts, such as the risk of floods, landslides, deforestation, contamination, and faunal affectation.

Colombia's history is an essential factor for this study as illegal groups and activities such as illegal mining that have struggled for control of the territory have had a presence in this area for decades, with forced disappearance and social and political pressures making its communities today continuously displaced.

Hidroituango is an economically strategic project and a complex entity that generates revenue and taxes, contributing to the region's economic growth and energy transition goals. However, it is also a subject of economic and social disputes regarding environmental protection and exploitation of natural resources, the effects on livelihoods and food security, and the protection of ecosystems. The water, energy, and social justice nexus in transitioning to a sustainable energy future is a challenge that is not unique to Colombia but a global concern. Balancing economic development and environmental and social justice remains a complex and ongoing challenge.

## 1.2 Significance of the Problem and Context

As a Colombian citizen, I have a deep personal connection to the country I call home. I have witnessed the struggles in rural areas and experienced the violence of territorial and political control from illegal groups. Colombia's geographical characteristics and ecosystem services, while a gift, also pose challenges, particularly for the most vulnerable and scattered communities.

This research thesis is grounded in the theoretical framework of one of the most fundamental yet complex rights: *the right to water*. The United Nations General Assembly explicitly recognized this right in July 2010 through resolution A/RES/64/292, which acknowledged the human right to safe and clean drinking water and sanitation as "essential for the full enjoyment of the right to life." (UN, 2019). The United Nations Rights Council further emphasized this right in resolution

15/L.14, stating that access to clean water and sanitation is a fundamental human right, closely linked to the rights to health, life, and dignity (UN, 2010).

Colombia, with its rich biodiversity and natural resources, plays a crucial role in the global commitment to respect, protect, and fulfill obligations towards the realization of the right to water. Additionally, it faces the pressing need to meet the Paris Agreement's goal of reducing carbon emissions to avoid a 1.5-degree Celsius increase in global average temperatures. This dual responsibility underscores the importance of Colombia's role in this transition.

The country's most significant goal in this framework is to reduce 20% carbon emissions by 2030 (Ministry of Environment and Sustainable Development, 2018). Hence, transitioning to renewable and clean energy sources is pivotal to achieving these goals. In this regard, Colombia is recognized as one of the leading countries in generating clean energy, as its energy matrix consists of 68,4% generated by hydropower plants, 13,3% by natural gas, 9,5% by carbon, 7,8% by liquid fuels, and 1% by non-conventional renewable energy sources such as wind, solar, and biomass (IDB, 2019).

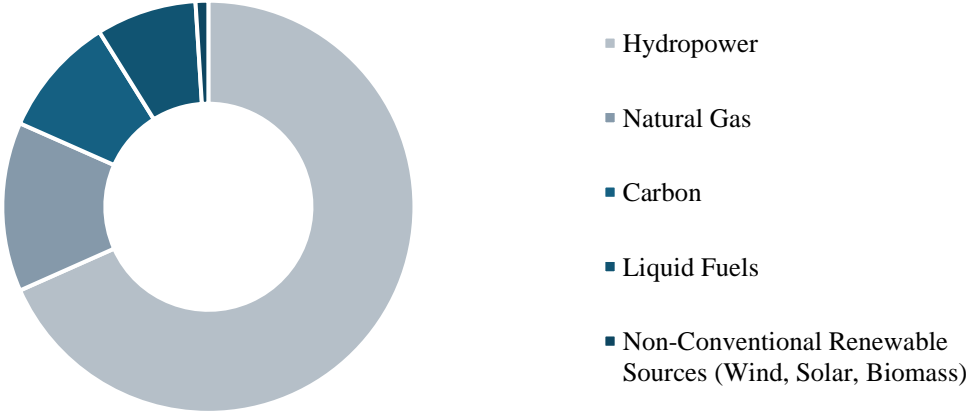


Figure 1.1: Colombia Energy Matrix. Source adopted from (IDB, 2019)

The concept of 'clean energy' is not just a topic of discussion across the energy sector and scholarship but a crucial aspect of this research. It is particularly relevant as it encompasses the notions of clean and renewable energy sources. According to TWI, *clean energy* is "energy gained from sources that do not release air pollutants." In contrast, *renewable energy* is defined as "power generated by sources that are constantly being replenished." (TWI, nd).

In the context of this research, hydropower generation is often considered a renewable energy source. However, the debate about whether this energy source can be considered 'clean' is a complex matter. This is because the infrastructure associated with the construction and management of these projects can lead to deforestation and industrialization processes that can harm the natural environment and disrupt the livelihoods of local communities.

For Colombia, and specifically for Hidroituango, the situation becomes even more intricate. The environmental impact associated with the dam is just one aspect. The project also grapples with territorial and social conflicts, which have proven to be a significant challenge for the local communities that live in proximity of these infrastructures.

At the national scale, Hidroituango is a strategic project that supports achieving goals for energy generation internationally in the fields of energy transition and renewable energy production. It is a project that pays income taxes to the nation, and the Ministry of Environment and Sustainable Development (Ministerio de Ambiente y Desarrollo Sostenible) –MADS is responsible for approving the environmental license for the project through a state agency called Environmental Licenses National Agency (Agencia Nacional de Licencias Ambientales) -ANLA.

At the regional scale, the project is located in the Antioquia province jurisdiction, where different Autonomous Regional Corporations (CAR) come into play and the project directly involves 12 municipalities (Municipios): Ituango, Peque, Buriticá, Briceño, Toledo, Sabanalarga,

Liborina, and Olaya. San Andrés de Cuerquia, Santa Fe de Antioquia, Valdivia, and Yarumal (Hidroituango, 2023). Additionally, it has significant impacts in regional ecosystems and water bodies, the most important one is the river basin of the Cauca River, which is one of the most extensive rivers in the country.



Figure 1.2: Cauca River, Photo taken by Camila Botero, 2024

Locally, communities living in the most proximate municipalities from the project have faced livelihood changes. Known for traditional practices such as fishing, farming, and artisan and ancestral gold mining along the riverbank, they have faced displacement to their life associated with the Cauca and its tributary rivers. These changes encompass not only economic development projects such as power generation plants but also the social and political disputes over the control of the territory from illegal groups and activities.

These national, regional, and local scenarios motivate the research to understand the social dynamics of the territory and the governance models around water, as well as the planning mechanisms of power dynamics shaping the water access paradox.

### 1.3 Research Objective and Guiding Questions

In the context of energy transition, this research aims to evaluate territorial planning tools and participation mechanisms in multiple dimensions, including scale (national, regional, and local) and the actors involved in decision-making. The main objective is to propose alternatives that contribute to adapting current water governance frameworks in the areas influenced by hydroelectric projects in order to prevent, mitigate, or compensate for the social, environmental, and economic impacts in the territories. A case study analysis of the Hidroituango project and its relationship with the Cauca River will be conducted to achieve this objective.

The questions guiding the research are:

- What are the specific social, economic, and cultural implications of the Hidroituango project on the communities affected, and how have these implications evolved?
- In what ways do the environmental and social disputes surrounding Hidroituango reflect broader challenges in Colombia balancing economic development, environmental conservation, and social responsibility?
- How have the governance frameworks related to water management and energy transition evolved in response to the social and environmental challenges posed by mega-infrastructure projects like Hidroituango?
- What roles do regional corporations and local governments play in influencing and managing the impacts of hydroelectric projects, and how effective are current mechanisms in addressing the concerns of communities?

- To what extent has the Hidroituango project disrupted traditional practices such as fishing, farming, and artisanal mining, and what strategies can be implemented to support these communities' resilience and adaptation?
- How can water governance frameworks be redesigned or enhanced to incorporate local knowledge and ensure the active participation of communities in decision-making processes?
- How can balance energy generation, economic growth, and environmental sustainability goals be achieved in Colombia's energy transition, particularly in regions with significant biodiversity and ecosystem services?

## 2. Literature Review

### 2.1 From Governing to Governance

**“Who gets to be included and how fluid power relations are constituted”**

(Pereira and McElroy, 2018)

Governance, as discussed by Watson (2018), Pereira and McElroy (2018), Krause (2009), and Özerol and Harris (2020), is characterized by an interplay of power, participation, and conflict.

On the one hand, Watson (2018) highlights the need for a conflict model of society in planning, emphasizing the importance of recognizing power dynamics and diverse voices within civil society. Pereira and McElroy (2018) further underscore the role of non-state actors in environmental governance, calling for adaptive and collaborative approaches. Krause (2009) and Özerol and Harris (2020) highlight the collective decision-making and management of ordinary affairs in governance, with the latter extending the concept to water resource allocation and distribution. These perspectives collectively define *governance* as a concept that transcends traditional notions of government by encompassing a broader array of actors, processes, and mechanisms involved in decision-making and managing common affairs or resources such as water.

The concept of governance reflects an evolving response to complex societal challenges and transformations, including globalization processes, rapid urbanization trends, environmental degradation, and socio-economic inequalities (Watson, 2018).

In this sense, the concept of governance can be reflected in four dimensions: (i) Political Economy, (ii) Urban Planning and Globalization, (iii) Environmental Governance, and (iv) Water Governance.

Governance viewed through the political economy lens emphasizes the integrated analysis of economic and political systems shaping collective decision-making. Economic incentives and political dynamics influence individual and social actions within the governance structures (Krause, 2009). According to Watson (2018), governance transformations are evident in urban planning, reflecting a shift from traditional governmental approaches towards more inclusive and adaptive forms of governance. This expansion signifies a response to the complexities of globalizing and multiscalar contexts involving non-state actors in decision-making.

The author further reflects that historical legacies of colonization, particularly to countries in the Global South, continue to shape governance structures, exacerbating patterns of inequality and influencing socio-economic dynamics (Watson, 2018).

For authors Pereira and McElroy (2018), environmental governance encompasses interventions to influence environmental actions and outcomes through regulatory processes, institutions, and collaborative mechanisms. These extend beyond government actions to include the involvement of diverse stakeholders such as communities, businesses, and non-governmental organizations (NGOs). Cross-scale governance initiatives have the opportunity to leverage partnerships between various actors, including public-private collaborations and civil society engagements, to address environmental challenges collectively (Pereira and McElroy, 2018).

Another helpful perspective to understand these collective processes, Özerol and Harris (2020) explore water governance, which encompasses political, social, economic, and administrative systems influencing the use of water, allocation of resources, and management, with

a focus on equity and efficiency by extending beyond formal institutions to incorporate social-political dynamics and everyday influences on decision-making related to water resources.

The transition towards the governance paradigm faces challenges related to power dynamics, institutional and regulatory layers, and the need for collective decision-making. Conflicting rationalities (Watson, 2018) and interests within society pose the importance of recognizing diverse perspectives and addressing the power differentials in governance by all the actors involved. Participatory planning approaches are often based on the assumption that civil society is definable, organized, homogeneous, and actively consensus-seeking, thus frequently underestimating the societal complexities and conflicts (Cooke and Kothari, 2001 quoted in Watson, 2018). The challenge remains through these governance frameworks on accountability, transparency and the need to meet meaningful consensus, especially in the contexts of deep difference (Watson, 2018).

## 2.2 Water, and Energy Nexus

The water-energy-food nexus is an interdependent system that requires an integrated governance approach to address its challenges (Pereira and McElroy, 2018). This approach emphasizes the need to break down traditional sectoral silos and consider the interconnectedness of these systems (Pereira and McElroy, 2018). This nexus and the water and energy nexus by itself are embedded in the trade-offs and synergies between these systems, which are also influenced by social-ecological and socio-technical factors (Pereira and McElroy, 2018).

The water and energy nexus is influenced by the human right to safe and clean water and sanitation, which requires the Member states to respect, protect, and fulfill these rights (UN, 2010). However, the commercialization, privatization, and commodification of water and water sources pose challenges to the realization of these rights (Sultana and Loftus, 2012).

Understanding water as a commodity has become a topic of significant debate and concern; Pereira and McElroy (2018) highlight the increasing complexity of environmental challenges and the struggle of governments to keep pace with these changes. The authors argue that while the private sector has developed corporate social and environmental responsibility activities to address environmental concerns, there is a recognition that fundamental changes in business practices are necessary to navigate a world of growing environmental constraints as well as finding institutional frameworks that stimulate innovation aimed at solving these challenges rather than exacerbating them.

Drawing on the work of Allenby and Richards, as well as Steffen et al., Pereira and McElroy (2018) emphasize the role of the private sector in technological innovation and the creation of pathways to sustainability. However, they caution that in some cases, innovation may be supply-driven rather than demand-driven, potentially leading to unsustainable development trajectories. Furthermore, the authors discuss the evolution of corporate social responsibility (CRS) from philanthropy, which aims to align the corporate sector and powers with socially desirable objectives and long-term sustainability. They suggest that businesses have recognized the social costs of economic activities and are increasingly focusing on CRS to address them (Pereira and McElroy, 2018).

Sultana and Loftus (2012) offer a critical perspective on the private sector's and the market's role in water provision. The authors express concerns about the commodification of water and its potential implications for the right to water. While recognizing the importance of holding governments politically and legally accountable for ensuring access to water, the authors argue that struggles for the right to water often require social mobilization and activism to translate moral

arguments into actionable claims. They highlight the emergence of a global water justice movement fueled by concerns over water commodification and access (Sultana and Loftus, 2012).

Düren (2017) contributes to the discussion by highlighting the transformation of water into a traded commodity in industrialized societies. The author points out the challenges associated with water pollution, particularly in regions where natural freshwater sources are contaminated by agricultural runoff, industrial waste, and environmental disasters.

Understanding the water-energy nexus can have similar implications for complex and interconnected territorial, sectorial, and collective systems that encompass multiple dimensions, including environmental sustainability, socio-economic development, and political governance.

On the one hand, water and energy are fundamental to human society's development and prosperity. However, despite their interconnectedness, water and energy have traditionally been governed as separate issues, leading to increased trade-offs and risks, particularly in climate change-induced scenarios such as water scarcity (Pereira and McElroy, 2018). Taking the hydropower generation as an example, dams are often not perceived as water storage systems for agriculture nor in the events of extreme droughts - or precipitation to subside water flow along river basins, as this nexus is not yet perceived from a regional scale across different sectors.

Effective governance of the water-energy nexus should understand that some challenges include fragmented frameworks, inadequate resource management, and limited institutional capacity. In this regard, the nexus approach offers alternative governance outlooks by emphasizing integrative strategies that bridge silos and engage diverse stakeholders (Pereira and McElroy, 2018). These authors argue for a shift in governance paradigms and the need to break down established sectoral boundaries and adopt a holistic approach to decision-making. This entails addressing the issues of scale and complexity inherent in adaptive systems, where governance must

navigate diverse socio-technical innovations and social-ecological dynamics (Pereira and McElroy, 2018).

## 2.3 Justice and the Right to Water

Exploring the notions of the right to water seems cohesive with exploring what justice means. Although the extensive literature examines various aspects of these topics, the most relevant works to this research delve into the multifaceted nature of the relationship between justice and rights.

On the one hand, literature from authors Sultana and Loftus (2012) discuss the need to transform the dominant view of water as a commodity and challenge its economic valuation, advocating for a political understanding of the right to water. This political understanding can be perceived in the water justice movement that involves environmentalists, human rights activists, indigenous groups, and grassroots communities (Sultana and Loftus, 2012). This movement understands water as a common heritage and a public trust and should not be privatized for profit (Barlow, 2008, quoted in Sultana and Loftus, 2012). The authors stress the need for critical attention to issues of displacement, mismanagement, and power in water governance, drawing parallels with Henri Lefebvre's (1968) concept of the *Right to the City*; they conceptualize the right to water as a political effort, involving democratic control over water resources and social power.

**“Right to water understood as a political moment, akin to the right to the city, and implying democratic participation in producing the flows of water and social power on which life itself depends.”** (Sultana, and Loftus, 2012).

These notions are in some sense, opposite to what authors Bustamante, Crespo, and Walnycki (2012), argue, as they critique the rights-based approach, for potentially promoting exclusive ownership of water resources, leading to sectionalism and appropriation of nature.

**“Using the concept of rights to frame and understand how cultures relate to and interact with their environment and its resources runs the risk of overlooking those cultures and societies that are not based on the existence of any kind of right over nature, their environment, or its resources.”** (Bustamante, Crespo, and Walnycki 2012).

These authors argue that the human right to water and water rights are not necessarily incompatible (Bustamante, Crespo, and Walnycki 2012). Colombia's case serves as an example, as the Cauca River was declared a subject of rights within a specific historical, environmental, and social context, and the state has started to incorporate water rights as part of institutionalizing the rights to water.

When discussing the rights-based approach, the authors argue that it is based on the abstract and accepted idea of what it means to be human (Bustamante, Crespo, and Walnycki 2012). They caution against oversimplifying complex situations by framing them solely in terms of morality, which can lead to polarized debates and neglect existing complexities. This approach can inadvertently portray marginalized groups as victims, reinforcing a political order that may limit their agency and representation (Castilla Masso, undated, quoted in Bustamante, Crespo, and Walnycki, 2012). It is crucial to understand this dynamic to avoid appropriating the voices of marginalized communities and to ensure their autonomous right to access the political sphere.

Perera (2012) highlights the importance of recognizing water struggles as deeply rooted in specific historical, geographical, political economies, and cultural contexts. Exploring the dimensions of the fundamental human right to water and the rights-based approach to water itself does not automatically define the character of water as a non-commodity (Perera, 2012). Nonetheless, to develop a framework of water as a human right would also be imperative to develop the state's role as a provider and guarantor of this right and legitimate it (Bustamante,

Crespo, and Walnycki 2012). Drawing on Bakker's notion of the commons, Perera suggests that endorsing collective ownership and management of water resources offers a principled and strategic alternative to privatization. The author calls for revising the human right to water, shifting towards collective and interrelated conceptions that challenge anthropocentrism and capitalist ideologies.

Heffron (2021) introduces the concept of a just transition to a low-carbon economy, which comprises the principles of distributive, procedural, recognition, and restorative justices to ensure the application of human rights across the energy lifecycle by proposing the *Just Framework*, which unites climate, environmental, and energy justice scholarship. In the authors' words, **“justice means more fairness and the search for sustainable and equitable solutions, equality and inclusiveness.”** (Heffron, 2021), as traditional economies have not yet reached just outcomes for societies.

Inequality is a pressing global issue, and policy failures in addressing inequality are evident as it continues to rise. Resolving this issue requires a comprehensive approach from all three areas of justice—climate, environmental, and energy—to adopt a more holistic perspective on society and contribute to a just transition. According to Heffron, current perspectives often overlook the root causes of inequality, especially concerning climate and environmental justice, where the focus primarily shifts to adaptation rather than prevention. Energy justice, on the other hand, aims to tackle inequality proactively. Overall, justice frameworks should prioritize examining the events triggering inequality, emphasizing both the temporal aspects and the locations where injustices occur.

Hence, the Just Framework encompasses five essential aspects of justice necessary for upholding human rights throughout the energy life cycle: (i) *Distributive justice* focuses on fair

resource distribution, emphasizing transparency in revenue allocation and tax reforms; (ii) *Procedural justice* ensures stakeholder involvement throughout project stages, with EIA becoming increasingly stringent; (iii) *Restorative justice* rectifies energy sector injustices through proper waste management and decommissioning, with a focus on preventing abandoned energy sites; (iv) *Recognition justice* centers on acknowledging the rights of various groups, particularly indigenous communities, and implementing legal structures like Social Licenses to Operate; and (v) *Cosmopolitan justice* highlights the global effects of energy activities, necessitating legal action to address cross-border impacts (Heffron, 2021).

## 2.4 Energy and Risk in Transition

As highlighted by various authors, energy transition and risk are intertwined concepts that require action, holistic approaches, international cooperation, and ethical considerations. On the one hand, Düren (2017) emphasizes the need for a global transition to renewable energy sources, particularly in light of the Paris Agreement's goals. This transition is further explored by Quentin, Nauges, Wai Wah Chan, and Rinaudo (2015), who stress the multidimensional nature of transitioning urban water systems. Guarín (2018) provides a specific case study of Colombia's transition to green growth, while Johansson, McCormick, Neij, and Turkenburg (2006) discuss the environmental and social challenges associated with renewable energy sources. These authors explore the need for a rapid and comprehensive transition to sustainable energy sources and the challenges and opportunities associated with this transition.

The energy transition and global challenges explored by Düren (2017) highlight the need for an energy transition driven by population growth, increasing energy consumption, and the imperative to mitigate climate change. The transition requires a shift from fossil fuels, given their role in contributing to climate change through greenhouse gas emissions. Additionally, the author

argues that renewable energy sources, such as hydropower, offer a sustainable solution to the global energy crisis. These sources are characterized as simple, safe, and capable of addressing the energy problem at a large scale (Düren,2017).

At the national scale, Colombia's focus on energy projects to boost economic growth while adhering to environmental policies, including commitments to green growth and the Paris Agreement, reflects a global trend towards aligning economic development with sustainability goals (Guarín 2018). The multidimensional nature of transitioning urban water systems toward sustainability emphasizes the need for integrated, adaptive, and participatory approaches. This broader perspective extends beyond energy to include other critical sectors, such as water management (Quentin, Nauges, Wai Wah Chan, and Rinaudo, 2015).

On the other hand, Johansson, McCormick, Neij, and Turkenburg (2006) touch upon energy production and disasters' social and environmental impacts. Large-scale energy projects, such as hydropower dams, can lead to community displacement and ecological disruption. Additionally, human-induced climate change exacerbates the risks of climate-sensitive hazards, impacting vulnerable populations disproportionately (Cutter, 2020).

In this regard, the ethical responsibility of achieving a global energy transition requires innovation and ethical considerations to ensure the well-being of humanity and the planet (Düren 2017). While societal shifts and inequalities influencing disaster preparedness, response, and recovery need to address social vulnerabilities for equitable recovery and resilience-building in the face of climate change (Cutter, 2020).

# 3. Background

## 3.1 Geographical Characteristics of the Cauca River Basin

The Cauca River is the main water body of Colombia's western region. It springs in the southern part of the country, near the Sotar highland in the Cauca Province, and flows parallel to the Western Mountain Range. It has a length of 1,350 kilometers and merges into the Magdalena River in the Bolvar Province. The River navigates most of Colombia's western territory from south to north; it crosses nine provinces: Cauca, Valle del Cauca, Quindo, Risaralda, Caldas, Antioquia, Crdoba, Sucre, and Bolvar, and 183 municipalities. It is the source of socio-economic services and development and serves as a natural fauna and flora corridor. (CONPES 3624 of 2009 quoted in Ministry of Environment and Sustainable Development, nd).

The river has historical significance dating back to pre-colonial times. Indigenous communities living along the river used it to communicate with other regions and trade food and goods (Valencia, 2000, quoted in Prez-Valbuena, Arrieta, and Contreras, 2015). During the colonization period, the river was used to transport soldiers and resources for expeditions (Henao, 2005, quoted in Prez-Valbuena, Arrieta, and Contreras, 2015). In the 19th century, steam navigation was introduced. And, in 1888, the first steamboat navigated along the river, conditions that determined the process of regional integration into markets that led to subsequent social and economic development (Patino, 1989 quoted in Prez-Valbuena, Arrieta, and Contreras, 2015).

The consolidation of steam-powered transportation along the Cauca River received a significant boost around 1905 when the National Government granted subsidies to river navigation

companies (Patiño, 1989, quoted in Pérez-Valbuena, Arrieta, and Contreras, 2015). Nevertheless, the development of roads and infrastructure in the region led to the decline and disappearance of the use of the Cauca River as a means of transporting goods and people (Pérez-Valbuena, Arrieta, and Contreras, 2015).



Figure 3.1 Cauca River Geographical Location. Source adopted from *Cauca River: economic geography of its area of influence* (Pérez-Valbuena, Arrieta, and Contreras, 2015) and file topographic map of Colombia from Wikipedia.org

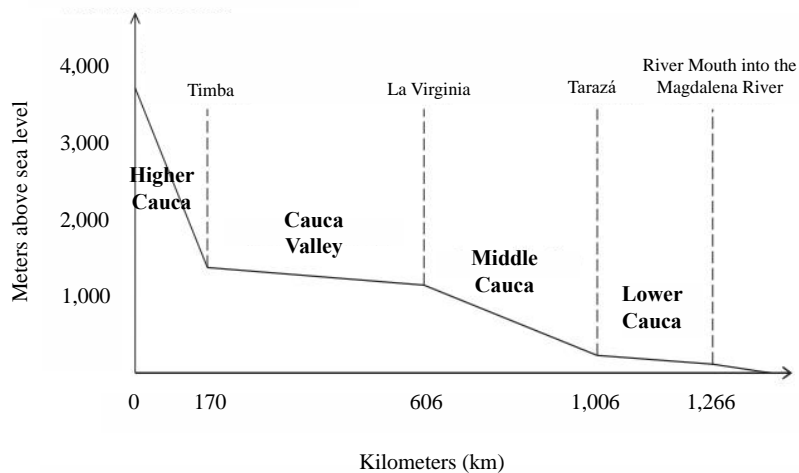


Figure 3.2 Cauca River Basin Elevation. Source adopted from Valle del Cauca Regional Autonomous Corporation (CVC, 2008)

### 3.2 Socio – Economic Characteristics of the Cauca River Basin

The research study focuses on the municipalities and communities located along the middle and lower basins of the Cauca River, which, as mentioned before is one of the largest rivers in the country and flows from south to north through the Western Mountain Range. It is also one of the most important rivers for the economic development of the Andean and Caribbean regions.

The territories under study have similar socio-economic characteristics. Their proximity to a water resource like the Cauca River has led to the development of fishing, agriculture, traditional mining, illegal mining, and small—and large-scale hydroelectric projects as their main sources of income (Pérez-Valbuena, Arrieta, and Contreras, 2015). However, the population is culturally and ethnically diverse, with indigenous, Afro-Colombian, and agricultural communities across this region.

The populations that lives along the Cauca River face challenges regarding their socio-economic conditions and quality of life. These communities lag behind other municipalities in the country in terms of income generation, access to education and health, unemployment, and

informal labour measured by the Multidimensional Poverty Index (DGIRH, 2021). This index indicates that one-quarter of the municipalities in the Cauca River basin have a multidimensional poverty index exceeding 50% of their population (DGIRH, 2021). When environmental factors are considered, their vulnerability increases in the face of projected climate change scenarios (Pérez-Valbuena, Arrieta, and Contreras, 2015).

According to a study conducted in 2015 (Cauca River: economic geography of its area of influence by Pérez-Valbuena, Arrieta, and Contreras), agricultural processes are among the most important economic activities in the municipalities within the influence area of the Cauca River. The study divides the municipalities into two groups: those in the Caribbean region adjacent to the Cauca River and those that do not belong to this region. It was found that in the Caribbean region, the primary agricultural activities are cassava (58.6%), plantain (27.4%), and oil palm (1.4%). On the other hand, the rest of the municipalities' agricultural activities include sugarcane (88.5%), plantain (3.6%), coffee (1.2%), and citrus fruits (1.1%) (Pérez-Valbuena, Arrieta, and Contreras, 2015).

Moreover, the Institute of Hydrology, Meteorology and Environmental Studies (IDEAM), state that agricultural activities use the most water resources nationally, followed by hydroenergy, livestock activities, and domestic use (Water demand includes the total volume of water extracted from the natural environment) (IDEAM, 2023).

Additionally, is the river with the most significant fishing activities in the country characterized by species that travel upwards for reproductive purposes. The geographical characteristics of the river and its proximity and ecological synergies with marshes make it a suitable area for fishing communities that have been established along the river basin for generations. (Movimiento Rios Vivos, 2012).

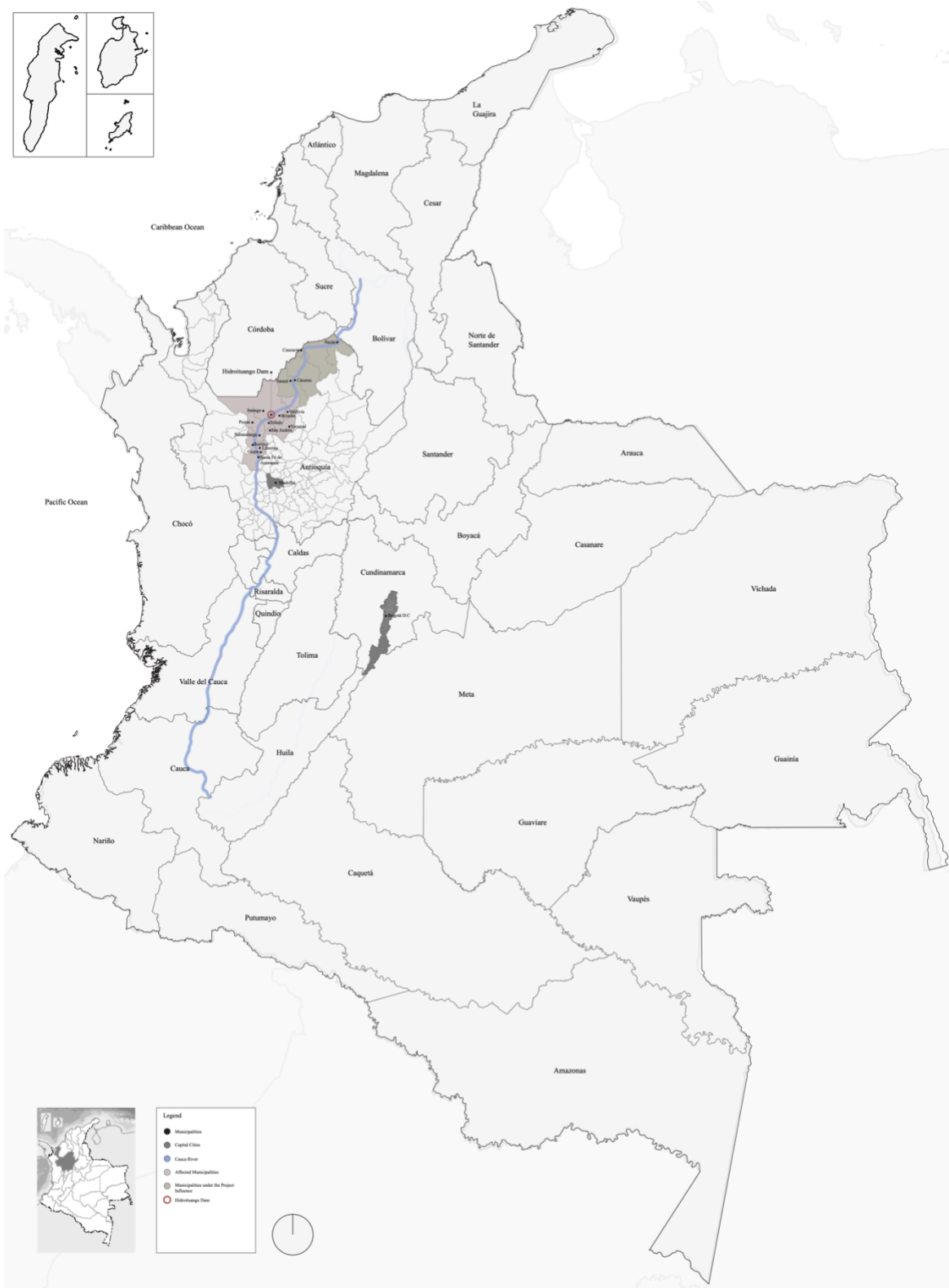


Figure 3.3 Provincial Division of Colombia and Municipalities under the study, own creation. Basemap, Colombian Federation of Municipalities, 2018

At the municipal level, the National Planning Department (DNP) carries out the Municipal Performance Measurement (MDM) annually. This measurement aims to assess, compare, and rank municipalities based on their management capacity and development results. The goal is to promote better administrative management, quality of public spending, and investment-oriented towards results (DNP, 2022). The MDM has two components: (i) the *Management Component* measures local governments' actions and decisions to use public resources for development. It includes: the mobilization of resources translated into investment, execution of budgeted resources, open government and transparency, and use of territorial planning instruments for resource allocation. (ii) the *Results Component* measures the change in the living conditions of the population, such as citizens' access to education, health, public services, and security. The final *MDM indicator* is derived from the change in the *Results Component* between one year and another. The score ranges from 0 to 100 and reflects the municipality's performance (A score of 100 indicates outstanding performance, while 55 or more is considered high, between 45 and 55 is medium, and below 45 is low) (DNP, 2022).

<b>Municipalities</b>	<b>MDM</b>	<b>Management</b>	<b>Results</b>	<b>MDM 2016</b>	<b>MDM 2022</b>
Briceño	44,11	44,15	68,71	Medium	Low
Buriticá	55,03	53,68	71,08	Low	High
Cáceres	48,00	46,97	63,80	Low	Medium
Caucacia	52,57	52,64	71,55	Medium	Medium

Ituango	51,02	50,31	67,39	Medium	Medium
Liborina	56,72	56,77	69,07	Low	High
Nechi	48,16	47,78	67,90	Medium	Medium
Olaya	53,40	52,72	64,78	Medium	Medium
Peque	60,52	58,75	71,67	Medium	High
Sabanalarga	49,50	50,45	64,71	Medium	Medium
San Andrés de Cuerquía	32,09	32,87	64,79	Low	Low
Santa Fé de Antioquía	66,46	66,02	72,42	High	High
Tarazá	45,01	43,68	69,56	Low	Medium
Toledo	46,84	46,06	68,83	High	Medium
Valdivia	38,52	37,29	67,27	Medium	Low
Yarumal	64,05	64,57	71,50	High	High

Table 3.1 Municipal Performance Measurement (MDM) for affected municipalities and those in the Hidroitungo project's influence area. Source (DNP, 2022)

The 2022 average MDM for Colombia was 52,82 – medium; for the Antioquía Province, this indicator was 54,59 - medium, almost reaching high performance. The table above depicts the MDM results for the affected municipalities and those in the Hidroitungo project's influence

area for the year 2022 and a comparison of the final MDM indicator from 2016 when the National Planning Department started to measure this indicator. It is worth noting that out of the sixteen municipalities, five of them scored a high performance (Buriticá, Liborina, Peque, Santa Fé de Antioquía, and Yarumal); eight municipalities scored a medium performance (Cáceres, Cauca, Ituango, Nechi, Olaya, Sabanalarga, Tarazá, and Toledo); and three scored a low performance (Briceño, San Andrés, and Valdivia). The majority of municipalities remained the same from 2016; five improved their score (Buriticá, Cáceres, Liborina, Peque, and Tarazá), and three deteriorated (Briseño, Toledo, and Valdivia).

Many political, social, and economic factors can contribute to these changes. Even though most municipalities improved or remained the same between 2016 and 2022, it is important to note that the average performance is below both the national and province performances, indicating that attention is required to the institutional capacity and for development and resource allocation in these areas.

Moreover, there is social fragmentation throughout the Cauca River basin, mainly attributed to the effects of the armed conflict, the perception of danger leading to social distrust, and a sense of loss of access to justice and obstacles in social participation (DGIRH, 2021). Some of the most striking effects of the armed conflict in the Cauca River basin identified in the social and environmental diagnosis of Sentence T-038, 2019, are: (i) 183 attacks on populations by armed groups, mostly occurring between 1996-2000; (ii) the death of 334 people due to harassment, combat, and bombings; (iii) 555 massacres between 1981-2012, resulting in 3,310 victims; (iv) 10,910 kidnappings by different armed actors; and (v) 217 murders of social leaders between 2016-2019. It is worth noting that Antioquia and Valle del Cauca are the provinces where the highest number of events related to the armed conflict occurred (DGIRH, 2021).

### 3.3 Pescadero – Ituango’s History

In 1969, the idea of a hydroelectric project for the Antioquia region was born based on studies that would harness the flow of the Cauca River as an energy source. The preliminary studies were developed by the engineer José Tejada Saenz, who also developed a document that studied the hydrological potential of the Middle Cauca. (Jiménez - Villamil, 2019).

In the late 1970s, Pescadero–Ituango, also known as Hidroitango, was included in the country's electric expansion plans. However, the National Government (1982-1986) ordered the suspension of the country's electric sector expansion, and the feasibility studies were suspended. By 1992, the country faced an energy crisis due to droughts attributed to the El Niño phenomenon and a lack of capacity to meet energy demand (Jiménez-Villamil, 2019); a national blackout occurred, leaving the country without electricity for several hours.

In the mid-1990s, the idea of Hidroitango resurfaced, promoted by the Antioquia Province Government and the formation of the project's promoting society, composed of the Antioquia Power Company (EADE), the Colombian Association of Construction Engineers (ACIC), the Government of Antioquia, Integral Firm, and the energy company ISAGEN (Jiménez - Villamil, 2019).

Between 2003 and 2009, the Hidroitango partnership was established between the energy company of Medellín: Empresas Públicas de Medellín (EPM), the Government of Antioquia, and the Institute for the Development of Antioquia (IDEA). The inclusion of Hidroitango as a strategic project in the Antioquia Development Plan (2008 – 2011) was a crucial step to strengthen the province's fiscal income and meet the region's growing energy demands. During this time, the allocation of the Obligations of Firm Energy (OEF), the Declaration of Public Utility, and the release of the environmental license were issued. In 2007 a bidding process was opened for the

construction, in which a company that win the bid would be responsible for technical support, project oversight, and land acquisition (Jiménez-Villamil, 2019). In 2010, EPM won the bid, and between 2011 and 2015, engineering works on the dam, roads, and consortium contracts began. During these years, the diversion of the Cauca River took place.

In January 2016, the National Environmental Licensing Authority (ANLA) suspended the construction of the Valdivia–Ituango road due to environmental management, and later that year, ANLA granted a modification (Jiménez-Villamil, 2019). In 2017, the partial diversion of the Cauca River resumed, and by the end of the same year, the left tunnel of the dam was blocked.

The years 2017-2018 are crucial to understanding the current context of the project. In 2017, the infrastructure crisis of Hidroitango began due to earth movements that caused tunnel blockages. By this time, the project was around 87% complete, with an elevation of the dam reaching 379 meters above sea level (masl); however, this elevation was insufficient considering that the diversion tunnel closures needed to be at an elevation of at least 390 (masl) (Jiménez Villamil, 2019).

It is important to note that the events that took place during that year consisted of engineering construction matters beyond the scope of this research, which led to contingencies in the project. Nevertheless, these infrastructure works in regard to the diversion and discharge tunnels are the causes of the contingency faced by the project during the following years.

In 2017, the Cauca River was rising in water levels, and the company decided to overflow the "machinery house" (Casa de Maquinas) where the turbines for energy generation and equipment were situated causing a significant amount of economic losses for the company.



Figure 3.3 Hidroituango's Machinery House, Photos taken by Camila Botero, 2024

In May 2018, the Government of Antioquia declared a state of emergency after the river flow increased due to the amount of water going through the machinery house and diversion tunnel—a potential overflow caused nearby communities to be evacuated downstream (Medellín's Mayors Office, 2022).

**“The schedule was the project's greatest enemy, what happened was catastrophic. But that also taught us that there was a great challenge of rhythms, while the rhythm of the CFO, the company, the banks was to put the system into operation, start generating energy, well, people's times were different. The issue of rhythm is an essential issue, the rhythm of communities, the rhythm of NGOs, the rhythm of companies, and the rhythm of the state, which have short-term cycles.”** (Excerpts from the semi-structured interviews, 2024)

The damage to the infrastructure that further obstructed the diversion tunnels from the Cauca River resulted in a decrease in the river's flow after the dam, causing environmental damage to the river's flow and economic losses for the inhabitants of downstream communities such as Valdivia, Cáceres, and Cauca. Once the technical problems of the tunnels were resolved and the river's flow was unblocked, the unexpected increase in river flow caused flooding in Puerto Valdivia, and 600 people were evacuated. These floods destroyed homes, community

infrastructure, and bridges. Due to the rising Cauca River, the evacuation of 12 municipalities in the river's influence areas downstream, spanning three departmental jurisdictions (Antioquia, Sucre, and Córdoba), was ordered. And in May 2018, more than 22,000 people were evacuated (Jiménez Villamil, 2019).



Figure 3.4 Evacuation in Puerto Valdivia, photo taken by Pablo Cuellar (BBC, 2018)

The company has made significant progress with the Hidroituango project. As of today, most infrastructure work has been completed, including the final elevation of the dam. Following the contingency in 2018, the diversion and drainage tunnels were closed. After the machinery house was recovered and construction resumed on four of the eight turbines, the project reached 50% operation. To achieve 100% operation, a new contractor must finish the remaining four turbines (EPM, 2024).

When discussing the events during the site visit in March 2024, EPMs' team of engineers and social and environmental workers agreed that the emergency scenario has become a milestone

of lessons learned for emergency response and recovery. The company has made significant efforts to implement prevention and monitoring measures post-contingencies. One such effort was the creation of the Technical Monitoring Center, which aims to have interdisciplinary monitoring and early risk alerts within the project, as well as movement sensors upstream and downstream of the river. This monitoring center works every day and is in operation 24 hours a day with the capacity to alert the command center of any river rises.

**“It is one of the most monitored projects in the world. We have 13,500 instruments from La Virginia - upstream to Margenta - downstream. These instruments gather information for hydrometric river flow monitoring with up to 26 hours of anticipation.”**  
(EPM Official for the Technical Monitoring Center, 2024).

The data gathered by the company can react to river floods with the monitoring system that alerts the company about potential upstream river floods, which can be managed by controlling water levels through the dam and mitigating uncontrolled downstream discharge in extreme rainfall such as the El Niño Phenomenon. Similarly, hydroelectric infrastructures have the potential to capt and store water for extreme draughts with the capacity to control water supply for the region.



Figure 3.5 View from the Hidroituango dam to the Cauca River and tip of the infrastructure, Photo taken by Camila Botero, 2024

It's important to note that the National Environmental Licensing Authority (ANLA) suspended the project's environmental license following the contingency. The license is still suspended, but the company is allowed to operate under Resolution 820 of 2018. An action plan was developed to restore the environmental license with the communities and the institutional actors in charge of monitoring the project, and the license will only be restored once this action plan is implemented and all the agreements are met (EPM, 2024).

## 4. Legal Framework

### 4.1 Overall Summary of Colombia's Policy Framework

The 20th-century political and economic history marked a significant foundation for the country's current policy and legal frameworks. In the late 1980s and early 1990s, the country underwent (i) the decentralization processes, (ii) the enactment of the new Constitution (1991 Constitution), and (iii) the implementation of market-oriented economic reforms, including trade liberalization (Krause, 2009). The emergence of these processes can be attributed to various factors such as the exclusive nature of the political system, which had been dominated by the Liberal and Conservative parties, and the lack of representation for left-leaning political groups. In addition, due to the dispersed rural development in the country, attributed to its complex geographical characteristics, state authority was diminished, creating a space for illegal groups known as "guerrillas" and social movements, which established new forms of authority.

Moreover, the surge in drug trafficking activities during the 1980s exacerbated the crisis, leading to an increase in violence. The influence of drug money into the political arena further eroded the system's credibility, fostering patronage and corruption (Krause, 2009).

Following the assassination of three presidential candidates in 1989, there was growing support for a Constitutional Assembly to reform the political structure and promote broader popular participation. Subsequently, after a successful referendum and the election of a Constitutional Assembly, the new Constitution was ratified on July 4, 1991 (Krause, 2009). The

1991 Constitution defines the Colombian state as "democratic, participative, and pluralist" (Public Service Department, 1991).

One of the most significant components of the new Constitution that reshaped governance structures in the country was administrative and political decentralization. The process of decentralization consisted of consolidating Colombia as a unitary state, decentralized, and with autonomy of its territorial entities (DNP, 2002). This means that participation would be given via elected representatives both at the regional and local levels for governors and mayors. In addition, the Constitution and further legislation define a whole set of mechanisms for direct participation in (i) political decision-making via referendums and plebiscites and (ii) controlling the activities of the public administration and the respect of the citizens' rights via the right to demand a constitutional review, tutelary action (*acción de tutela*), and civic oversight committees (*veedurías*) (Public Service Department, 1991, quoted in Krause, 2009).

Administrative decentralization meant to shift (i) functions, (ii) resources, and (iii) decision-making autonomy from the National Government to regional and local territorial entities. Furthermore, political decentralization meant to transfer the rights to (i) elect governments and (ii) formulate and implement policies within the scope of their territories (National Planning Department, 2002, quoted in Krause, 2009).

The political decentralization in Colombia comprises two sub-national levels: (i) Provinces (*Departamentos*) and (ii) Municipalities (*Municipios*). Currently, there are 32 provinces and 1,101 municipalities in Colombia (DNP, 2022). At the provincial level, citizens directly elect the Governor (*Gobernador*) and the representatives of the Provincial Assembly (*Asamblea Departamental*), and at the municipal level, citizens directly elect the Mayor (*Alcalde*) and the representatives of the District Council (*Concejo Municipal*). Among other things, the municipal

governments have the responsibilities to (i) deliver public services, (ii) foster local development via territorial planning and investment in local infrastructure, and (iii) promote the participation of citizens (Krause, 2009).

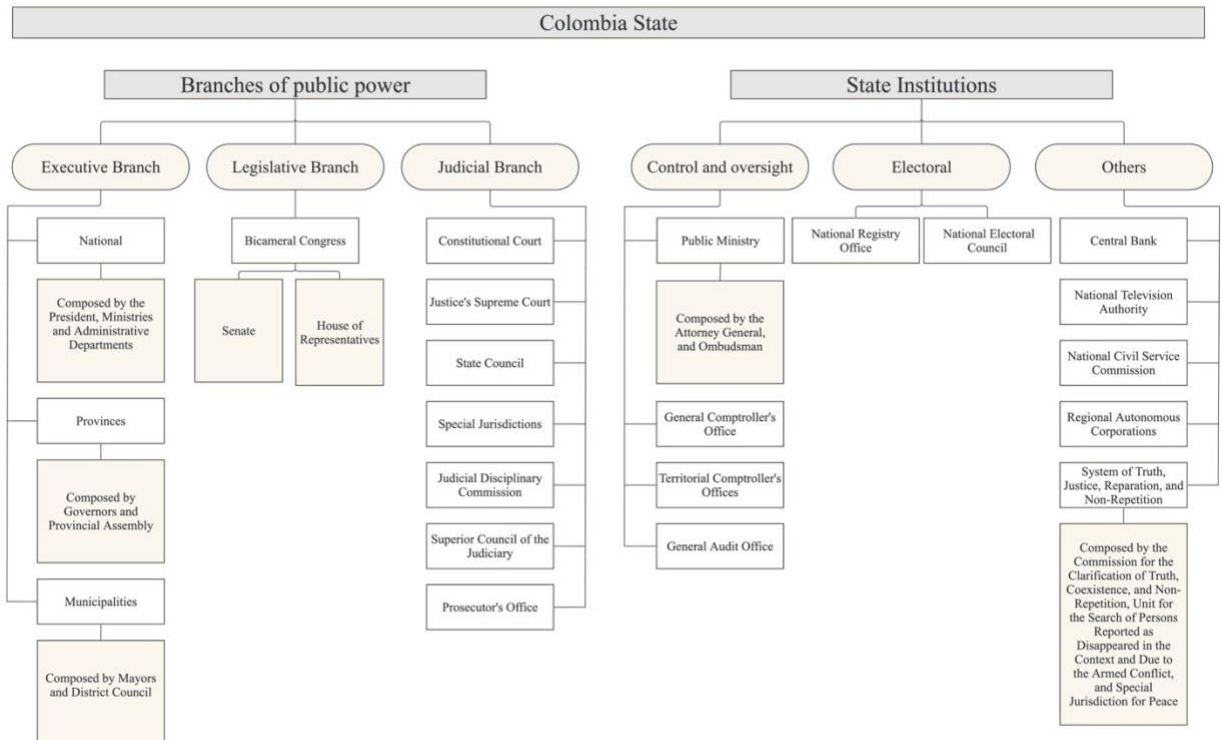


Figure 4.1 Structure of the Colombian State, own creation based on the information provided by the National Administrative Department of Statistics (DANE).

As shown in Figure 4.1, the Colombian state is divided into public power and state institutions. Branches of public power include the (i) executive branch led by the President, the Ministries and administrative departments such as the National Planning Department (DNP); the (ii) legislative branch is composed of a Bicameral Congress (Congreso Nacional) constituted by the Senate (Senado), and the House of Representatives (Cámara de Representantes); and the (iii) judicial branch is “responsible for enforcing the rights, obligations, guarantees, and freedoms

established in the Constitution and laws, for achieving and maintain social harmony” (DANE, nd) composed, among others by the Constitutional Court (Corte Constitucional).

This institutional framework and the political parties represented in the Congress, technocrats, and civil society organizations compose the actors and institutions of policy-making processes in Colombia. Moreover, the Constitutional Court has been considered an important veto player in policy-making processes since its inception in 1991, and most of its rulings have resulted from citizens using their right to appeal a constitutional review (Acción pública de inconstitucionalidad) (Krause, 2009).

The second milestone after the enactment of the 1991 Constitution was the recognition of ethnic groups as individuals, as, before this Constitution (1886), these groups were considered savages and “relatively incapable” (Constitutional Court, nd).

Ethnic groups are **“people who come from the same ethnicity; that is, they share a system of beliefs and cultural values, a common cultural history, and set of identity traits”** (Constitutional Court, nd). These groups share their ancestry, have a common origin, and are linked to the territory through culture, languages, beliefs, worldviews, and customs (Constitutional Court, nd).

Ethnic groups in Colombia comprise three main population groups: (i) Indigenous peoples, Nations, Communities, and Tribes; (ii) Afro-Colombian populations; and (iii) ROM people who speak the Romani or Caló language - a mixture of Spanish, Andalusian, Catalan, and Basque (Constitutional Court, nd). Hence, the 1991 Constitution recognized them as political actors and subjects of rights; it also recognized their self-government, relationship with their territories, and the autonomy of their traditional authorities.

The legal instrument in which these rights are enacted is called *Consultation* (Consulta Previa). Hence, the consultation process is a fundamental right incorporated into the national legislation through Law 21, 1991, by the integration of the United Nations and the International Labour Organization (ILO) agreement 169 from 1989. Consultation is the right of ethnic groups in Colombia to decide on measures (legislative and administrative), projects, works, or activities to be carried out within their territories, thereby seeking to protect their cultural, social, and economic integrity and guarantee their right to participation (ANLA, 2022). This process is overseen by the Office of the National Authority for Consultation (DANCP) under the Ministry of Interior Affairs (Ministerio del Interior).

## 4.2 Water and Energy Sectors

The water and energy sectors in Colombia are structurally separated. This separation also exists in different sectors, such as housing, agriculture, security, commerce, and culture. It is worth noting the distinction between water as an environmental resource, under the jurisdiction of the Ministry of Environment and Sustainable Development, and water and sanitation as service provisions, which come under the jurisdiction of the Ministry of Housing, City, and Territory (MVCT).

The roles and responsibilities of the different actors in these sectors are horizontally articulated into policy making, regulation and control, generation or service, and delivery. These roles are also distributed among different territorial scales: (i) nation, (ii) province, and (iii) municipalities, as shown in Tables 4.1 and 4.2.

<b>Role</b>	<b>National</b>	<b>Provincial</b>	<b>Municipal</b>
Policy Making	Ministry of Environment and Sustainable Development (MADS)	Autonomous Regional Corporations (CAR)	Mayor's Office
	National Environmental Licensing Authority (ANLA)	Provincial Assembly	Municipal Council
	National Planning Department (DNP)	Governor's Office	
	National Unit for Disaster Risk Management (UNGRD)		
Regulation	Regulatory Commission for Water and Sanitation (CRA)	Autonomous Regional Corporations (CAR)	Mayor's Office

Table 4.1 Roles in the water sector in Colombia, own creation

At the national level, the Ministry of Environment and Sustainable Development (MADS) is responsible for the **“design and formulation of national policy regarding the environment and renewable natural resources, as well as establish criteria for environmental planning of land use, to ensure the conservation and sustainable use of renewable natural resources and the environment”** (MADS, 2024). Affiliated with this ministry is the National Authority for Environmental Licenses (ANLA), this agency grants or denies environmental licences for the execution of a project, work, or activity that has the potential to generate significant environmental impacts. ANLA also guarantees that projects, works, or activities subject to licensing, permission, or environmental procedures comply with environmental regulations (MADS, 2024).

In coordination with all sectors and territorial entities, the National Planning Department (DNP) coordinates, articulates, and guides short-, medium-, and long-term planning, policy cycle, and the prioritization of investment resources (DNP, 2024). Additionally the National Unit for Disaster Risk Management (UNGRD) coordinates and articulates the National System for Disaster Prevention and Response (SNPAD) to incorporate risk management, emergency response and disaster recovery processes into policy guidelines (UNGRD, nd).

At the provincial level, the Autonomous Regional Corporations (CAR) outline the policies regarding river basins and water resource management, and are responsible for regulating and controlling the environmental policies they set (Krause, 2009). The CARs are comprised of territorial entities that, due to their characteristics, are geographically part of the same ecosystem or form a geopolitical, biogeographic, or hydrogeographic unit (MADS, 2024). Currently, there are 33 CARs along the Colombian territory, and they do not necessarily encompass the same administrative and political division as provinces and municipalities.

Furthermore, these entities are responsible for publicly assembling and mobilizing civil society to participate through a Basin Council in the formulation of the Watershed Management and Planning Plans (POMCA). POMCAs are **“consultative and representative bodies of all stakeholders who live within the watershed and act as the space for dialogue, proposals, and consensus regarding the management, utilization, and conservation of the watershed”** through resolution 509, 2023 (MADS, nd).

At the municipal level, the mayor is responsible for urban and rural planning, by defining investment priorities, allocating resources, and guaranteeing access to public services through (i) territorial planning and (ii) public investment.

The two main instruments for territorial planning are (i) the Municipal Development Plan (Plan de Desarrollo Municipal) and (ii) the Land Use Plan (Plan de Ordenamiento Territorial - POT). On the one hand, the District Development Plan outlines the priorities for local development, identifying gaps and challenges for the coming administration. On the other hand, the Land Use Plan can be seen as translating the Development Plan into the urban and rural space (Krause, 2009). It guides construction activities and delimits residential and industrial areas, urban expansion areas, and risk-prone areas. **“Municipal administrations must promote the coordination between social, economic, urban, and other interests, through the development of mechanisms that facilitate the participation of communities and their organizations.”** (MVCT, 2023).

Community Action Boards (Juntas de Accion Comunal - JAC), are one of the vehicles for civil participation. They are social, non-profit community organizations that promote social management. JACs have legal representation, assets and are voluntarily constituted by residents of a particular area who work together to promote integral, and sustainable development (Article 8 of Law 743 of 2002).

<b>Role</b>	<b>National</b>	<b>Provincial</b>	<b>Municipal</b>
Policy Making	Ministry of Mines and Energy	Autonomous Regional Corporations (CAR)	Mayor’s Office
	Mines and Energy Planning Unit (UPME)	Provincial Assembly	Municipal Council
	Ministry of Commerce, Industry and Tourism	Governor’s Office	
	National Planning Department (DNP)		

Regulation	Regulatory Commission of Energy and Gas (CREG)	Autonomous Regional Corporations (CAR)	Mayor's Office
	Public Services Superintendency		
Service Delivery	Dealers and Transmitters	Transmitters, Distribution, and Generators	Generators

Table 4.2 Roles in the energy sector in Colombia, own creation

Similarly, the Ministry of Mines and Energy is responsible for the formulation, and adoption of policies, plans, programs, projects, and regulations, for the mining and energy sector (Ministry of Mines and Energy, nd). Affiliated to this ministry are both the the Mines and Energy Planning Unit (UPME), and the Regulatory Commission of Energy and Gas (CREG). These entities regulate, and promote the provision of public services for electricity and gas, and plan in coordination with stakeholders in the mining-energy sector, the development and utilization of mining and energy resources as well as the development and dissemination of information required for policy formulation and decision-making respectively (Ministry of Mines and Energy nd).

### 4.3 Environmental Assessments

The Environmental Impact Assessment (EIA) and the Environmental Diagnosis of Alternatives (DAA) are the tools that the National Environmental Licensing Authority (ANLA) or the Regional Autonomous Corporations (CAR) mandate for decision-making on projects, works, or activities that require environmental licensing. The DAA supports the request for alternative evaluation, and the EIA supports the evaluation of the environmental feasibility of a project (ANLA, nd). The assessment must describe the characteristics and setting of the project following the outline described in Table 4.3.

#	Description of activity
1	Object and scope of the study
2	Executive summary
3	Delimitation of the direct and indirect influence area of the project
4	Description of the project, including location, stages, dimensions, estimated costs, execution schedule, processes, identification and estimation of inputs, products, waste, emissions, discharges, and inherent risks of the technology to be used, their sources, and control systems
5	Information on the project's compatibility with the land use established in the POT (Land Use Plan)
6	Information on renewable natural resources intended to be used or affected for the project's development
7	Identification of communities and mechanisms used to inform them about the project
8	Description, characterization, and analysis of the biotic, abiotic, and socioeconomic environment in which the project is intended to be developed
9	Identification and evaluation of the environmental impacts that the project may cause, indicating which ones can be prevented, mitigated, or compensated
10	Proposal for the Environmental Management Plan (PMA) of the project, which must contain the following: <ul style="list-style-type: none"> <li>a) Measures for prevention, mitigation, and compensation of environmental impacts that the project may cause on the environment and/or communities during the project's construction, operation, maintenance, dismantling, and/or termination phases.</li> <li>b) Monitoring program of the project to verify compliance with environmental commitments and obligations during the implementation of the PMA and verify compliance with environmental quality standards established in current regulations. Likewise, the assessment of the expected environmental performance of the project, the efficiency and effectiveness of the environmental management measures adopted, and the relevance of necessary corrective measures applicable to each case.</li> <li>c) Contingency plan containing prevention and emergency response measures that may arise during the life cycle of the project.</li> <li>d) Projected costs of the Management Plan in relation to the total project cost and schedule for executing the Management Plan.</li> </ul>

Table 4.3 Components of the Environmental Impact Assessment, source ANLA

Furthermore, Figure 4.2 depicts the process for granting or denying the environmental license, which requires, among other elements, that the consultation process be conducted if any ethnic groups are present in the project's influence area. For the Hydroelectric sector, in particular,

the environmental license, the connection study, and the consultation process—if required by law—are the most significant steps of any given project and, if granted, are the ones that make any project feasible and attractive for investment.

**“Nowadays environmental licenses are the greatest challenges for any project. That's why today a project is valued and viable, to the extent that it already has environmental approval.”** (Excerpts from the semi-structured interviews, 2024)

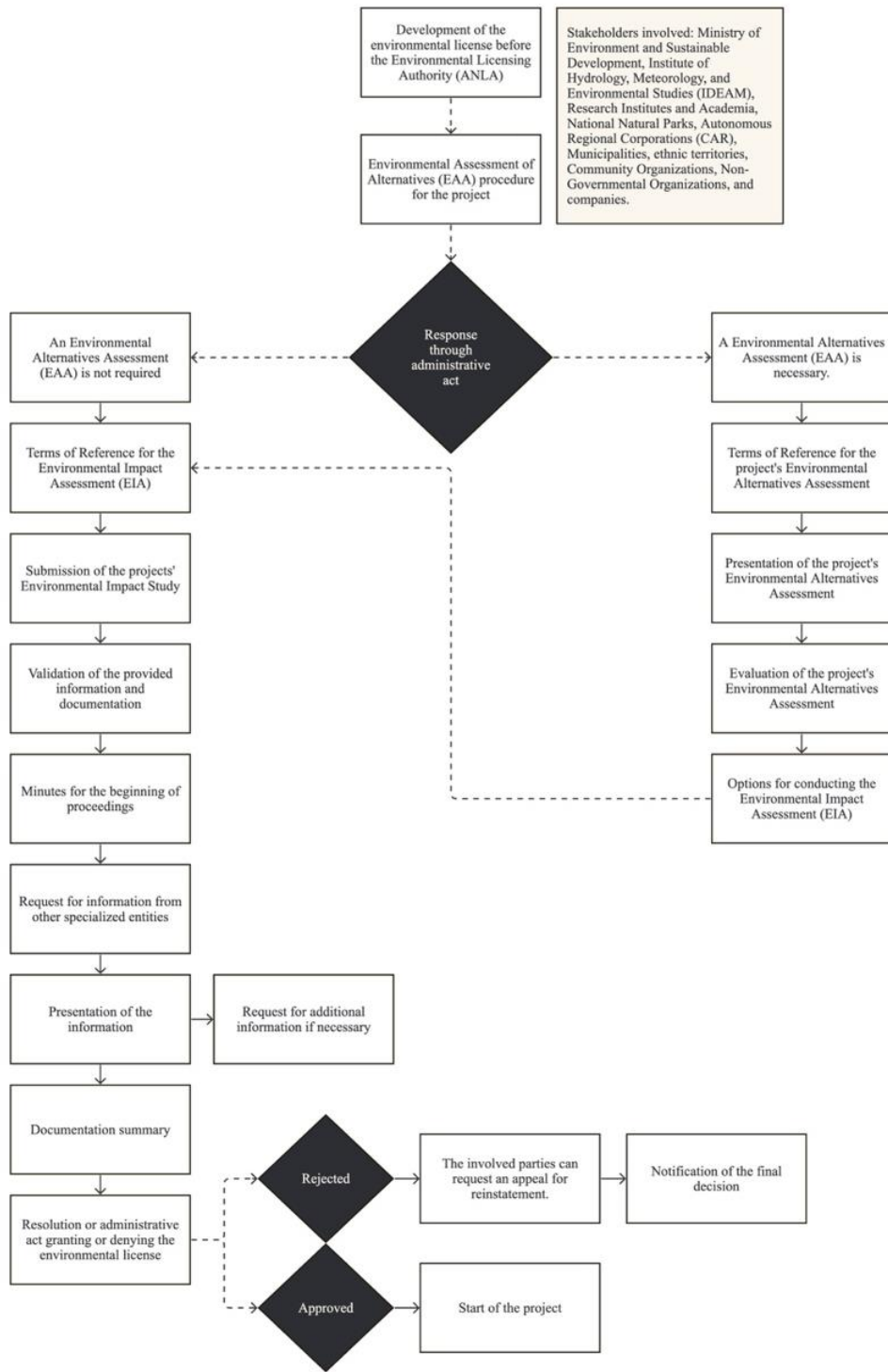


Figure 4.2 Environmental Licence Flow Chart, own creation based on Decree 1076, 2015

## 4.4 The Cauca River as a Subject of Rights

In 2019, the Superior Tribunal of Medellín initiated the T-038 Legal Guardianship process, which recognized the Cauca River and its tributaries rivers (Nechi and San Jorge) as a legal entity subject to rights. The responsibility for this entity's protection, conservation, maintenance, and restoration falls upon EPM (Empresas Públicas de Medellín) and the State.

The Constitutional Court declared the Cauca River a subject of rights through a judicial sentence. This sentence was a response to the effects caused by the closure of one of the gates of the Hidroituango hydroelectric plant during the contingencies, causing an 88% decrease in the river's flow from the dam to the municipality of Nechi for approximately six days.

In this regard, the sentence provides guidelines for the formation of a guardianship commission of the Cauca River which comprises appointed guardians from the National Government, representatives of communities, the University of Antioquia, and an advisory team that includes representatives from the Alexander Von Humboldt Institute, the National Authority of Aquaculture and Fisheries (AUNAP), and the Autonomous Regional Corporation of Antioquia (CORANTIOQUIA). Furthermore, the legal guardianship process mandates support and monitoring from the Attorney's General Office and the Ombudsman's Office.

The "Geographical Area of the Sentence" is defined following the hydrographic zoning of the Institute of Hydrology, Meteorology and Environmental Studies (IDEAM) and includes three hydrographic zones that cover the entire watershed, as well as La Mojana region. These areas correspond to 7% of the country's continental territory (8,152,149 hectares) and encompass nine departments, 228 municipalities, and 15 Environmental Authorities.

In terms of hidrography, the geographic area of the sentence encompass 55 POMCAs (12 approved, 9 in the process of consolidation, and 34 unstarted).



Figure 4.3 Geographical Area of the T-038, 2019, own creation (topographic map file of Colombia from Wikipedia.org)

The Integrated Water Resource Management Office (DGIRH) under the Ministry of Environment and Sustainable Development (MADS) is currently undergoing the implementation of the working plan. Which is divided into five stages: (i) conceptualization and integration; (ii) socio-environmental assessment; (iii) project identification, gap assessment, and the design; (iv) formulation of the monitoring strategy; and (v) executing the monitoring plan (DGIRH, 2023). This office also acts as the legal representative of the Cauca River by presidential mandate.

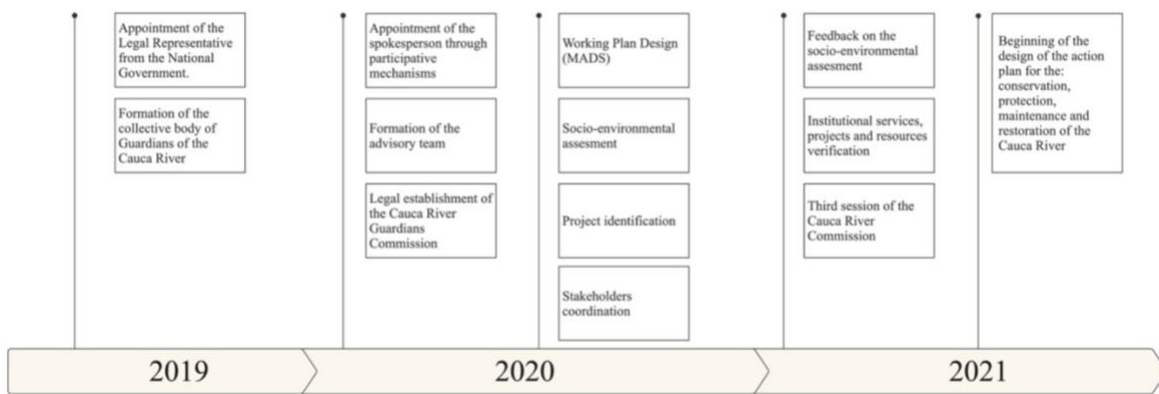


Figure 4.4 Actions Taken in the Framework of the Senence T-038, 2019, Source Adopted from DGIRH, 2023

The DGIRH identified institutional programs, initiatives, and actions from more than 97 actors (67 municipalities, four ministries, 15 environmental authorities, two institutes, EPM, four provincial governments, Natural National Parks, Adaptation Fund, and AUNAP) with a total of 405 projects, actions, and programs along the Cauca River basin that account for approximately \$ 77.000 billion in investment. The Ministry also identified that most projects develop restoration and recovery actions located mainly in the middle and lower Cauca basin.

**“They assign the role of representing the river to the weakest ministry in the system, the Ministry of Environment. And if we are going to talk about the energy transition, what about**

**the Ministry of Mines and Energy, and the productive sectors like agriculture, which is the largest water consumer in Colombia and the world? So, when discussing energy transition, how can we not incorporate these ministries into this ecosystem? These are the type of shortcomings that I battled for five years, but it wasn't possible to unite them.”** (Excerpts from the semi-structured interviews, 2024)

# 5. Methodology

## 5.1 Methodological Framework

The methodological framework of this research is qualitatively based. It is divided into three main stages: (i) Policy analysis and legal framework, (ii) Semi-structured interviews, and (iii) the implementation of a simulation methodology with local communities. The three stages of the methodology outline a comprehensive analysis of context-based conditions, the understanding of development patterns of hydroelectric projects in Colombia, and explore the interconnection of water, energy, and local communities in the face of the energy transition.

Moreover, based on policy documents, historical research, interviews, and field work, the methodology aims to examine the role and knowledge of technical experts in the fields of energy, policy-making, human rights, and environmental and social studies, as well as local knowledge and beliefs systems on consensus building to develop recommendations and new approaches to decision-making processes in planning our territories. Hence, governance of water in Colombia that understands historical legacies, worldviews, and socio-economic development as a collective building of the future of nature and humans.

## 5.2 Policy Analysis and Semi-Structured Interviews

The initial phase of the research examines the existing governance frameworks, including policies, regulations, institutional structures, planning mechanisms, and participatory methods. This section reviews national, regional, and local policies on the energy and environmental sectors in Colombia under the national government and the Ministries of Energy and Mines (Ministerio

de Minas y Energía), and the Ministry of Environment and Sustainable Development (Ministerio de Ambiente y Desarrollo Sostenible). Additionally, it studies the governance frameworks for decision-making under the jurisdiction and guidance of the Ministry for Internal Affairs in Colombia (Ministerio del Interior).

Subsequently, literature review and study context-based case studies at the national and local level aim to explore the interplay between environmental and energy sectors, and analyze their coherence and potential conflicts in the territory. With this in mind, identify the stakeholders involved and those lacking participation in hydroelectric power projects' decision-making.

Lastly, five semi-structured interviews were conducted with local experts in Colombia in energy, policy-making, human rights, and environmental and social studies. These interviews took place virtually and followed questions intended to guide a conversation while giving autonomy to explore pertinent ideas that could come up during the process. The structure of the interviews was divided into five parts, where the interviewed could:

1. Give an introduction of their area of expertise and the relation with the Hidroituango or similar infrastructure projects in Colombia;
2. Grasp the fundamental characteristics of high-impact infrastructure projects in the country to understand the benefits and disadvantages for local communities and the environment;
3. Address governance frameworks, the incorporation of local knowledge, and community participation in decision-making processes;
4. Address the environmental and social conflicts surrounding infrastructure projects to seek a balance between economic development, environmental conservation, and social responsibility and;
5. Look into the future by reflecting on the past.

The following table depicts the questions guiding the semi-structure interviews:

<b>Sections</b>	<b>Guiding questions</b>
Introduction	<p>What has been your experience with infrastructure projects that have had a high social, economic, and/or environmental impact in Colombian territories?</p> <hr/> <p>Are you familiar with the Hidroituango? If so, what has been your experience with it or similar projects?</p> <hr/> <p>What are the functions of the Ministry of Environment and Sustainable Development of Colombia regarding projects like Hidroituango?</p> <hr/> <p>What were the social, environmental, and political conditions for declaring the Cauca River as a subject of rights, and how was this process carried out?</p> <hr/> <p>What does legally representing the Cauca River entails?</p>
Characteristics of the project	<p>What are the perceived benefits and drawbacks of large-scale infrastructure projects like Hidroituango in terms of job creation, income generation, and regional development?</p> <hr/> <p>What mechanisms exist to ensure transparency and social responsibility in the planning, implementing, and monitoring of energy projects?</p> <hr/> <p>In your opinion, are these participation mechanisms transparent?</p> <hr/> <p>What challenges exist regarding governance, transparency, and accountability in the planning and executing of large-scale development projects in Colombia?</p> <hr/> <p>What conflicts have arisen in Colombia regarding high-impact infrastructure projects?</p> <hr/> <p>Who are the actors involved in decision-making regarding high-impact infrastructure projects?</p> <hr/> <p>How has the emergence of new actors influenced decision-making processes?</p> <hr/> <p>How have land ownership rights, displacement, and cultural heritage issues influenced social conflicts and disputes?</p> <hr/> <p>What mechanisms does EPM have in place to ensure transparency and social responsibility in the project's planning, implementation, and monitoring?</p> <hr/> <p>How are risk, environmental, and social studies addressed for large-scale projects like Hidroituango? Moreover, who are the actors involved in these processes?</p> <hr/> <p>To what extent have local communities been involved in the decision-making process regarding the project's implementation?</p> <hr/> <p>Do you believe that conflicts have arisen in the project's influence areas? If the answer is yes, what are they? Why?</p> <hr/> <p>What steps have been implemented over time to address conflicts with communities and other stakeholders within the project's affected areas?</p>

Governance frameworks, local knowledge and community participation in decision-making processes	What mechanisms currently exist to involve communities in decision-making processes?
	What barriers or challenges prevent communities from actively participating in these processes?
	How do issues like power imbalances, lack of access to information, and cultural differences impact decision-making processes?
	In your opinion, are there legal gaps in participation policies regarding decision-making?
	What initiatives or programs are necessary to build local capacity in governance and decision-making processes?
	How can governance frameworks be designed to be more flexible and responsive to local communities' needs and priorities?
Economic development, environmental conservation, and social responsibility	How can traditional knowledge and practices be integrated into formal governance frameworks?
	Are there alternative models of economic development that prioritize environmental sustainability, social equity, and community participation?
	What mechanisms exist to ensure that the interests of communities and conservation efforts are adequately represented and addressed in decision-making processes?
	What lessons can be drawn from the environmental and social conflicts surrounding projects like Hidroituango regarding the balance between economic development, environmental conservation, and social responsibility?
Leassons learned and looking into the future	How can different stakeholders collaborate more effectively to address interests and conflicts and promote sustainable development practices in Colombia?
	What opportunities exist for multi-stakeholder partnerships and knowledge exchange platforms to promote dialogue, consensus building, and joint decision-making on water-related issues?
	What strategies can be implemented to ensure that energy policies and initiatives contribute to achieving multiple development goals while minimizing impacts on communities?
	In your opinion, how can mechanisms be established to materialize social and environmental justice agendas in territories? Moreover, how can that balance be achieved?
	What would you do if you had the power to change any outcome other than the current conditions?

Table 5.1 Semi-structured interview questions

### 5.3 Simulation Game Framework

The following section of the methodology delves into the role of local knowledge in decision-making related to high-impact projects and evaluates its potential to contribute to water management and governance. Moreover, it explores how non-traditional belief systems and local practices can influence existing water governance frameworks. This process considered the challenges and historical legacies faced by local, indigenous, and afro-descent communities in understanding the specific impact on their livelihoods, access to and use of water resources, and cultural practices.

For this methodology section, a Role-Playing Game (RPG), or what has come to evolve from the theory of *Simulation Games* (Dorn,1989), was designed to model a representation of reality. It allows participants, in this case, the Guardians of the Cuaca River, to interact by following rules and playing specific roles (Camargo, Jacobi, and Ducrot, 2007). RPGs are "**caricatures of reality because they represent a simplified version**" (Dorn,1989). This approach aims to promote training tools for socio-environmental management and their capacity to facilitate learning and scientific knowledge, the expression of local expertise, and their mobilization and participation in discussions (Pahl-Wostl, 2002).

Authors Dorn (1989) and Marios and Ray (1999) emphasize the role of simulation games in decision-making processes and skills development. Moreover, state that simulation games operate within an explicit set of rules and objectives, simulating central features of reality to engage players in decision-making processes (Dorn, 1989).

In this regard, a scenario is designed, and players navigate constraints, make decisions, and gain insights into a complex system (Marios and Ray, 1999) based on the documents and legal frameworks of governance in the energy, environment, and interior affairs sectors of the

Colombian state, as well as the protocols and recommendations of these entities for decision-making and community participation.

This process encompasses the entire life cycle of a high-impact project in the territory, such as a hydroelectric plant. Taking as reference the timeline of events, actions, and actors involved in the Hidroituango project, a flow chart (Figure 5.2) was developed covering stages from territorial recognition, pre-feasibility, feasibility and project design, decision-making, and consultations with communities and local governments, to implementation, construction, and the life-cycle operation of the project within the former legal frameworks in the country.

It is important to mention that this diagrammatic process was built within the framework of this research and sought coherence and alignment across various sectors, entities, and scales, as it is not readily available as a tool. Hence, it forms the basis of the proposed scenario in the methodology.

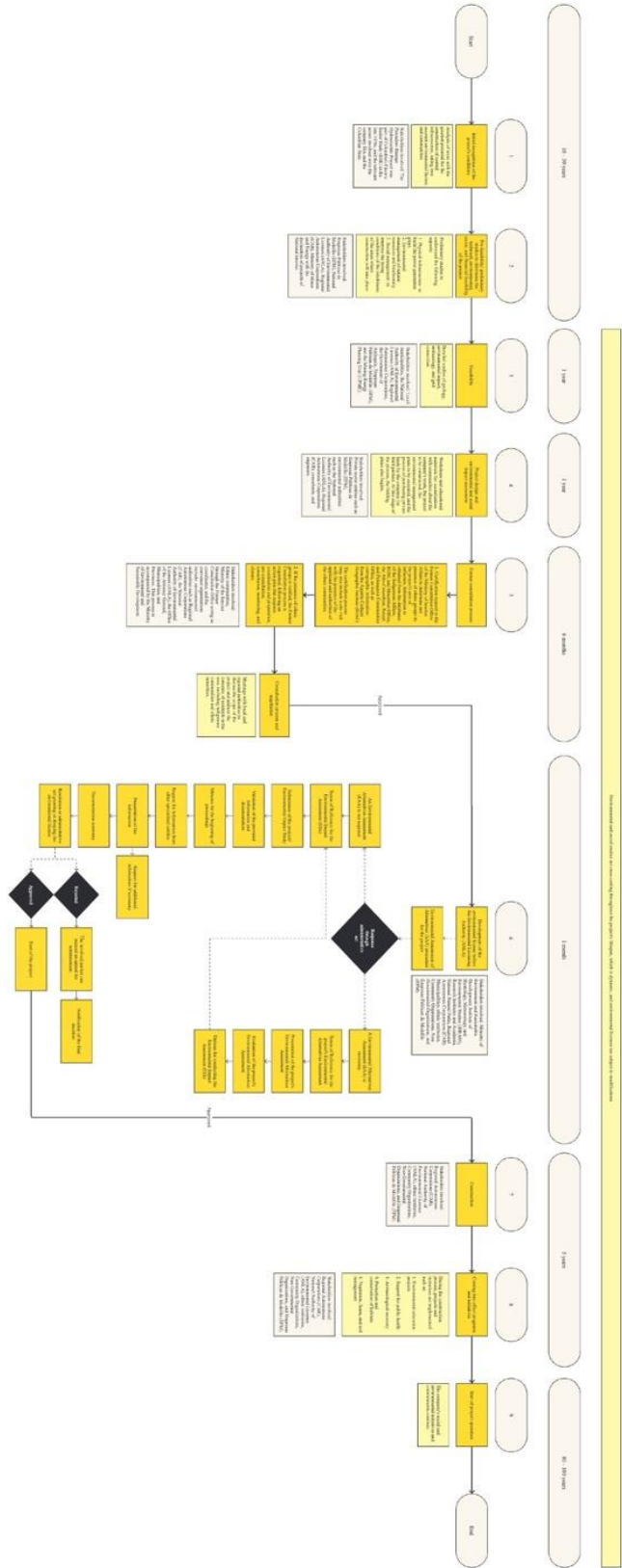


Figure 5.2 Decision Making process of a Hidroelectric Project in Colombia, own creation.

Moreover, Marios and Ray (1999) explore the nature of gaming simulations as platforms for skill development and experiential learning. Players engage in sequential decision-making exercises within these simulated environments, developing hypothesis testing, logic, and reasoning skills. Through immediate feedback mechanisms, players experience the consequences of their decisions, fostering a deeper understanding of cause-and-effect relationships.

Pahl-Wostl's (2002) exploration of social learning within sustainable development elaborates on the dynamics of participatory processes to address environmental challenges. Social learning, as conceptualized by the author, encompasses critical self-reflection, participatory decision-making, and reflexive capabilities among individuals and societies. Central to this framework is Kolb's (1984) concept of experiential learning, which highlights the cyclical nature of learning involving concrete experience, reflective observation, abstract conceptualization, and active experimentation. Additionally, the author argues that the polycentric approach to policymaking shifts focus from setting specific goals to prioritizing processes of change and social learning (Pahl-Wostl 2002).

Social learning aims to build shared problem perceptions, foster trust, and recognize mutual dependencies within actor networks by integrating subjective, intuitive understanding with factual knowledge (Pahl-Wostl, 2002). This approach acknowledges the limited predictability of human systems and emphasizes cooperation and coordination among stakeholders. Hence, it requires a reevaluation of rationality in sustainability policy and highlights the importance of considering the broader community interest over short-term individual gains to recognize the prevalence of social dilemmas in managing public goods such as water and the need for collective decision-making to address these challenges effectively (Pahl-Wostl, 2002).

## 5.4 Simulation Game Workshop

Having the scenario and diagrammatic process in place, the simulation workshop took place in the Caucaucia Municipality. Today, Caucaucia is one of the municipalities downstream of the Hidroituango project, and was declared an affected territory following the contingencies in 2018. This municipality serves as a meeting place for the Guardians of the River due to its proximity to the Cauca and its tributary rivers.



Figure 5.3 Location of Caucaucia Municipality. Source: Google Earth, 2023

The workshop was designed to follow three moments and last approximately two hours. The first moment encompasses the introduction of each one of the participants and the explanation of the exercise. During this time, participants were asked to answer four questions: (i) who do you represent in this exercise? (ii) what are your needs? (iii) what are your concerns? and (iv) what are your interests? The idea of the first moment was to understand their roles, hear about their stories and the communities they represent, and create a space for dialog and creative thinking.

Originally, this information would serve as the description of the role for the next moment of the exercise, and each participant was intended to adopt a new role during the simulation workshop. However, the Guardians of the River agreed to collectively participate and develop one

new process diagram, except for one of the Guardians, who decided to fulfill the exercise independently.

In the second moment, participants were given a printed version of the diagrammatic process. They were asked to change, redraw, or comment on their thoughts on the current decision-making process of a hydroelectric project in Colombia that simulated the Hidroituango project's process.

To develop this part of the workshop, three questions were given to the participants: (i) considering your role, what steps/order would you change in the process? (ii) is any actor missing? If the answer is yes, who? Where should they be incorporated? and (iii) what prevention, mitigation, and/or compensation actions could be implemented, and at what point would you include them?

Lastly, the third moment of the workshop aimed to reflect, discuss, and gather all thoughts to understand common grounds collectively, this moment aimed to differentiate between the predictable trajectory of any given hydropower project in current realities and the imaginary "bold path", to think about the limitations and constraints that exist today, and how we can challenge the current status-quo to collectively think about the future.

## 5.5 Limitations

The study of water governance, particularly the Hidroituango case study, represented a significant challenge to the research. Firstly, the country's multiculturalism, along with its diversity and geographical complexity, creates a multifaceted scenario with many aspects to address and study.

This research thesis does not aim to cover all dimensions but rather to provide a unique perspective on one of the many sides and challenges that require in-depth exploration. Furthermore, this research thesis does not intend to delve into the technical or political

complexities of the Hidroituango case since there is extensive literature on these topics. Instead, it aims to touch upon the fundamental questions that we, as a society, still have unanswered and the reasons why we have not yet found spaces to reach consensus, where decision-makers are influenced by their differences in knowledge but also to achieve collective goals.

For this reason, this research thesis recognizes that one of the most significant limitations is the scope and selection of participants. Despite efforts to gather viewpoints with greater diversity and knowledge, it is important to acknowledge that the research sampling for the semi-structured interviews and simulation game may not fully represent the diversity of stakeholders and perspectives relevant to decision-making processes for hydropower projects in Colombia, particularly in the Cauca River.

Additionally, the scope of the simulation workshop is limited when addressing power asymmetries. For these processes to be carried out comprehensively, it is important to develop spaces of trust and reciprocity and understand that these exercises should be part of a set of actions that, with greater depth and time, unite strategies for managing change in the legal, political, social, and environmental dimensions of water governance.

## 6. Results and Findings

The semistructured interviews gathered technical information and insights from professionals who: (i) have worked in the energy and water sectors, (ii) have worked at the national government, particularly for consultation processes, human rights, and policy-making for the environmental and energy sectors, and (iii) have worked for EPM as consultants in risk management or leading social and environmental programs within the company. Some of the common topics of discussion regarding the impact of the hydropower sector in Colombia are discussed as follows:

### 6.1 Social and Economic Dynamics

**“And perhaps the problem isn't even in regards to energy, maybe the problem lies in the structure of our society and the relationships between society and power, in other words, in the social contract itself.”** (Excerpts from the semi-structured interviews, 2024)

The private sector in the energy sector plays a significant role in local economies by creating businesses and hiring local labor. In some cases, companies support these associative schemes in their commerce certification processes and accountability books. Additionally, they contribute to local and national taxations, and some municipalities benefit from initiatives like *projects for taxes*, (Obras por Impuestos) although these are not universally implemented in the country.

Moreover, the private sector often develop strategies for local employment, which involves a social investment agreement facilitated by civil participation, with communities engaging through *Community Action Boards* (Juntas de Accion Comunal). This approach fosters local employment and drives the economy by stimulating consumption and activity. These actions have both positive

and negative impacts. On the one hand, economic activities are stimulated, however, there is a tendency to create economic dependency on the specific industry, so the entire regional economy suffers when companies cease operations.

Social investment is further facilitated through association contracts, where communities share in the results or profits of businesses. Many companies engage in voluntary social investment, directing funds to specific areas such as education, productivity, or sanitation.

Moreover, this type of projects often brings an influx of people and resources to local areas, overwhelming municipalities and communities unprepared for this influx. Similarly, land acquisition offers significant monetary compensation, which communities may struggle to manage and measures such as *Resettlement Standards* (Estándares de Reasentamiento) aim to address these challenges by developing joint action plans.

**“There has always been doubt about how to assess the attraction impact that a project of this magnitude has on the present and future dynamics, both economically, socially, and culturally, of a territory.”** (Excerpts from the semi-structured interviews, 2024)

There are ongoing discussions, such as those within the Inter-American Commission on Human Rights, regarding displacement due to development, highlighting the need for further consideration of social and economic impacts in project planning and execution.

## 6.2 Participation and Transparency

In Colombia, companies must conduct public hearings before obtaining an environmental license, whether through a Regional Autonomous Corporations (CAR) or the National Authority of Environmental Licenses (ANLA). A consultation process is also mandated if ethnic groups are present in the area.

Additionally, Colombia recently ratified the Escazú Agreement, signed in Costa Rica, and granted the right to information on environmental matters. Furthermore, *Environmental Management Plans* are tools for publicizing environmental instruments. When a license is granted, companies must detail the impacts associated with the project and its corresponding management measures, which must be reported every six months. These plans and compliance reports are publicly accessible and further promote transparency.

**“What are the responsibilities and what are the missed opportunities for each of us in not doing a project? And I believe there are actors in the value chain who go unpunished for that. That is part of transparency and governance processes, who assumes the responsibilities for a project not being developed? Usually, the company or the investor and the community, neither the state, nor the non-governmental organizations nor the academia assume them.”**

(Excerpts from the semi-structured interviews, 2024)

Other strategies for transparency are the *voluntary standards*, these often guide a company on how its social and environmental management system should operate. Standards ensure discussions of impacts, monitoring, and information quality, among other factors.

Participation of local communities and organizations in decision-making processes has evolved in Colombia. While some of these groups, such as NGOs, may not have decision-making power, they participate in hearings and influence decisions. This shift towards greater social emphasis in project viability marks a significant change, with more weight placed on local perspectives rather than institutional frameworks. Additionally, it has led to projects having higher standards, as both institutions and companies face greater scrutiny. Consequently, projects exhibit higher quality operations, although managing impacts may require greater resources today than before.

**“The socialization issues are absolutely dysfunctional for the purposes that a high-impact project must fulfill. Companies, must conduct a number of sessions where they explain the impacts to the communities and gather information. But, how real are the mechanisms that allow companies to incorporate those considerations into actions?”**

(Excerpts from the semi-structured interviews, 2024)

### 6.3 Environmental Management

In Colombia, various forms of compensation are implemented for environmental management. One method for example, involves reforestation requirements imposed by regulatory agencies like the ANLA or CARs. For instance, if one hectare of land is cleared for project development, the responsible entity must reforest two hectares as compensation, these ratios are defined project by project from the responsible environmental authority.

Another compensation method, known as the percentage approach happens when the total project cost is assessed by regulatory bodies, and a certain percentage is designated for environmental investment in the impacted area.

One of the most complex and structural approximation in regards to the environmental and social management is the conceptualization of the *area of influence* of any given project in Colombia. This is defined by the company during the process of environmental licesing to be able to asses the impacts on ecosystems and communities. The area of influence hence delimits the extent of the impacts and defines the territories that aught to be compensated.

**“The area of influence is a significant trigger in these types of projects because it delineates a boundary, and discussing delimitations is complex in this country, especially when it comes to water. Where does it start and where does it end?”** (Excerpts from the semi-structured interviews, 2024)

## 6.4 Infrastructure

Private companies have played a significant role in providing infrastructure and investment for development such as roads, electricity, schools, and hospitals, in many areas where they operate. These investments can be part of the set of actions and strategies to promote CSR and voluntary commitments. Projects like Hidroituango have long term advantages, as these energy infrastructures can have a life cycle up to a 100 years, thus generating energy and revenue for decades.

**“The investment that EPM has made in each municipality is similar to the annual budget that each municipality has. So, we double what they can have in benefits in each of their territories.”** (Excerpts from the semi-structured interviews, 2024)

## 6.5 Simulation Methodology Findings

Some of the most important insights from this exercise are reflected in how the current approaches to hydroelectric projects are conceived. Libardo, Benito, Haiber, Emilse, and Julio spent an afternoon with this researcher and discussed their role as representatives from the Sinu Indigenous, Afro-Colombian, and Fishing communities in the Middle and Lower Cauca basin.

Their insights, deeply rooted in their profound knowledge of the territory, its history, and the role of the river in their lives, were brought to light through the simulation game. This game served as a catalyst for a rich discussion on the current decision-making process for a hydroelectric project in Colombia.



Figure 6.1 Guardians of The Cauca River – Simulation Methodology - Cauca, Colombia, 2024

The Guardians highlighted the need for broader and updated information on territorial dynamics by opening the conversations with communities before any project starts as valuable inputs for decision-making and understanding the different world views and ancestral knowledge.

**“You don’t need to have a title to be an expert”** (Guardians of the Cauca River, 2024)

Additionally, there is a need to recognize economic and environmental compensations before implementing projects by thinking of long-term impacts on their territories. And a greater need to guarantee the non-displacement of communities and their life associated with the river and their lands, as well as understand how ecosystem services beyond the river are affected; this means water bodies and tributary rivers along the basin that provide food and economic security.

**“The river suddenly had some owners”** (Guardians of the Cauca River, 2024)

One of the most important things that also came up was the need to recognize communities that are “outside” the legal framework of ethnic nations; these could include fishing communities, for example, who are left out of participation spaces by the legal mechanisms. Furthermore, more transparent processes in the monitoring and follow-up of agreements and compensations from private companies and the state.

**“The invasion of indigenous nations persist”** (Guardians of the Cauca River, 2024)



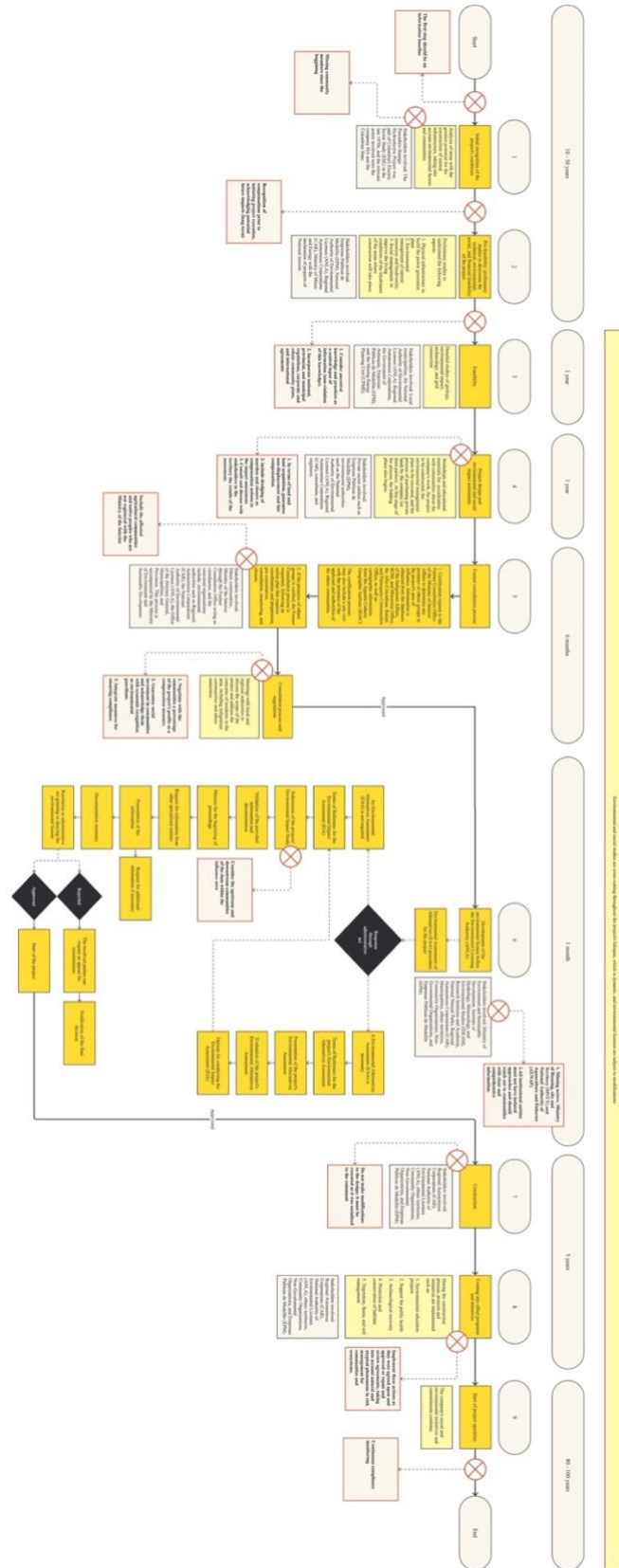


Figure 6.3 Results of the Simulation Methodology translated. Own creation.

## 6.6 Challenges

**“The problem lies in the general inability to understand each other”** (Excerpts from the semi-structured interviews, 2024)

Big-scale projects, particularly in the hydroelectric sector, pose a number of challenges and dynamics within the context of employment, development and planning, and transparency, and participation in Colombia.

On the one hand, the need for employment opportunities in these territories is juxtaposed with limited capacities to address this demand effectively. Companies often fail to generate alternative employment avenues beyond the predominant sector despite wanting to create jobs.

One critical issue recognized in this regard is the scarcity of skilled employment opportunities in local communities. While large-scale projects may positively impact unskilled labor, the availability of skilled positions remains a challenge due to the lack of specialized capacities. As a result, while unskilled employment may increase, skilled employment opportunities remain limited, hindering economic development and the lack of decision-making positions.

Furthermore, the complexities surrounding local employment dynamics indicate that higher wages offered by companies can distort local labor markets, leading to difficulties in retaining workers in the local businesses. This pressure on local wages and employment norms can further exacerbate economic disparities within communities.

While projects may bring economic benefits, they can also create dependencies and fail to catalyze broader regional development. Despite generating revenue through taxes and royalties, the government often lacks a comprehensive strategy for leveraging these funds to promote sustainable regional growth.

In terms of transparency and participation, challenges remain due to information asymmetry and participation fatigue. The importance of inclusive decision-making processes and the dangers of certain organizations monopolizing participation can potentially exclude marginalized voices. Furthermore, the need to address ideological biases and ensure that development initiatives should be grounded in evidence-based approaches rather than ideological preconceptions.

**“Participation fatigue is often common in these scenarios as well. People go to many meetings, but don't see results. So, when you keep attending meetings and they keep repeating themselves without concrete results, that's frustrating. I mean, people just don't want to go anymore.”** (Excerpts from the semi-structured interviews, 2024)

Furthermore, concerning voluntary standards, transparency poses a significant challenge. Companies may claim compliance with these standards, yet without independent verification mechanisms in place, accountability remains elusive. Consequently, many firms adopt such standards not out of commitment but rather as a means to appear fashionable, enhance their public image, and bolster their standing in the stock market. This phenomenon is commonly referred to as *greenwashing*.

Another critical issue is the tendency to overlook the actual impacts and focus solely on financial negotiations. In many regions, there exists a multitude of pressing needs, and stakeholders prioritize immediate resolutions over deliberating the long-term implications for their territories.

Idealization presents yet another challenge when discussing participation. Some individuals believe that anything attractive is inherently very bad, perpetuating an ideology that views all extra activism negatively. Conversely, others may express disinterest in projects developed in certain territories due to the presence of illicit crops. However, the development of projects in these areas

can lead to increased control and security, which may not be desirable for some actors of society. Thus, the allure of idealization can hinder meaningful participation and engagement in development initiatives. However, participation has shifted from being institutional centered to socially centered. Communities, social organizations, and stakeholders are actively participating and engaged in decision -making creating avenues for accountability, transparency, and participation.

**“The community is much more active, much more knowledgeable about their rights and regulations, and much more demanding.”** (Excerpts from the semi-structured interviews, 2024)

Hydropower projects, while holding significant importance for a nation's energy infrastructure, face numerous challenges in terms of development and planning. Despite considerable investment efforts by companies operating in the territories, a prevailing challenge lies in the lack of regional and strategic planning for these projects. The government often assumes the role of supervisor and tax collector without implementing a cohesive regional strategy that involves actors across sectors and scales to address development on a larger scale.

**“The development of these projects must be part of territorial development projects. It's not just about planning a project; it's about planning development in a territory based on the opportunities offered by these projects. [...] These types of projects should be clearly embedded in the processes and mechanisms of territorial planning, even beyond the development plans that correspond to each territory of regional or municipal authorities. They should also be immersed in regional competitiveness plans and land management plans. And when I say immersed, I don't mean just being mentioned in the document, but actively involved in the real process of development construction.”** (Excerpts from the semi-structured interviews, 2024)

This lack of harmonization between institutions further exacerbates the challenges. Environmental institutions, provincial governments, Mayor's Offices, and agencies such as the National Mining Agency each have their competencies and functions, leading to disjointed efforts and inefficiencies. Moreover, the absence of regional assessments hinders comprehensive planning, as companies are typically tasked with evaluating their projects in isolation, limiting the consideration of cumulative impacts.

**“In the framework of contingency, the ministries were zero aligned, especially involving the environmental sector, the social sector, and perhaps to some extent the infrastructure sector.”** (Excerpts from the semi-structured interviews, 2024)

Another critical issue pertains to the definition of the area of influence, particularly in relation to direct impacts on ethnic territories and communities. The Constitutional Court has emphasized the importance of understanding the broader impacts beyond the geographical location of the project, highlighting the need for a more comprehensive approach to assessing impacts, especially the downstream effects.

**“Challenges still exist regarding the project’s area of influence. For example, from ecosystem and environmental service perspectives, everything that one would understand as the area of influence changes. So, most likely, there will always be problems, and that's a matter of managing expectations. Moreover, those outside the area of influence do not receive compensation, and I believe that's where the perversion lies, in the use of the concept of the area of influence. Because the logic isn't the area of influence for the real generation of processes that contribute to governance and territorial development, but rather it's the area of influence to see how much I give you and obviously, how much I receive. On the other hand, the area of influence also has to do with the phenomena of migration due to**

**development in these types of projects, and finally, there will always be someone left on the border.”** (Excerpts from the semi-structured interviews, 2024)

Furthermore, Colombia faces unique challenges in its energy infrastructure due to heavy reliance on hydropower, which accounts for most of its generation. However, during droughts and El Niño events, water shortages lead to energy deficits, highlighting the need for diversified energy sources and improved resilience.

In terms of planning, the absence of proactive generation planning by the state leaves a void, with private enterprises largely responsible for generation projects. Despite regulatory oversight, governance remains politicized, contributing to a lack of strategic planning and congestion in the transmission and distribution networks.

**“The planning overseen by the UPME is merely indicative. Essentially, there's no proactive planning for energy generation in Colombia; the State doesn't dictate preferences or priorities, instead, it relies on legal frameworks to send signals. The state ceded this control during the country's economic liberalization, notably during the government of President Gaviria. And although the State maintains regulatory oversight, the absence of comprehensive planning leaves a void. Thus, the absence of strategic planning persists as a significant flaw, evident in the reliance on indicative planning.”** (Excerpts from the semi-structured interviews, 2024)

## 7. Discussion and Conclusion

Despite the challenges faced today, opportunities for change and improved actions, mechanisms, and tools exist for a better future for societies and nature in Colombia.

First and foremost, there is a growing demand for a fundamental shift in the logic of planning development projects. Rather than focusing solely on project execution, there is a call to adopt a *regional perspective* centered on fostering local development. This entails viewing projects as integral to the development of an area, thereby stimulating economic growth and community advancement. Furthermore, before undertaking development projects, local and regional governments must evaluate *cumulative impacts and regional assessments*. These assessments comprehensively understand potential environmental and social impacts, facilitating more informed decision-making processes.

Additionally, *environmental compensations* offer a dual opportunity to mitigate environmental impacts, create employment opportunities, and diversify the local economy. Companies, particularly those developing high-scale infrastructure in rural areas, can implement environmental education strategies to train and empower local communities, promoting sustainable development through income generation and the restoration of natural ecosystems.

Furthermore, to ensure the credibility and accountability of voluntary commitments made by companies, the establishment of *independent verification mechanisms* is crucial. These mechanisms serve to uphold credibility and maintain accountability by providing objective assessments of companies' commitments.

In addition, *accurate participatory approaches* that actively engage local communities in planning and decision-making processes are essential for developing a low-carbon future. This involves knowledge exchange, capacity building, and considering the broader area of influence beyond the immediate project site. To achieve this, *independent scientific entities* are crucial to ensuring the reliability and credibility of information related to development projects. These entities provide objective and trustworthy information to stakeholders, contributing to informed decision-making processes, as in some cases, the involvement of universities and academic organizations can be perceived as biased.

These participation mechanisms should be adapted to suit local communities' existing conditions and needs. This may involve facilitating information sessions, using various forms of communication and technologies (radio, newspaper, social media etc), addressing concerns, and clarifying doubts to enhance community engagement and involvement. The closest example of these types of entities is the Guardians of the River Collegiate, which includes members of local communities and representatives, research organizations, representatives from the national government, and universities. The primary constraint with this entity is that today, it was created post-contingency and as a response to an emergency scenario, but ideally, these entities should participate in the long-term regional planning of territories.

Finally, acknowledging and *legitimizing the fears and concerns of local communities* regarding structural issues such as access to water, risk, and economic livelihoods is vital. This recognition fosters more inclusive and empathetic approaches to development planning, ensuring that the needs and concerns of all stakeholders are addressed.

This thesis has shown and taught this researcher that despite the existing opportunities for development, the territories and communities surrounding the rivers in Colombia lack identification of these areas' environmental, urbanistic, and social values.

We, as Colombians, have the particularity of 'turning the back' on the river, neglecting its potential and allowing it to become a place for industrial waste, polluted waters, and areas suitable for activities outside the law. This behavior not only harms the environment but also undermines the potential for sustainable development.

However, we have the opportunity to live in a territory with unparalleled water wealth in the region and the world, factors that should promote the protection, conservation, and appropriate use of these resources for *development* - development understood in a multicultural way, whether for short and long-term economic activities or its relationship with traditional livelihoods and the conservation of cultural activities.

Our current situation presents us with a unique opportunity to ensure a fair distribution and use of resources. This is not just about economic, livelihood, and recreational activities, but also about the protection and conservation of water for future generations. It's about fostering creativity and innovation, and creating an environment that empowers all members of society to participate in decision-making processes, regardless of their economic or political power, beliefs, or worldviews.

My hope is that this thesis serves as a starting point and a call to action for understanding the vast resources and opportunities that our pluralistic and multicultural nation still possesses. If we can grasp and implement these opportunities equitably, they can serve as the catalysts for the country many of us dream about. A country where crystal-clear water is the lifeblood of peoples and nature, where the four species of Ocelot and Puma continue to roam, and where thousands of

fish, birds, and insects thrive in one of the world's most biodiverse ecosystems. A country where Indigenous Nations, Afro-Colombian Communities can continue their life intertwined with the rivers, and where cities and rural communities coexist in harmony with nature.

**“When discussing regional development, a crucial question arises: What actions has the state taken, or failed to take? The issue in Colombia lies in the isolation of these projects. As long as this approach persists, we encounter obstacles, compounded by viewing communities as problems. Our current perspective on projects often separates investors from communities and the environment. However, until communities feel assured that companies won't exploit their resources and the environment, and until companies recognize communities as partners rather than obstacles, reconciliation will remain elusive.”** (Excerpts from the semi-structured interviews, 2024)

## 8. References

- Barraqué, Bernard, Isnard, Laure and Souriau, Julien. 2015. “How Water Services Manage Territories and Technologies: History and Current Trends in Developed Countries.” In *Understanding and Managing Urban Water in Transition*, edited by Quentin Grafton, Céline Nauges, Noel Wai Wah Chan, Katherine A Daniell, and Jean-Daniel Rinaudo, 15:33–60. New York: Springer Dordrecht Heidelberg.
- Blake, David J.H, Friend, Richard, and Promphakping, Buapun. 2009. “Landscapes Transformations and New Approaches to Wetlands Management in the Nam Songkhram River Basin in Northeast Thailand.” In *Contested Waterscapes in the Mekong Region, Hydropower, Livelihoods and Governance*, edited by Molle, Francois, Foran, Tira, and Kakonen Mira, 173 – 194. Oxford: Earthscan from Routledge.
- Bustamante, Rocio, Crespo, Carlos, and Walnycki. 2012. “Seeing through the concept of water as a human right in Bolivia.” In *The Right to Water Politics, governance and social struggles* edited by Sultana, Farhana, and Loftus, Alex, 223 – 240. Abingdon: Earthscan.
- Camargo, Maria Eugênia, Jacobi, Pedro Roberto, and Ducrot Raphaële. 2007. *Role-playing games for capacity building in water and land management: Some Brazilian Experiences*. Sage Publications.
- Colombia. Environmental Licenses National Authority, *Environmental public hearing minutes*. EL-PL-10, Santa Fe de Antioquia: 2018.
- Colombia. Former Ministry of Environment, Housing and Territorial Development, *by which an environmental license is granted for the hydroelectric project ‘Pescadero – Ituango’ and other determinations are made*. Resolution # 0155, Colombia: 2009.
- Colombia. Ministry of Mines and Energy. *Energetic transition: A legacy for the present and future of Colombia*. Colombia: 2021.
- Colombia. Ministry of Environment and Sustainable Development. nd. “Collaborative Platform 2 Upper Cauca River Basin.” Accessed November 27, 2023.

<https://www.minambiente.gov.co/gestion-integral-del-recurso-hidrico/plataformas-colaborativas/plataforma-colaborativa-2-cuenca-alta-del-rio-cauca/>

Colombia. Ministry of Environment and Sustainable Development of Colombia. 2021. “Ruling T-038 2019.” Last modified November 11, 2021. <https://test-portalsirh.minambiente.gov.co/category/observatorios/sentencias/>

Colombia. Public Service Department, *Political Constitution 1 of 1991 National Constitutional Assembly*. Colombia: 1991.

Colombia. Superior Court of Medellín, *Guardianship Action T-038 from 2019*, Castro - Córdoba, Juan Luís, Ochoa, Diego - Hernán. 05001-31-03-004-2019-0007-01, Medellín: 2019, <https://tribunalmedellin.com/images/decisiones/civil/050013103004201900071.pdf> (accessed November 30, 2023)

Consortium Generación Ituango. 2011. *Environmental Management Plan for hydroelectric project ‘Pescadero – Ituango’*. Colombia.

Consortium Integral. 2007. *Environmental Impact Study for hydroelectric project ‘Pescadero – Ituango’*. Colombia.

Constitutional Court of Colombia. nd. “Ethnic Groups and the 1991 Constitution”. Accessed in March 5, 2024. <https://derechosenelterritorio.com/conceptos-claves/grupos-etnicos-y-la-constitucion-de-1991/>

Cutter, Susan. 2020. “Tipping Points in Policy and Practice.” In *U.S Emergency Management in the 21<sup>st</sup> Century: From Disaster to Catastrophe*, edited by Rubin, Claire and Cutter, Susan, 11 – 34. New York: Routledge.

Dorn, Dean S. 1989. “Simulation Games: One More Tool on the Pedagogical Shelf”. *Teaching Sociology* 17, no. 1: 1–18. <https://doi.org/10.2307/1317920>.

Düren, Michael. 2017. “The Nexus of Energy, Carbon and Water.” In *Understanding the Bigger Energy Picture DESERTEC and Beyond*, 5–40. Cham: SpringerBriefs in Energy.

Düren, Michael. 2017. “Energy in Times After the Energy Transition.” In *Understanding the Bigger Energy Picture DESERTEC and Beyond*, 45–87. Cham: SpringerBriefs in Energy.

Fonseca-Cepeda, Valentina, Castillo- Brievea, Daniel, Baquero-Bernal, Luis, Rodríguez, Luz Angela, Steiner, Eliane, & Garcia-Ulloa, John. 2022. “Magical Realism for Water Governance Under Power Asymmetries in the Aracataca River Basin, Colombia.” *International Journal of the Commons*, 16, no. 1: 155–172. <https://doi.org/10.5334/ijc.1167>

- Goodwin, Morag. 2020. “Reflection on ‘Gender-Sensitive Analysis of Water Governance: Insights for Engendering Energy Transitions.’” In *Engendering the Energy Transition*, edited by Joy Clancy, Nthabiseng Mohlakoana, Lillian Sol Cueva, Gül Özerol, and Mariëlle Feenstra, 237–40. Cham: Springer Nature Switzerland AG.
- Grafton, Quentin, Céline Nauges, Noel Wai Wah Chan, Katherine A Daniell, and Jean-Daniel Rinaudo. 2015. “Understanding and Managing Urban Water in Transition” In *Understanding and Managing Urban Water in Transition* 15, edited by Quentin Grafton, Céline Nauges, Noel Wai Wah Chan, Katherine A Daniell, and Jean-Daniel Rinaudo, 15:1–30. Global Issues in Water Policy. New York: Springer Dordrecht Heidelberg.
- Guarín, C, Diego. 2018. “Environmental Impact Assessment in Colombia: Review of the Electrical Sector.” M.Sc diss., Institute for Technology and Resources Management in the Tropics and Subtropics.
- Heffron, R.J. 2021. “What is the “Just Transition”?.” In: *Achieving a Just Transition to a Low-Carbon Economy*, edited by Heffron, R.J. 9 - 20. Palgrave Macmillan, Cham. [https://doi.org/10.1007/978-3-030-89460-3\\_2](https://doi.org/10.1007/978-3-030-89460-3_2)
- Heffron, R.J. 2021. “The Just Framework.” In: *Achieving a Just Transition to a Low-Carbon Economy*, edited by Heffron, R.J. 21 - 42. Palgrave Macmillan, Cham. [https://doi.org/10.1007/978-3-030-89460-3\\_2](https://doi.org/10.1007/978-3-030-89460-3_2)
- Hidroituango. 2023. “Hidroituango Project”. Accessed 7 December, 2023. <https://www.hidroituango.com.co/>
- Institute of Hydrology, Meteorology and Environmental Studies (IDEAM). 2023. *National Water Study: 2022*. Ideam.
- Inter-American Development Bank (IDB). 2019. “Colombia's energy matrix is renewed”. Accessed December 5, 2023. <https://blogs.iadb.org/energia/es/la-matriz-energetica-de-colombia-se-renueva/>
- Integrated Water Resource Management Office (DGIRH). 2021. “Sentencia T-038, 2019”. Accessed February 15, 2024. <https://test-portalsirh.minambiente.gov.co/sentencia-rio-cauca-t-038-de-2019/#:~:text=La%20sentencia%20T%2D038%20de,%2C%20al%20medio%20ambiente%20sano%20%80%9D>.
- Ituango Hydroelectric S.A, E.S.P. n.d. *Disaster Management*. Medellín: EPM
- Ituango Hydroelectric S.A, E.S.P. n.d. *Risk Management Plan*. Medellín: EPM

- Janssen, Marco A., and Elinor Ostrom. 2006. "Empirically Based, Agent-Based Models." *Ecology and Society* 11, no. 2. <http://www.jstor.org/stable/26265994>.
- Jiménez - Villamil, Andrés. 2019. "Hidroituango: A failure from the management". Undergraduate diss., Los Andes University, Engineering Faculty.
- Johansson, Thomas B, McCormick, Kes, Neij, Lena, and Turkenburg, Wim C. 2006. "The Potentials of Renewable Energy". In *Renewable Energy*. Routledge: 9781849772341.
- Johannessen, Ase, Gerger-Swartling, Asa, Wamsler, Christine, Andersson Kim, Arran, Julian-Timothy, Hernández-Vivas, Dayana-Indira, and Stenstrom Thor-Axel. 2018. "Transforming urban water governance through social (triple-loop) learning." *Environmental Policy and Governance*, 29 (ERP Environment and John Wiley & Sons Ltd): 144 – 154. Doi: 10.1002/eet.1843.
- Kooijman, Annemarije. 2020. "Why a Feminist Political Ecology Approach Is Relevant for Assessing Energy Access in Developing Countries." In *Engendering the Energy Transition*, edited by Joy Clancy, Nthabiseng Mohlakoana, Lillian Sol Cueva, Gül Özerol, and Mariëlle Feenstra, 249–52. Cham: Springer Nature Switzerland AG.
- Krause, Matthias. 2009. "Political-Economic Framework for Analysing the Relation Between Governance and the Provision of Water and Sanitation Services." In *The Political Economy of Water and Sanitation*, 33–65. New York: Routledge.
- Krause, Matthias. 2009. "The Role of Governance and Private Sector Participation for the Provision of Water and Sanitation Services: Case Study on Colombia." In *The Political Economy of Water and Sanitation*, 90–144. New York: Routledge.
- Llano-Arias, Valeria. 2015. "Community Knowledge Sharing and Co-Production of Water Services: Two Cases of Community Aqueduct Associations in Colombia." *Water Alternatives*, (8) 2: 77 – 98.
- Marios, C. Angelides, and Ray J. Paul. 1999. "A Methodology for specific, total enterprise, role-playing, intelligent gaming-simulation environment development." *Decision Support Systems* 25, (Elsevier): 89 – 108. PII: S0167- 9236 99.00002-0
- Marín-Moreno, L and Montenegro, M. 2021. "Desterradas del río. Hidroituango y la destrucción del cuerpo-territorio por megaproyectos. Entre el interés general y el sostenimiento de la vida". *Nordic Journal of Latin American and Caribbean Studies*, 50, no.1, 84–93. <https://doi.org/10.16993/iberoamericana.520>

- Maselli, Gabriella, and Nestico, Antonio. 2022. “Long Term Effects Evaluation for Investments in the Energy and Water Sectors”. In *Water-Energy-Nexus in the Ecological Transition, Natural-Based Solutions, Advanced Technologies and Best Practices for Environmental Sustainability*, edited by Mourad Amer, 11 – 14. Springer Nature Switzerland AG. [https://doi.org/10.1007/978-3-031-00808-5\\_3](https://doi.org/10.1007/978-3-031-00808-5_3)
- Maselli, Gabriella, Naddeo, Vincenzo and Nestico, Antonio. 2022. “Financial Risk Analysis for Water and Energy Projects”. In *Water-Energy-Nexus in the Ecological Transition, Natural-Based Solutions, Advanced Technologies and Best Practices for Environmental Sustainability*, edited by Mourad Amer, 39 – 41. Springer Nature Switzerland AG. [https://doi.org/10.1007/978-3-031-00808-5\\_10](https://doi.org/10.1007/978-3-031-00808-5_10)
- McCauley, Darren, Heffron, Raphael. 2018. “Just Transition: Integrating climate, energy and environmental justice” *Energy Policy* 119. Elsevier: 1-7. <https://doi.org/10.1016/j.enpol.2018.04.014>.
- Medellín’s Mayors Office. 2022. “What is Hidroituango and how do we rebuild it?”. Accessed December 17, 2023.
- Meissner, Richard. 2016. *Hydropolitics, Interest Groups and Governance The Case of the Proposed Epupa Dam*. Switzerland: SpringerBriefs in Environmental Science.
- Middleton, Carl, Garcia, Jelson, and Foran, Tira. 2009. “Old and new Hydropower Players in the Mekong Region: Agendas and Strategies.” In *Contested Waterscapes in the Mekong Region, Hydropower, Livelihoods and Governance*, edited by Molle, Francois, Foran, Tira, and Kakonen Mira, 23– 45. Oxford: Earthscan from Routledge.
- Ministry of Environment and Sustainable Development (MDS). Nd. “Watershed Management and Planning Plans (POMCA)”. Accessed March 7, 2024. <https://www.minambiente.gov.co/gestion-integral-del-recurso-hidrico/planes-de-ordenacion-y-manejo-de-cuencas-hidrograficas-pomca/>
- Ministry of Environment and Sustainable Development (MADS). 2024. “Functions and Objectives”. Accessed March 6, 2024. <https://archivo.minambiente.gov.co/index.php/ministerio/objetivos-y-funciones#:~:text=Coordinar%2C%20promover%20y%20orientar%20las,modelos%20alternativos%20de%20desarrollo%20sostenible.>
- Ministry of Housing, City and Territory (MVCT). 2023. “Land Use Planning Plans”. Accessed March 7, 2024. <https://www.minvivienda.gov.co/viceministerio-de-vivienda/espacio-urbano-y-territorial/plan-ordenamiento-territorial/participacion-pot>

- Ministry of Mines and Energy. Nd. “Mission and Vision”. Accessed March 8, 2024. <https://www.minenergia.gov.co/es/ministerio/estrategico/cultura-corporativa/>
- Money, Alex. 2018. “Corporate Water Risk and Return.” In *Food, Energy and Water Sustainability Emergent Governance Strategies*, edited by Pereira, Laura M, McElroy, Caitlin A, Littaye, Alexandra, and Girard Alexandra M, 152–71. Abingdon: Routledge.
- Movimiento Ríos Vivos. 2021. “Fishing in the Canyon of the Cauca River - Hidroituango and the Great Pollution of the River”. Accessed March 7, 2024. <https://riosvivoscolombia.org/la-pesca-en-el-canon-del-rio-cauca-hidroituango-y-la-gran-contaminacion-del-rio/>
- Murcia, Carolina, Guariguata, Manuel R, Andrade, Ángela, Andrade, Germán-Ignacio, Aronson, James, Escobar Elsa-Matilde, Etter, Andrés, Moreno, Flavio. H, Ramírez Wilson, and Montes, Elena. 2016. “Challenges and Prospects for Scaling-up Ecological Restoration to Meet International Commitments: Colombia as a Case Study.” *Conservation Letters: A journal of the Society for Conservation Biology*, 9(3): 213 – 220. Doi: 10.1111/conl.12199.
- National Authority for Environmental Licenses (ANLA). 2022. “Consultation Process”. Accessed March 5, 2024. <https://www.anla.gov.co/participacion-ciudadana/durante-el-proceso/consulta-previa>
- National Authority for Environmental Licenses (ANLA). Nd. “Environmental Licenses”. Accessed March 8, 2024. <https://www.minambiente.gov.co/asuntos-ambientales-sectorial-y-urbana/licenciamiento-ambiental/>
- National Planning Department (DNP). 2002. *Municipal Decentralization Assessment in Colombia: Balance of a Decade*. Bogotá: National Planning Department: ISBN 958-8025-38-9.
- National Planning Department (DNP). 2022. “Territorial Performance: Municipal performance measurement results, 2022 term”. Accessed February 20, 2024. <https://2022.dnp.gov.co/programas/desarrollo-territorial/Estudios-Territoriales/Indicadores-y-Mediciones/Paginas/desempeno-integral.aspx>
- National Planning Department (DNP). 2024. “Mission”. Accessed March 6, 2024. <https://www.dnp.gov.co/la-entidad/informacion-general#:~:text=El%20DNP%20es%20el%20centro,de%20los%20recursos%20de%20inversi%C3%B3n.>
- National Administrative Department of Statistics (DANE). Nd. “Structure of the Colombian State”. Accessed February 15, 2024. <https://www.dane.gov.co/files/induccin-institucional/modulo1-1.html>

- National Unit for Disaster Risk Management (UNGRD). Nd. “Objectives and Functions of the National Unit for Disaster Risk Management”. Accessed March 6, 2024. <https://portal.gestiondelriesgo.gov.co/Paginas/Objetivos.aspx>
- Nestico, Antonio. 2022. “Investments in the Water and Energy Sectors. Cost–Benefit Analysis and Multi-criteria Assessments to Support the Decision-Making Processes”. In *Water-Energy-Nexus in the Ecological Transition, Natural-Based Solutions, Advanced Technologies and Best Practices for Environmental Sustainability*, edited by Mourad Amer, 3 – 6. Springer Nature Switzerland AG. [https://doi.org/10.1007/978-3-031-00808-5\\_1](https://doi.org/10.1007/978-3-031-00808-5_1)
- Organization for Economic Cooperation and Development. 2022. *How to Assess Water Governance. A Methodology Based on the OECD Principles on Water Governance*. OECD.
- Özerol, Gül, and Leila M Harris. 2020. “Gender-Sensitive Analysis of Water Governance: Insights for Engendering Energy Transitions.” In *Engendering the Energy Transition*, edited by Joy Clancy, Nthabiseng Mohlakoana, Lillian Sol Cueva, Gül Özerol, and Mariëlle Feenstra, 59–82. Cham: Springer Nature Switzerland AG.
- Pahl-Wostl, C. 2002. “Towards sustainability in the water sector – The importance of human actors and processes of social learning.” *Aquat, Sci.* 64, 394–411. <https://doi.org/10.1007/PL00012594>
- Pereira, Laura. M, McElroy, Caitlin. 2018. “An introduction to food-energy-water nexus thinking and sustainability governance.” In *Food, Energy and Water Sustainability Emergent Governance Strategies*, edited by Pereira, Laura. M, McElroy, Caitlin A, Littaye, Alexandra, and Girard Alexandra M, 88–110. Abingdon: Routledge.
- Perera, Veronica 2012. “From Cochabamba to Colombia.” In *The Right to Water Politics, governance and social struggles* edited by Sultana, Farhana, and Loftus, Alex, 241 – 256. Abingdon: Earthscan.
- Pérez-Valbuena, Gerson Javier, Arrieta, Ali Miguel and Contreras, José Gregorio. 2015. “Cauca River: the economic geography of its area of influence”, *Working Documents on Regional and Urban Economy*, no. 225 (Magazine of the Central Bank 1063): 17-51.
- Pfisterer, Stella, and Van Tulder, Rob. 2021. “Governing partnerships for development in post-conflict settings: Evidence from a longitudinal case study in Colombia”. *Business Ethics, Env & Resp*, 30: 44–60. <https://doi.org/10.1111/beer.12278>
- Polanco, Jorge-Andrés, Suárez-Gomez, Juan D, and Escobar-Sierra, Manuela. 2023. “Sustainability and Governance Regimes in Hydropower Territories: Multiple-Case Study in Colombia.” *American Society of Civil Engineers, ASCE*, 1-12.

- Public Companies of Medellin (EPM). 2023. *Progress of the Specific Action Plan*. Medellín: EPM
- Public Companies of Medellin (EPM), and National University of Colombia. 2021. *Land Planning Guidelines for the Municipalities Downstream of the Ituango Hydroelectric Project*. Medellín: EPM
- Sultana, Farhana, and Loftus, Alex. 2012. “The Right to Water, Prospects and Possibilities.” In *The Right to Water Politics, governance and social struggles* edited by Sultana, Farhana, and Loftus, Alex, 1 – 19. Abingdon: Earthscan.
- TWI. nd. “What is Clean Energy? How does it work? Why is it so important?.” Accessed December 8, 2023. <https://www.twi-global.com/technical-knowledge/faqs/clean-energy>
- UN (United Nations) General Assembly. 2010. *Resolution adopted by the General Assembly on 28 July 2010 – The human right to water and sanitation*. Sixty-fourth session. A/RES/64/292. Available at <https://digitallibrary.un.org/record/687002?ln=en&v=pdf>
- UN (United Nations) General Assembly. 2010. *Resolution adopted by the General Assembly Human Rights Council 24 September 2010 – Human rights and access to safe drinking water and sanitation*. Fifteenth session. A/HRC/15/L.14. Available at [https://www.internationalwaterlaw.org/documents/intldocs/UNGA-HRC\\_Resolution-HR\\_to\\_Water\\_and\\_Sanitation.pdf](https://www.internationalwaterlaw.org/documents/intldocs/UNGA-HRC_Resolution-HR_to_Water_and_Sanitation.pdf)
- Usuga, Esteban, and Sanchez, Edith. (nd). *Associative Territorial Scheme in the Hidroituango Zone and its Legal and Political Viability for the Consolidation of Supramunicipal Management*. Medellín: EAFIT University.
- Wadsack, Karin, Daw Jennifer, Guerra Fernandez, Omar Jose, Heimiller, Donna, DeGeorge, Elise, Healey, Vickie, Chartan, Erol, and Campos do Prado, Josue. 2021. *Barriers and Opportunities for U.S. Hydropower Industry Engagement in Brazil and Argentina*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-6A65-78265. <https://www.nrel.gov/docs/fy21osti/78265.pdf>.
- Watson, Vanessa. 2009. “Seeing from the South: Refocusing Urban Planning on the Globe’s Central Urban Issues” *Urban Studies* 46 (11): 2259-75.
- Xiawei, Liao, Eyre, Nick, and Hall, Jim W. 2018. “Water for Energy in China .” In *Food, Energy and Water Sustainability Emergent Governance Strategies*, edited by Pereira, Laura.M, McElroy, Caitlin A, Littaye, Alexandra, and Girard, Alexandra M, 67–87. Abingdon: Routledge.