

Governance for Climate Change Adaptation in transboundary conservation areas

A case study of La Amistad International Park (Pacific Side) between
Costa Rica and Panama

Ana Gabriela Monroy Chaparro

Supervisors

Anna-Riikka Kojonsaari

Guntra Aistara

Thesis for the fulfilment of the
Master of Science in Environmental Sciences, Policy & Management (MESPOM)
jointly operated by Lund University – University of Manchester -
University of the Aegean – Central European University

Lund, Sweden, June 2023

**Erasmus Mundus Masters Course in
Environmental Sciences, Policy and
Management**

MESPOM



This thesis is submitted in fulfilment of the Master of Science degree awarded as a result of successful completion of the Erasmus Mundus Masters course in Environmental Sciences, Policy and Management (MESPOM) jointly operated by the University of the Aegean (Greece), Central European University (Hungary), Lund University (Sweden) and the University of Manchester (United Kingdom).

© You may use the contents of the IIIIEE publications for informational purposes only. You may not copy, lend, hire, transmit, or redistribute these materials for commercial purposes or for compensation without written permission from IIIIEE. When using IIIIEE material you must include the following copyright notice: 'Copyright © Ana Gabriela Monroy Chaparro, IIIIEE, Lund University. All rights reserved in any copy that you make in a clearly visible position. You may not modify the materials without the permission of the author.'

Published in 2023 by IIIIEE, Lund University, P.O. Box 196, S-221 00 LUND, Sweden,
Tel: +46 – 46 222 02 00, e-mail: iiiiee@iiiiee.lu.se.

ISSN 1401-9191

VIENTRE DE LA MADRE TIERRA

Paola Valverde Alier

Entran las Abuelas Piedras
a esta casa del sudor

Reposaron su sabiduría
en el Sagrado Fuego
antes de hacer su ingreso

Todo comienza en el Este

Abrimos la puerta roja
a la humildad
a la Madre Tierra
a lo que nace

El ritmo del tambor
es su latido

El Sur
el camino que toma el sol

Abrimos la puerta amarilla
a la voluntad
al agua del cielo
la que fecunda

Invocamos al crecimiento
los ancestros
las generaciones futuras

El Oeste anida
al que transita la oscuridad
sin perderse en ella

Abrimos la puerta negra
al poder
la sinceridad
el guerrero

En el Norte
ponemos nuestros sueños

Abrimos la puerta blanca
a la pureza
a la integridad
al aire

El verde es orden y equilibrio
azul el Padre Cielo
morado el Corazón

Invitamos a pasar al Cóndor y al Águila
animales que elevan nuestros rezos
al Gran Espíritu
con la promesa de ver
algún día
al Norte unido con el Sur

Acknowledgements/ Agradecimientos

Gracias todos los participantes de mi investigación, quienes no solo mostraron su interés en este proyecto, sino que depositaron su confianza en mí y me abrieron las puertas de su casa y del Parque Internacional La Amistad (Pacífico) tanto en Costa Rica como en Panamá.

My gratitude to all hosts and guides who helped me in the journey of visiting PILA in both countries, the authorities, funding initiatives and friends who are impossible to name in this limited space. Mi admiración a Yendry Suárez, Damaris Sánchez, y Martha Esquivel por liderar el camino para todas las mujeres de Centroamérica.

Big thanks to the ones who took the time to listen to my confusion, talk about my ideas and provide me with meaningful feedback. Thanks to Guntra for your support. Lars, Anna Rikka, Laszlo, Sayel and Isra for your invaluable feedback.

My deepest appreciation to the people that supported me during the last weeks before my thesis submission, when I lost it all. Thanks for your kindness and empathy, I will never forget it.

Thanks to Diego, Maricruz, and Lena for being my older siblings in this MESPOM journey. To the friends, I made along the way, for sharing incredible moments in Austria, Greece, and Sweden. To my classmates for their company and their generosity in sharing about them and their home countries.

Todo mi amor para Margaret, Blondie y Brownie por confiar en el proceso y traer su cariño al cruzar el océano Atlántico. Los llevo conmigo, a donde sea, siempre.

Thanks to the ones that safeguard the unknown life of Mesoamerica and the world.

Abstract

Climate change is an urgent global issue affecting millions of people and several ecosystems. However, there is a significant gap between what has been done and what is needed for climate change adaptation. Conservation areas play a crucial role in responding to climate change by providing essential ecosystem services and supporting biodiversity and human adaptation. However, there is a lack of research on how climate change affects these areas (including buffer zones) and how stakeholders are addressing the impacts. This research focuses on La Amistad International Park (Parque Internacional La Amistad-PILA), which is a unique binational conservation territory between Costa Rica and Panama. This study explores three questions: How has the context of Costa Rica and Panama influenced adaptation conditions and priorities in La Amistad International Park Pacific side? How have different stakeholders at different levels implemented adaptation measures? How can governance principles contribute to climate adaptation efforts in PILA? The study employs a qualitative design, uses a document review, 29 semi-structured interviews, and participant observation in the Pacific side of the Park and surrounding communities. Multilevel governance provides insight into the variety of decision-making levels associated with PILA. The key findings are that the context of each country (current conditions, economic activities, challenges, etc.) has a big influence on how climate change impacts are observed, and the measures taken. The responses to attributed climate change impacts and other ongoing challenges in La Amistad vary on the type of actor and decision-making level. Effectiveness, inclusiveness, and connectivity can be used to improve climate action, address development and conservation challenges, and enhance climate change adaptation on both sides of the park. This work contributes to the academic literature on governance and adaptation in transboundary conservation areas, such as PILA.

Keywords: Climate change adaptation, Multilevel Governance, Transboundary conservation area, La Amistad International Park (PILA)

Executive Summary

Problem definition and research questions

Climate change is a fundamental agenda due to the urgency of acting when millions of people and several ecosystems are already affected by its impacts. As a response, policy frameworks have been designed and implemented but, regarding climate change adaptation, there is a significant gap between what has been done and what is needed.

Some territories like conservation areas are key for climate change response due to providing relevant ecosystem services as well as their future role for climate adaptation of biodiversity and societies. However, there is not much research about how conservation areas and their buffer zones are affected by climate and how stakeholders are addressing the impacts considering the many levels of decision-making involved.

In vulnerable regions like Mesoamerica (Southern Mexico to Panama), adaptation is a priority and it faces challenges in coordinating efforts in territories that are key areas for their ecosystem's services provision, beauty, cultural value, and preserved landscape. Therefore, it is fundamental to study how different governments, organizations, communities, and other actors have implemented (or not) actions for climate change adaptation under challenging circumstances.

This thesis focuses on the climate change adaptation response in La Amistad International Park between Costa Rica and Panama from a multilevel perspective, to understand the current adaptation actions and the governance conditions existing in the Pacific sides of each country. This aims to provide some guidance about how to reduce the climate action gap and improve governance for adaptation by understanding different stakeholders' interests, improving collaboration, and reflecting on further action.

The research questions are:

How has the context of Costa Rica and Panama influenced adaptation conditions and priorities in La Amistad International Park Pacific side?

How have different stakeholders at different levels implemented adaptation measures?

How can governance principles contribute to climate adaptation efforts in PILA?

Multilevel governance is used as the main guideline due to the diverse levels of decision-making involved in La Amistad International Park and its surrounding communities, as well as the complex interactions between higher levels like national authorities (top-down) with local stakeholders (bottom-up) who are essential to achieve accurate adaptation goals based on the governance arrangements in place.

Methodology

For this research, the case study of La Amistad International Park is considered, due to its relevance and complexity in terms of governance and the possibility of reaching diverse local actors' perspectives in two different countries regarding climate change adaptation.

The research design is based on qualitative research with a document overview, semi-structured interviews, and participant observation after a thematic analysis takes place to identify common topics related to the research questions and most common responses. To collect data 29 semi-structured interviews (13 stakeholders in Costa Rica, 14 stakeholders in Panama, and 2 with Binational actors) were conducted and participant observation in PILA and surrounding communities in the Pacific side took place.

After all interviews and notes were considered for manual coding, the information was analyzed and reported based on its relevance for multilevel governance and adaptation in both countries.

Key findings

The main results can be grouped in terms of context, governance, and adaptation. The context on both sides of the park has influenced adaptation needs as largely economic activities have impacted ecosystems, resulting in different consequences of climate variability and impacts. On both sides of the park, these are important aspects to be addressed to maintain the conservation and development goals in the region to avoid conflicts between the people and nature.

This research shows that the context of each country (current conditions, economic activities, challenges, etc.) greatly influences how climate change impacts are observed and the measures taken. In Costa Rica, adaptation efforts are more preventive based on the conservation actions happening near the park whereas in Panama these are reactive measures in terms of disaster risk reduction and agricultural activities because of the impacts already experienced.

The responses to attributed climate change impacts and other ongoing challenges in La Amistad International Park are different depending on the type of actor and decision-making level reported. Higher levels of decision-making have implemented top-down measures and established a framework in terms of climate change and biodiversity. Still, locally based stakeholders have not necessarily reacted specifically to climate change but mostly with daily practices and adjustments to environmental changing conditions. There is a great richness in inhabitant's observations about changes in the environment some attributed to climate change and others not necessarily but more cooperation for aligning actions and priorities with other decision-makers is needed.

Finally, governance principles like effectiveness, inclusiveness, and connectivity have implications for adaptation in the park and surrounding areas because they can enhance climate change adaptation on both sides of the park.

Conclusions and recommendations

Better effectiveness is a starting point for ensuring the park's functioning and managing other relevant agendas to further deal with climate change with a more prepared staff member as well as more possibilities to cooperate with other actors. Therefore, it is urgent to strengthen the capacities of park management on both sides, in each country, by having well-trained staff, planning documents and resources to deal with current and future issues like climate change without forgetting the historical problems in the region.

The inclusiveness of vulnerable actors is fundamental for climate change action in a region where historically marginalized groups like indigenous people, farmers, and women have been excluded from decision-making in developing and conservation issues. Women, small-scale farmers and indigenous communities should be also part of adapting actions because they are already facing impacts in their daily lives and they rely on natural resources provided by the Park.

Connectivity is fundamental for effective climate change action as there is more collaboration, communication, and possibilities of joining forces for the benefit of people and ecosystems. A better representation of diverse sectors for adaptation in the decision-making spaces can help to avoid contradictory goals that lead to less effective adaptation action or even maladaptation because there is no coordination between agendas.

The results here aim to be a reference for further adaptation governance in conservation areas in two different countries when diverse stakeholders are involved. Also, governance principles can be used as a tool for improving action on conservation, climate change and development.

Table of Contents

LIST OF FIGURES	2
LIST OF TABLES	2
ABBREVIATIONS	2
1 INTRODUCTION	1
1.1 PROBLEM DEFINITION	2
1.2 SCOPE AND DELIMITATION	4
1.3 ETHICAL CONSIDERATIONS	4
1.4 AUDIENCE.....	5
1.5 OUTLINE	5
2 INTRODUCTION TO THE CASE STUDY	6
2.1 COSTA RICA.....	6
2.2 PANAMA.....	6
2.3 LA AMISTAD INTERNATIONAL PARK.....	7
3 LITERATURE REVIEW	10
3.1.1 <i>Adaptation governance</i>	10
3.1.2 <i>Conservation areas and adaptation governance</i>	11
3.1.3 <i>What has been written about La Amistad International Park?</i>	12
4 CONCEPTUAL FRAMEWORK	14
4.1 MULTILEVEL GOVERNANCE	14
4.2 TOP-DOWN AND BOTTOM-UP.....	16
4.2.1 <i>Key governance principles</i>	19
5 RESEARCH DESIGN	21
5.1 CASE STUDY.....	21
5.2 DATA COLLECTION.....	21
5.3 DATA ANALYSIS	23
5.4 REFLECTIONS ON METHODS.....	23
6 FINDINGS FROM LA AMISTAD INTERNATIONAL PARK	25
6.1 PILA (PACIFIC SIDE) IN COSTA RICA.....	25
6.1.1 <i>Context of the park and surrounding areas</i>	25
6.1.2 <i>Governance conditions</i>	28
6.1.3 <i>Adaptation</i>	30
6.2 PILA (PACIFIC SIDE) IN PANAMA	32
6.2.1 <i>Context of the park and surrounding areas</i>	33
6.2.2 <i>Governance conditions</i>	36
6.2.3 <i>Adaptation</i>	40
7 DISCUSSION	43
7.1 RQ1: HOW HAS THE CONTEXT OF EACH COUNTRY INFLUENCED ADAPTATION CONDITIONS AND PRIORITIES IN LA AMISTAD INTERNATIONAL PARK PACIFIC SIDE?.....	43
7.2 RQ2: HOW HAVE DIFFERENT STAKEHOLDERS AT DIFFERENT LEVELS IMPLEMENTED ADAPTATION MEASURES IN LA AMISTAD INTERNATIONAL PARK (PACIFIC SIDE)?.....	45
7.3 RQ3: HOW GOVERNANCE CAN CONTRIBUTE TO CLIMATE CHANGE ADAPTATION IN PILA?	47
8 CONCLUSION AND RECOMMENDATIONS	51
BIBLIOGRAPHY	54
APPENDIX	59

List of Figures

Figure 2-1 La Amistad International Park (Pacific and Caribbean) Boundaries.....	8
Figure 4-1 Multilevel network of adaptation governance including sectors	15
Figure 4-2 Top-down and bottom-up in adaptation policy.....	18
Figure 4-3 <i>Top-down and bottom-up integrated</i>	18
Figure 5-1 Relevant interviewed stakeholders from different decision-making levels in both Countries	22
Figure 6-1 View from the administrative office of PILA in Altamira, Biolley Costa Rica 25	
Figure 6-2 View from the pathway that goes to PILA in Las Nubes, Panama.	32

List of Tables

<i>Table 4-1 Common governance principles in conservation areas, for adaptation purposes and multilevel perspectives</i>	19
--	----

Abbreviations

ACLAC - Área de Conservación La Amistad Caribe
ACLAP- Área de Conservación La Amistad Pacífico
AMIPIILA- Asociación de Amigos del Parque Internacional de la Amistad.
FUNDICCEP- Fundación para el Desarrollo Integral, Comunitario y Conservación de los Ecosistemas en Panamá (FUNDICCEP)
IPCC- Intergovernmental Panel on Climate Change
IUCN- International Union for Conservation of Nature
MINAET- Ministerio Nacional de Ambiente y Telecomunicaciones (Ministry of Environment and Telecommunications)
Mi Ambiente- Ministerio de Medio Ambiente de Panamá (Ministry of Environment of Panama)
MIDA- Ministerio de Desarrollo Agropecuario (Ministry of Agricultural Development)
MIDEPLAN- Ministerio de Desarrollo Económico y Planeación de Costa Rica (Ministry of National Planification and Economic Policy)
NATURA- Fundación Natura (Natura Foundation)
OECD- Organization for Economic Cooperation and Development
PILA- Parque Internacional La Amistad (La Amistad International Park)
SINAC- Sistema Nacional de Áreas de Conservación (National System of Conservation Areas in Costa Rica)
SINAP- Sistema Nacional de Áreas Protegidas en Panama (National System for Protected Areas Panama)
TNC- The Nature Conservancy
UNDP- United Nations Environmental Program
UNESCO- United Nations for Education, Science and Culture Organization
UNFCCC-United Nations Framework Convention for Climate Change

1 Introduction

Climate change is a fundamental agenda due to the urgency of acting when millions of people and several ecosystems are already affected by its impacts. As a response, policy frameworks have been implemented but, regarding climate change adaptation, there is a significant gap between what has been done and what is needed.

Adapting to climate change is one of the biggest challenges that territories, communities and institutions currently face. This is because efforts to reduce vulnerability and increase the resilience of people and ecosystems also require dealing with uncertainty and prevention of future damage.

Adaptation has diverse definitions depending on the scope and purpose of action. The United Nations Framework Convention for Climate Change (UNFCCC) considers adaptation as the “adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts. It refers to changes in processes, practices, and structures to moderate potential damage or to benefit from opportunities associated with climate change”. Authors like Williams (2012) define adaptation as the process “through which an actor can reflect upon and enact change in those practices and underlying institutions that generate root and proximate causes of risk, frame capacity to cope and further rounds of adaptation to climate change”. Adaptation can be framed as the process that occurs when measures are taken for current and future impacts due to changing conditions.

Some of the main characteristics of adaptation are that it involves “changes in social-ecological systems in response to actual and expected impacts of climate change in the context of interacting non-climatic changes” (Moser & Ekstrom, 2010, 22026 p.) This process can be reactive from short-term to long-term expectations and preventive measures. It also implies deeper transformations that go beyond the global climate goals, and that the results are not granted for moderating the damage or providing opportunities for benefit (Moser & Ekstrom, 2010).

Adaptation to climate change is not only a complex technical issue for societies and ecosystems to face projected climate effects, but also a demanding governance issue (Termeer, 2011, 2016). To be successful, this process requires the active and sustained participation of diverse stakeholders from individuals, firms, and civil society as well as governments and other national, regional, and multilateral organizations and international agencies (Neil Adger et al., 2005; UNFCCC, 2022). Climate change adaptation also requires coordination with different decision-makers and sectors, and regulations or legal frameworks to support the impacts and circumstances in this changing time (Keskitalo et al., 2016, 3p.). Overall good governance is needed at different levels for adapting to climate change (Dicker & Kyriacou, 2021).

Governance is defined as: “the complex process through which a plurality of social and political actors with diverging interests interact to formulate, promote, and realize common

objectives through mobilizing, exchanging, and deploying a range of ideas, rules and resources” (Torfing et. al, 2012, 2p.). The United Nations Development Program states that governance is “[...] the system of values, policies, and institutions by which a society manages its economic, political, and social affairs through interactions within and among the state, civil society and private sector” (UNDP, 2007)”.

Governance studies have been focused on mitigation where adaptation-related decisions and initiatives have been overlooked (Hall & Persson, 2018). Despite governance being a key aspect of climate adaptation at all levels (Dicker & Kyriacou, 2021), studies of governance and adaptation have focused on higher-level decision-making in specific regions like Small Island Developing States (Bruijn & Dieperink, 2022) or the Amazon Forest (Tigre, 2019). Some governance studies have addressed stakeholders but only specific actors like Rangers Managers (Schliep et al., 2008).

Some governance studies on adaptation have been explored from a polycentric point of view due to the diversity of socioecological systems at the local scale (ecosystems and community). However, in some contexts, due to the hierarchy of the decision-making framework, it is necessary to consider a multilevel perspective on the current adaptation actions and further opportunities to adapt.

It becomes relevant to explore the governance dynamics when different adaptation responses, policy frameworks and actors are related or not in different levels of decision-making. Therefore, conservation areas can be a great opportunity to explore those complexities because they are fundamental for sustainable development, but also crucial for adapting to climate change (IUCN, 2019).

Climate change adaptation in conservation areas is still a research area to be explored. There is some literature regarding protected areas and climate change but mostly focuses on mitigation, specific ecosystem services like carbon dioxide sequestration (IUCN, 2019) or technical studies on adaptation for biomes and ecosystems (Dobrowski et al., 2021). There is also research on adaptation to marine areas (Gruby, R. L., & Basurto, 2013; O’Regan et al., 2021) as they are explicitly affected by climate impacts.

While these are some initiatives in terms of adaptation governance in protected areas, most of them are government-oriented with a regional focus like mountains (Cattivelli, 2021) or well-known forests like the Amazon (Tigre, 2019). Better research on case studies for specific ecosystems is needed for effective adaptation, not only documenting policies but also the experiences of local stakeholders.

1.1 Problem definition

Adaptation to climate change is an ongoing process that several territories are forcibly facing around the world. For regions like Central America and the Caribbean, adaptation to climate change is the priority in their climate agenda. This is because they are vulnerable, due to their geographical location (between the Pacific and Caribbean oceans) and their historical social, economic, and political conditions which continue shaping their interaction with the environment (Miller, 2011).

In the last few years, Central American countries have been affected by climate change impacts. Extreme events like hurricanes, droughts or rainfall pattern changes threaten the efforts to protect the environment, achieve sustainable development, fulfil the inhabitants' basic needs, and prevent illegal activities like mining, logging, and cultivating drug crops. However, most studies about adaptation in the region have been focused on the physical implications of adapting or in community-based studies without necessarily exploring the governance dynamics and how they could influence further adaptation actions.

Central America is also considered a hot spot for biodiversity and has a large number of conservation territories. Protected areas are key for biodiversity, ecosystem services, development, and cultural practices, as well as for helping people cope with climate change and provide opportunities for adaptation and risk reduction (IUCN, 2019). However, climate change is already affecting conservation areas because it impacts ecosystems and species in diverse ways that contribute to the current biodiversity decline (UN, 2022).

Specifically, in Central America, there is a lack of documentation about transboundary conservation areas, and most studies found are about transboundary water resources (GWP, 2016; IUCN, 2019). Also, there are not many studies of binational protected areas in Central America that focus both on climate change and adaptation yet.

La Amistad International Park was selected as a case study due to its management complexity and the involvement of several stakeholders at different decision-making levels. At the time this research was proposed there was just one management plan in place from Costa Rica including the Pacific and Caribbean, while the Management Plan from the Panama side was under development. Therefore, I consider it necessary to conduct fieldwork on the Pacific side of the conservation areas to gather information from locally based stakeholders.

Previous research work on La Amistad International Park has focused on governance from an institutional perspective based on transboundary cooperation (Porras, 2013) or from a polycentric approach for understanding geographies of governance (Miller, 2011). However, no work provides an integrated perspective of PILA on the Pacific side, focusing on relevant issues like climate change and analyzing specific governance aspects for further actions.

Research goal and questions

This work aims to explore how the governance for climate change adaptation is happening (or not) in the International Park La Amistad (Pacific side) between Costa Rica and Panama. Specifically, this research focuses on responding to the following questions:

- 1) How has the context of each country influenced adaptation actions in La Amistad International Park Pacific side?
- 2) How have stakeholders at different decision-making levels implemented adaptation measures?
- 3) How can governance contribute to adaptation efforts in PILA?

This is based on a multilevel perspective that compares different scales of decision-making involved in the International Park for climate change adaptation. The main assumption is that climate change responses at the decision-making levels might differ because PILA is governed differently in each country, the perceptions of changes and challenges are influenced by local stressors/challenges as well as governance arrangements. For this reason, their response, and further action need to incorporate collaborative actions within levels and countries in the name of making PILA a more resilient conservation space.

1.2 Scope and delimitation

La Amistad International Park has been selected as a case study due to the environmental relevance and the institutional particularities of being a conservation area located and “managed” between two different Central American countries. The spatial delimitation refers to the Pacific side of the transboundary international park in both Costa Rica and Panama. This is because the Pacific side is where the administrative offices are, as is the most accessible and well-connected area in both countries.

This case study selection was made in consideration of the challenges of doing fieldwork in other transboundary conservation areas based on the nature and actors involved in the adaptation process of a region like Central America. Illegal activities (mining, drug cultivation), transnational companies’ interests, and political concerns can limit the scope of research as it might not be easy or possible to ask questions, reach stakeholders and report the results in all conservation areas of the region.

1.3 Ethical considerations

For this research, no big influences from specific stakeholders were reported. All semi-conducted interviews were voluntary and took place in Spanish after understanding and signing a consent form based on the ethical guidelines of the University of Lund and other MESPOM Consortia Universities (included in the appendix).

All interviewees were informed that if they did not want to participate at any point, immediately their participation in the research would conclude and no information would be used. All contact data was included in an informative page in case further withdrawal of the study was requested. In some cases, it was not possible to interview people or no clear affirmative answers were collected so despite their relevance for the case study, there were no more attempts to contact stakeholders and they are considered as pending actors.

The data collected from stakeholders and relevant actors was used for reporting on my thesis document and it will be used for the reports to both countries’ stakeholders and other academic purposes like articles and conferences. None of the data collected intends to harm the interviewees or their relationships with other actors but contributes to the study of the region.

This research work includes information from relevant sources that were found and reported with appropriate citations. No sensitive materials have been used for the literature review of theories and programs implemented. No private information will be disclosed as established in the consent form.

1.4 Audience

This work aims to be used by stakeholders who are living, working, and involved in planning at the park and nearby territories, for a better understanding of adaptation. International organizations and governmental actors from Costa Rica and Panama can also benefit from the results of this study. This can contribute empirically to understanding how this park works on the Pacific side and can set a precedent for binational conservation areas that face similar challenges in the region but also have other contexts.

By writing a report for the participants or an article in Spanish, the local actors involved can also have access to the results obtained. It will be shared with all participants for their information and both sides of the park can have access for them to know what is the context of each country. It will also be part of the scientific research done in the national protected areas of Costa Rica and Panama.

1.5 Outline

Chapter 1 is the introduction about the topic by presenting the problem definition, what this research aims to achieve, the delimitation, ethical aspects, and the intended audience for this research.

Chapter 2 is a quick introduction to the case study including a brief context of Costa Rica and Panama as well as the description of La Amistad International Park.

Chapter 3 is a review of some of the previous work written in terms of adaptation governance, adaptation in conservation areas and La Amistad International Park as a case study.

Chapter 4 explains the theoretical framework based on multilevel governance, a top-down and bottom-up approach and key governance principles.

Chapter 5 describes the research design and methodology based on the research needs.

Chapter 6 presents the findings from the fieldwork in PILA. They are divided into countries (Pacific side) because the park administration takes place in that way and considers the surrounding areas, governance conditions and aspects for adaptation response.

Chapter 7 discusses the findings concerning the three main questions and how multilevel governance and adaptation governance are related to this content.

Chapter 8 states the conclusions of the research and recommendations.

2 Introduction to the case study

To provide the reader with an overall perspective about where the transboundary territory is located, this section includes a brief description of Costa Rica and Panama in terms of some aspects that could have implications for adaptation. It also included a description of La Amistad International Park to introduce the territory selected as a case study.

2.1 Costa Rica

Costa Rica is a small country located between the Pacific and Caribbean Islands with approximately 51.100 km² of land and 589.000 km² of maritime area (MINAET, 2012, 7p.). This tropical country has a diverse range of ecosystems and reliefs that considering climates host around 5-6% of world-known species (UNDP, 2021). It is considered a vulnerable country to climate change impacts for its geographical location (Adaptation Fund, 2021) as well as the economic activities and social aspects that rely deeply on the use of natural resources.

The main economic activities are related to tourism, agriculture for exportation (pineapples, bananas, and coffee) as well as manufacturing of pharmaceuticals and small technologies (UNDP,2023). In social terms, this country is well known in the region for having “the highest standard of living within Central America” (UNDP, 2023) but the country’s income inequality rate is one of the highest in the entire Latin America and the Caribbean region (World Bank, 13p. 2022). That has an impact on historically disadvantaged groups like indigenous, Afro-descendants, women, migrants, rural populations, and irregular urban settlements.

Costa Rica has been widely recognized for its championship in environmental efforts and sustainable development. In line with this, biodiversity is a sector where actions on conservation and management have placed the country leading regionally and worldwide on the environment (UNDP, 2010). This can be observed in the 169 conservation areas that represent 26% of its territory as a protected area and the Payment for Ecosystem Services Program that has allowed important reforestation rates in the country in the last decades.

Unfortunately, the increase in the sea level, the changes in the climate conditions for farming and fishing as well as the extreme meteorological events in the last decades have impacted several territories in the country with loss of human lives, harvest damage, and other affectations (UNDP, 2023). As a response, the main policy frameworks on climate change developed by the country are Costa Rica’s National Climate Change Adaptation Policy (NCCAP, 2018), the National Decarbonization Plan (NDP, 2019), and the Nationally Determined Contribution (NDC) 2020.

2.2 Panama

Panama is a vulnerable isthmian territory to climate change impacts because it often experiences extreme weather events like rainfalls, windstorms, floods, droughts, wildfires, earthquakes, landslides, tropical cyclones, tsunamis, and ENSO/El Niño-La Niña events

(Adaptation Fund, 2021) This country connects the North and South of America and the Pacific and Atlantic oceans and it is well-known for its large water resources that nowadays have been affected by climate variability, the increase of temperature and sea level rise (Cárdenas et. al, 2022).

The main economic drivers of Panama are related to the Panama Canal considered “one of the man-made wonders of the world” (World Bank, 2023) in activities such as services, wholesale, retail trade, transportation, storage, and communications. Other sectors like construction, mining, and manufacturing have contributed to the country’s rapid economic growth and COVID recovery too (World Bank, 2023).

However, the biggest challenges of Panama to reduce the poverty and inequality among indigenous communities, Afro-descendants, and women, are still a work in progress. Panama is the 6th of the most unequal countries in the world, meanwhile, the country recovered from COVID in 2021 by growing 15.3 per cent, the poverty increased by 14.1 per cent in 2020, 2 percentage points higher than the 2019 (World Bank, 2023) meaning that 1 out of 4 kid lives hungry in a wealthy country (Panama sin pobreza, 2022)

Regarding nature, Panama is one of the most biologically important regions on earth, due to its varied wealth of ecosystems and biodiversity (Cárdenas et al., 2022) Panama is also well-known for having “one of the highest percentages of forest cover in the world, covering 68 per cent of the country’s total area” (World Bank, 2023). Nowadays this country is considered one of the three only carbon-negative countries (with Bhutan and Suriname) (Mission Panama, 2021) as it has more than 33% of the land protected with efforts to further reforest more areas (World Bank, 2023). But mega projects, land change use, ecosystem fragmentation and climate change are heavily affecting specific territories including La Amistad International Park.

2.3 La Amistad International Park

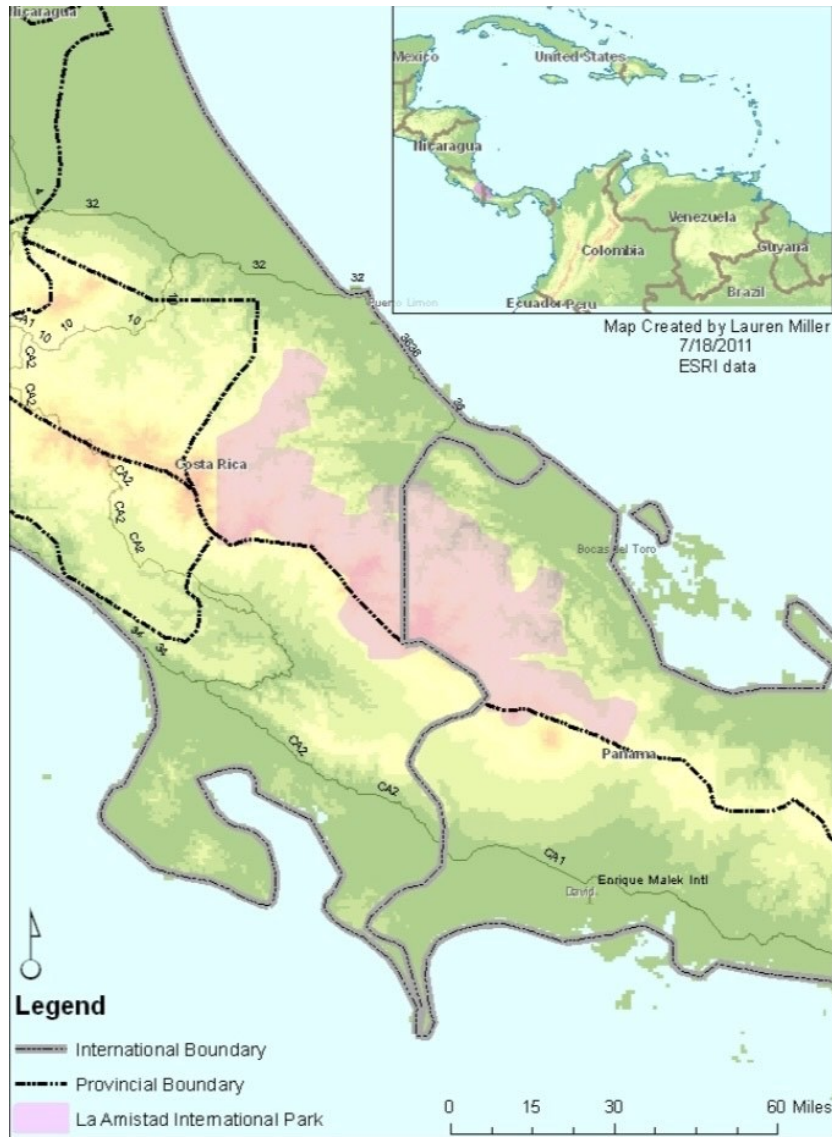
La Amistad International Park is a binational conservation territory located between Costa Rica and Panama. This area comprises the largest nature reserve in Central America and inside contains, “several hundred endemic plant species and one of the last major refuges for threatened fauna” (UNEP-WCMC,2017) Due to its connectivity and biological richness is included as a part of the 5-great forest of Mesoamerica (Wild Conservation Society, 2021)

This unique conservation area was created by Costa Rica and Panama with two main objectives: Maintaining the natural richness and heritage of the area and creating a peaceful border model between countries in Central America (Castro, et al, 1995). In the surrounding areas of the park, diverse ethnical groups of people (mestizo, Chinese, black, etc.) can be observed and specifically, this conservation area is well known for having the Bribri, Cabécar, Naso, Ngäbe, and Buglé indigenous peoples inside its territory (WCS, 2021)

Of its complexity, this territory has diverse denominations, that in terms of governance have different implications. The International Park La Amistad as a conservation area is governed

differently in both countries as Conservation Areas have different roles in Costa Rica and Panama.

Figure 2-1 *La Amistad International Park (Pacific and Caribbean) Boundaries*



Source: Lauren Miller 2011 *Geographies of governance across la Amistad International Park*.

Each country declared the Park as a protected area but with different perceptions of the park. In both countries on the Pacific side, previous inhabitants were living or using it for small-scale farming or cattle ranch. Since then, some ecosystems next to the administrative offices inside the park have been recovered.

In the case of Costa Rica, the main actor managing the park is the National System of National Conservation Areas (Sistema Nacional de Areas de Conservación-SINAC in Spanish). La Amistad is part of two main Conservation Areas: Conservation Area La Amistad Caribbean [Área de Conservación La Amistad Caribe (ACLA-C)] and Conservation Area La Amistad Pacific [Área de Conservación la Amistad Pacífico (ACLA-P)]. Even the Pacific side of PILA in Costa Rica, is just 12% of the territory, in this sector

the main administrative activities take place, and some others are developed in terms of research, tourism, environmental education and prevention, protection and control” (SINAC, 2017).

In the case of Panama, the National System of Protected Areas (Sistema Nacional de Áreas Protegidas-SINAP in Spanish) is the main institution in charge of the protection of the park and it is heavily supported by the Ministry of Environment (Mi Ambiente). Very similar to Costa Rica, the Park is only accessible from the Pacific side, despite most of the conservation land being in Bocas del Toro on the Caribbean side (Aqua, 2021) Also in terms of land use the government recognizes that the Park has a key role on the food security of Panama because of the economic activities inside PILA, and it is also “a touristic attraction for national and foreign visitors” (Mi Ambiente, 2022)

Because Costa Rica and Panama are closely related within their borders, the Transboundary Agreement between Costa Rica (1995) and Panama (1994) was signed and a governance structure was established. This Agreement has an Executive Secretariat with a permanent binational commission, as well as diverse guidelines to be executed. In line with this, the Binational Technical Executing Unit (Unidad Técnica Ejecutora Binacional- UTEB PILA) is a governance mechanism coordinated by the Ministry of Economic Planning and Economic Development (MIDEPLAN) in Costa Rica and by the Ministry of Economy and Finance (Ministerio de Economía y Finanzas) in Panama.

This governance mechanism was designed for the binational activities related to the administration, conservation, and management of the park (UTEB-PILA, 2011) and meets every 6 months altering their host place between Costa Rica and Panama. It also communicates with relevant actors representing the transboundary park. Actors interviewed reported that organizations like IUCN, and Natura Foundation are supporting the organization of the meetings for having the stakeholders like park rangers and government representatives together in those spaces.

In addition to a conservation area and a transboundary area, this territory on each side constitutes the core zone of two different biosphere reserves in Costa Rica and Panama respectively. It is also considered a World Heritage Site by UNESCO with the name of Talamanca Range-La Amistad Reserves / La Amistad National Park since 1983 and includes other conservation and no conservation territories in Costa Rica and Panama.

This study just focuses on the Pacific Side, including Buenos Aires and Coto Brus municipalities in the province of Puntarenas in Costa Rica. Regarding Panama Las Nubes, Guadalupe, Piedra Candela and Boquete, in the district of Cerro Punta, Volcán and overall, the Chiriquí region is referred.

3 Literature review

A brief description of the literature found for adaptation governance, conservation and La Amistad as a case study are explored in this section to provide a broader context.

3.1.1 Adaptation governance

Due to the growing implementation of policy on climate change and realizing the relevance of adaptation as a separate agenda from mitigation, studies of governance have tried to understand how adapting to climate change occurs and is governed. Adaptation governance is defined by David Huitema as

“[...] the patterns that emerge from the governing activities of social, political, and administrative actors in the realm of climate change adaptation. The governing activities refer to their combined efforts to adapt to climate change, their efforts to found institutions that deal with the issues, and finally, they refer to their ideas about appropriate normative underpinnings for the way climate change adaptation should be governed, considering wider social and political beliefs and systems” (Huitema et al., 2016).

The author also mentions that climate change adaptation governance: a) is a collective process that involves efforts of multiple societal actors, b) involves the creation of institutions, organizations, and normative principles for solving problems and building institutions and c) it can be governmentally driven with regulations and validations provided or more organically generated between groups and organizations (Huitema, et. al, 2016)

Some complexities are the division between local and regional (ecosystem) levels vs the global adaptation framework established by the United Nations Framework on Climate Change Convention (UNFCCC) and reinforced after the Paris Agreement. Also, there is not a common specific goal and scope because adaptation includes diverse aspects like “the health of vulnerable groups, the resilience of critical infrastructures, the preservation of farming livelihoods, and so on” (Huitema et al., 2016).

Assessing governance is a needed exercise for a better decision-making process. Once the governance dynamics, progress and challenges are understood, more accurate actions can be implemented. In the case of climate change adaptation, it is fundamental to avoid inaccurate efforts that instead of increasing resilience could lead to maladaptation or waste of resources during a climate crisis. By looking at previous adaptation governance assessing exercises, it could be possible to identify the governance conditions that can support adaptation in and outside the park.

In “A Framework for Assessing Climate Adaptation Governance on the Caribbean Island of Curaçao” (2022) the author Esmé de Bruijn develops a methodology based on the Small Island Developing States (SIDS) to understand how adaptation has been implemented in the Caribbean. She bases her work on Michael Lockwood's paper: *Good Governance for terrestrial protected areas: A Framework, principles, and performance outcomes*, (2010) as

he describes a framework in terms of quality and management effectiveness of protected areas, using 7 principles like legitimacy, transparency, accountability, inclusiveness, fairness, connectivity, and resilience (Lockwood, 2010). He acknowledges protected area governance, but the whole assessment guide is indeed designed for natural resource management (NRM) and protected area authorities, without necessarily putting the centre of attention on local communities' rights or other levels of decision-making.

Following that, De Bruijn's good governance principles for Curacao are defined as transparency, accountability, inclusiveness, connectivity, and government effectiveness and they have their criteria description and indicators. The research is based on document analysis and conducted interviews with policymakers and NGOs in Curaçao "to obtain a better understanding of Curaçao CCA governance and to investigate how they valued the local adaptation governance practices on their island" (Bruijn & Dieperink, 2022, 6p). This is insightful research, but it is limited to including the perspective of actors (non-governmental organizations), whereas the complexity of climate adaptation requires the inclusion of diverse actors from a multilevel perspective in these territories.

All these contributions highlight the diverse perspectives on adaptation governance and its relevance. To explore in depth these aspects, the conceptual framework section in this research will better explore those principles developed for assessing governance.

3.1.2 Conservation areas and adaptation governance

Adaptation has become a common concern for authorities and communities closely related to conservation areas. This is because the changing conditions of key biodiversity ecosystems are altering the ecosystem services and that is leading to an impact on people and life as it is known. Adaptation based on ecosystem systems is a recognized approach that in some ways combines social and ecological agendas, not necessarily focusing on how ecosystems are governed but, on how they can be resilient and restored from a socioecological perspective. As ecosystems are governed and organized in different ways, it is important to acknowledge diverse decision-making levels regarding adaptation in conservation areas.

From a regional perspective, in the article "*Climate Adaptation Strategies and Associated Governance Structures in Mountain Areas. The Case of the Alpine Regions*", Valentina Cattivelli explores three governance issues based on the mountain's ecosystems: governance structures, stakeholders' involvement mechanisms, and links with the existing wider-scale strategies. By using South Tyrol as a case study, she reports the conditions of adaptation at a regional level and suggests "the improvement of knowledge and an appropriate system for its dissemination, and the definition of a dedicated plan" (Cattivelli, 2021) for long-term adaptation actions.

Another regional perspective based on the national efforts of Amazon countries is provided by Maria Antonia Tigre in "*Building a regional adaptation strategy for Amazon Countries*" (2019). Here she explains how Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname, Venezuela, and a territory of France (French Guyana) are implementing adaptation actions

nationally (NDCs) and through the Amazon Cooperation Treaty Organization (ACTO). It also includes a comparison between the regional mechanisms for cooperation in the Amazon and the adaptation efforts in Central America with the regional strategy for climate change (RSCC) established in 2010 by the Central American Integration System (SICA) and the Central American Commission on Environment and Development (CCAD). This analytical exercise is based on the policy framework of several countries involved but it does not describe other governance arrangements and actions between non-state actors or other levels where adaptation could be happening in the territory.

Nowadays most conservation studies are moving towards a changing world, but social and community aspects need to be also incorporated into the understanding of more effective adaptation. While the link between climate and conservation is strong their differences are making this an interesting field to be explored.

3.1.3 What has been written about La Amistad International Park?

For this research, some works were analyzed in Spanish and English from past times until now. The oldest document found is *La Amistad biosphere reserve* by Juan Jose Castro, Manuel Ramírez, Richard E. Saunier, and Richard A. Meganck as a part of the book “Conservation of Biodiversity and the New Regional Planning” (1995). In that document, there are 4 aspects relevant to planning after the establishment of the park. First, change because the ecosystem is changing due to natural phenomena like earthquakes as well as migration and development projects. Second, information flow because all levels involved should have information to avoid misunderstandings and encourage participation. Third, political will where both countries are aiming to make this park a conservation example and a peace park for the future. And fourth, financing for attracting donors and matching their interest with the priorities for the park.

Another document that provides general information from a binational perspective is the *Informe Binacional sobre la evaluación de la gestión de las autoridades ambientales de Costa Rica y Panamá en el Manejo Integral del Parque Internacional La Amistad* (Binational report about the evaluation of environmental authorities’ management of Costa Rica and Panama in the Integrated Management of La Amistad International Park, 2004). In this document, the binational management in the area is evaluated and it aims to verify the full compliance of the objectives using audit methodologies, comparing processes and results in each country. Since then, limited information for planning, and a lack of personal and sporadic binational efforts were reported as challenges to be solved.

For PILA Costa Rica, there is a diagnostic study by Pia Paaby and Carlos Borge (2004) that includes some of the risks, threats, and vulnerabilities in this territory. Regarding threats, it is said that the low social index in the population near the park promotes illegal activities while the most pressing issues are on the Caribbean side. In terms of vulnerability, on this side of the Park, these are described as challenges like the poverty of indigenous people and farmers, geographic isolation, and huge area without infrastructure, as well as the lack of research and scientific monitoring (Paaby & Borge, 2004). For the Pacific side, they specifically refer to rain and global warming as significant risks because of the sensitivity of some species.

Regarding the relationship of culture with nature, I. S. Candanedo Diaz in her PhD research work “Nature – Culture Interactions Among Peasant Communities Near La Amistad Transboundary Park, Panama, and Costa Rica” (2010) describes the interactions in five colonist communities near La Amistad Transboundary Park located along Panama– Costa Rica international border. Her valuable contribution is the comparison within territories regarding ecosystem management. In conclusion, she provides recommendations for policymaking including: “increased local participation, equitable sharing of benefits and costs, more attention to power imbalances and the role of cultural identity in nature conservation” (Candanedo, 2010, 4p.). This research is enrichingly descriptive of the local inhabitant’s perspectives from both countries.

Lauren F. Miller in her work *Geographies of Governance across La Amistad International Park* (2011), focuses on levels of trust, participation, and the emergence of polycentric governance among buffer zone community stakeholders. This combines the human geography of regions and Elinor Ostrom’s work on institutional arrangements. From her research, she concludes that “La Amistad is an eco-region that has been constructed and is continuously being reconstructed to address numerous agendas” (Miller, 2011, 124p.). Conservation goals are promoted by several multilevel actors but the bi-national park “is being reconstructed by international stakeholders to meet agendas beyond that of conservation” (Miller, 2011, 124p.).

From an international cooperation perspective, Nazaret Porras Quiroz in her research *Cooperación Transfronteriza Costa Rica Panamá: Gobernanza ambiental* (2013), (Transboundary Cooperation Costa Rica- Panama: Environmental Governance) analyzes how the transboundary cooperation has been occurring between both countries on the environment sector. She focuses on the Sixaola River and La Amistad International Park to better understand how joint management happens for water and biodiversity. She describes the institutions, functions, structure, and financing mechanisms as the actors and legitimacy of both Binational Institutions. In the end, she makes recommendations for public policy between both countries to define and achieve common environmental goals.

All these previous studies provide a general idea of the main cooperation and governance research interests in a binational park like PILA. They evidence the complexity and opportunities for researching the park but also surrounding communities. However, it was not possible to find any updated transboundary or binational research on governance, specifically related to climate change or adaptation in PILA Pacific.

4 Conceptual framework

As has been exposed, these are studies that attempt to address the complexity of governance dynamics related to adaptation to climate change. Theoretical approaches to governance like polycentric, transnational, multilevel, collaborative, etc. have studies on climate change adaptation and their contributions depending on the context and the scope of the research. For this case study, multilevel governance fits the primary purpose of understanding a complex socioecological system like La Amistad International Park with different stakeholders involved at diverse levels of action. Top-down and bottom-up approaches are also described for a better understanding of the complexity of policy implementation and actor interaction. Later governance principles are included as a part of the analysis for adaptation.

4.1 Multilevel governance

Multilevel governance (MLG) is an extended analytical framework that relies on decision-making levels and actors' responsibilities in implementing actions. Under this approach governing is understood as "a process of continuous interactions among governments and private entities, operating at, and between, several administrative levels and ultimately aiming at the realization of collective goals" (Termeer, 2010).

This concept was developed by the political scientist Gary Marks in 1993 (Saito Jensen, 2015) and it is often linked to the European Union establishment (Maastricht Agreement) when institutions and policy integration were promoted back in the 1990s (Tortola, 2017). Since then, this type of governance has acknowledged the influence of "government institutions operating at different scales, as well as diversification of actors from the private sector and civil society intervening in public issues" (Westman et al., 2019) but considers the displacement of state power and control to international actors and organizations above, to regions, cities, and communities below, and also to civil society with non-state actors (Pierre and Peters, 2000).

Authors like Hooghe and Marks (2001) explain that there are two types of theories for understating multilevel governance: Type I which is nested, structured and vertical and Type II which is more like an earth system, interrelated and "polycentric". Both share that the state is changing its role, that decisions are complex due to the diverse directions that power has within several stakeholders, and that more governance spaces exist but their coordination is also challenging (Saito Jensen, 2015).

Some of the critiques that have been made about Multilevel Governance are that most literature has been looking at national-supranational relations, but it has less explored the national-subnational sphere of interaction (Di Gregorio et al., 2019). In addition to this, there is a "limited ability to assess the importance of different levels of governance, its conceptual vagueness, and its lack of clarity about how to reconcile governmental hierarchies with horizontal autonomy" (Ibidem, 65p.)

Multilevel governance illustrates climate change is a complex global phenomenon, considering it is made up of “autonomous spheres of authority and multiple un-coordinated measures directed towards a common goal” (Bulkeley & Newell, 2015, p. 13). Due to the diversity of agendas and actors involved it has been used to better understand how to be effective policy implementation can be achieved.

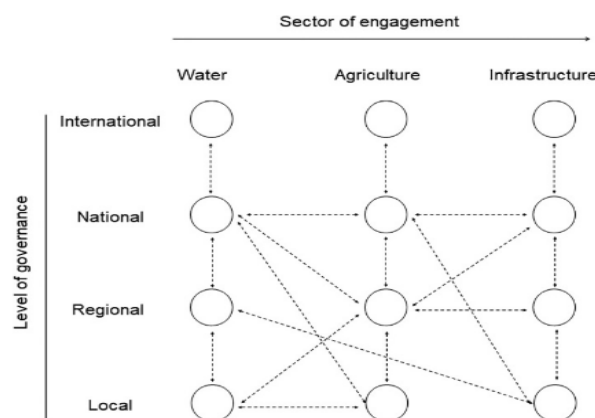
In the case of climate change adaptation, multilevel governance helps to address expected impacts and responsive actions at several governmental levels, sectors, and societies because impacts that have been predicted in similar ecosystems and countries could manifest differently due to conditions at regional and local levels of decision-making (Bauer & Steurer, 2014).

Multilevel governance in adaptation has been studied by authors like Neil Adger et al. (2005) who in the paper *Successful adaptation to climate change across scales* introduce the relevance of considering adaptation action in different scales to succeed. He proposes to focus on elements like effectiveness, efficiency, equity, and legitimacy because they are relevant to assess sustainable development, for better addressing the uncertain future (Neil Adger et al., 2005).

Another approach is the work of Katrien Termeer and others (2016) in “Coping with the wicked problem of climate adaptation across scales: The Five R Governance Capabilities”. This proposes five governance capabilities (reflexivity, resilience, responsiveness, revitalization, and rescaling) to deal with wicked problems like climate change adaptation where “governance institutions are poorly equipped to enable, or at least tolerate innovative strategies” (Termeer et. al, 2016). Those features are analyzed in three different levels of adaptation policy implementation: The United Nations Framework Convention on Climate Change, the European Union, and the Delta Program of the Netherlands.

For authors like Ishtiaque, (2021), an effective climate change response demands the interaction of actors operating at different levels, with different sectors of engagement and interactions that compose a multilevel network of governance as can be seen as follows:

Figure 4-1 Multilevel network of adaptation governance including sectors



Source: Ishtiaque, 2021 Multilevel governance

Multilevel governance aligns with the goal of this research due to the multiple decision-making levels involved in La Amistad International Park Management and its surrounding communities. In addition, another approach is by a reciprocal top-down/bottom-up approach, where multi-level climate governance: “provides an interface for policy-making decision processes, and at the same time it functions as a reinforcing mechanism and an enabler of action” (Zen et al., 2019).

4.2 Top-down and bottom-up

The top-down approach has been the most common frame to influence the design of policies and institutions for climate change action. The central core is to use climate projections and modelled impacts for decision-making (Conway, et al., 2019) from a global to local perspective to solve issues in the long term.

The top-down approach to climate change has been used for the climate framework establishment by the UNFCCC and it is about the Conference of the Parties (COP) ruling the climate change actions for the “benefit of all states” from the highest level of decision-making to the other national and subnational spheres. The best example of this is the Kyoto Protocol. But due to the lack of effective results and the urgency of facing other aspects than emissions reduction, (since the Durban platform, Cancun Agreements and now Paris Agreement), the climate framework aims to have a hybrid system where bottom-up is important as countries act based on their circumstances, but it has common global goals to achieve climate action (Stavins, et. al, 2014)

The case of adaptation was initially defined through top-down approaches derived from global climate models that were scaled- down into a regional or local scenario form (Van Last, 2008,166p). Those scenarios mainly were focused on global impacts like temperature, rainfall, and sea level changes but “having a very limited understanding of local dynamics” (*Ibid.*). In this sense, the proposed adjustments by international and national decision-making stakeholders (for example National Adaptation Plans) have been “integrated into the regulative, coercive, and normative governance framework and has implications for resource allocation” (Larsen et al.,2011, 25 p.) where not all resources are provided to where they are needed. The most significant limitations of this approach are related to the state-centric perspective, the sector-driven design of action, and the lack of connection with communities and other local actors.

As a response to the global trends and national policies on adaptation, a bottom-up approach has been proposed for more effective action. This perspective “deals with problems at the lowest possible level of decision-making” (Rayner,2010, 618 p.) and focuses on the first feasible level of organization, a more people-centered perspective looking for local knowledge generation considering “peoples’ understandings of present and changing conditions, risks and responses” (Conway et. al,2019 3p.)

The bottom-up perspective claims that “where something can be done at a local, city, regional or single-nation level, then it makes sound sense to focus policy attention there, without the need to fit it into a formal global charter for action” (Rayner, 2010, 617 p.)

Climate change negotiations like the Paris Agreement are based on National Determined Contributions by the parties that, considering their capacity and future development expectations, raise ambitions to achieve climate mitigation and adaptation.

For authors like Rayner, “A bottom-up approach to climate policy begins with adaptation” (Rayner, 2010, 617 p.) This can be explained because the approach focuses mainly on “the recent past and present vulnerability.” Previous work has shown that a bottom-up can contribute to better adaptive capacity and adaptation implementation with community-based vulnerability adaptation (CVA) and self-assessment of climate impacts (Butler, et al. 2015)

The weaknesses of this approach are that can be very locally focused, and it is difficult to provide sustainable action for a longer time as most adjustments are temporary (Butler, et al. 2015) Also incorporating the lessons in higher levels of decision-making is difficult so, “a much stronger involvement of higher jurisdictional levels, can help for envisioning and scaling up of effective approaches” (Huitema et al., S/P, 2016).

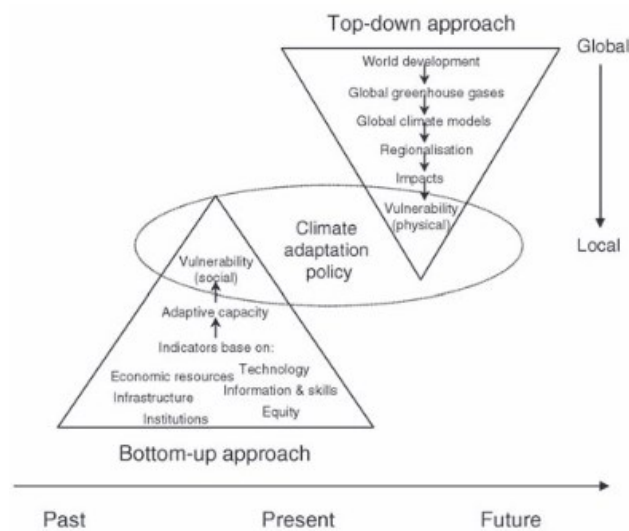
To make the most of both views, it has been proposed a link or dialogue for achieving common goals at all levels of action. On environmental agendas, linking top-down and bottom-up activities could be beneficial like “the ability to tie improved understanding and prediction of large-scale, socio-environmental systems directly to management outcomes desired by local-scale actors.” (Eicken, et al. 2021) This is because the locally driven action requires other actors involved in decision-making to have knowledge and access to resources, considering that national and international initiatives can just be effective if they are related to the needs of ecosystems and people in the territory.

An example of multilevel governance integration is the work by Homsy, et al., 2018, based on a comparison between watershed management in the United States and air quality management in China. He proposes five necessary ingredients to a multilevel framework: sanctioning and coordinating authority, provision of capacity, knowledge co-production, framing of co-benefits, and engagement of civil society. The main conclusion is that it is possible to compare these two radically different cases in terms of multilevel action but more analysis of the main central government decision-making in each country might be needed

The incorporation of top-down and bottom-up approaches specifically for adaptation has been done in diverse ways, depending on the research goal. In the paper *Connecting multiple levels of governance for Adaptation to climate change in advanced industrial states* Keskitalo et al., 2013 compare adaptation frameworks considering the policies, influences and impacts of countries like the UK, Finland, Sweden, and Italy. The main conclusion is that national policy development does not always result in local implementation or policy as it needs support from regional or lower levels (Keskitalo et al., 2013).

For authors like S. Dessai, and M. Hulme (2004) the top-down and bottom-up approaches are complementary for adaptation policy. In his review article: *Does climate adaptation policy need probabilities?* it is explained that social and physical vulnerabilities are often separated and these are differences in terms of timescale and planning horizons as the following diagram shows:

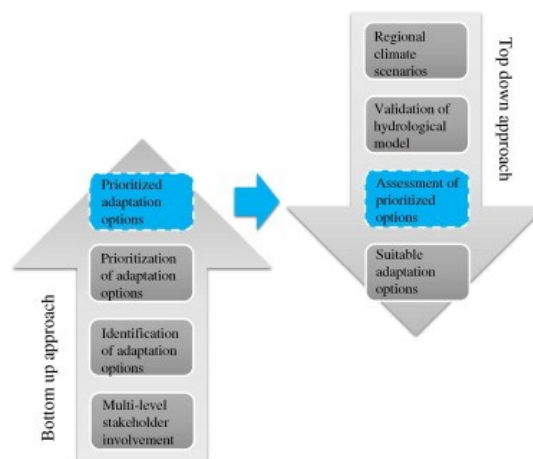
Figure 4-2 Top-down and bottom-up in adaptation policy



Source: S. Dessai, M. Hulme (2004), 112p.

Other authors like AG, Bhawe, et. al, 2014 have also used a combined bottom-up and top-down approach for assessing climate change adaptation options, including stakeholders' perceptions and modelling for robust adaptation planning for the Kangsabati river catchment in India.

Figure 4-3 Top-down and bottom-up integrated



Source:AG, Bhawe, et. al, 2014

While each case has a different analytical framework, considering both top-down and bottom-up perspectives is useful to provide the context of decision-making in a complex ecosystem like PILA. A top-down can help illustrate the initiatives implemented at a regional and national level and a bottom-up can be based on local knowledge and adaptation practices.

4.2.1 Key governance principles

As governance is a complex process that has been approached in different ways, the upcoming table shows different principles that can apply to better governance based on governance assessments related to conservation, adaptation, and multilevel governance.

Table 4-1 Common governance principles in conservation areas, for adaptation purposes and multilevel perspectives

Area of assessment	Authors	Main principles in terms of governance
Governance at various levels	Neil Adger, W., Arnell, N. W., & Tompkins, E. L. (2005).	Effectiveness , efficiency, equity, and legitimacy
Multilevel governance	Homsy, et. al., 2018	Sanctioning and coordinating authority, provision of capacity, knowledge co-production, framing of co-benefits, and engagement of civil society
Conservation	Michael Lockwood (2010): Good governance for terrestrial protected areas: A framework, principles, and performance outcomes.	Legitimacy, transparency, accountability, inclusiveness , fairness, connectivity , and resilience”.
Adaptation in the Caribbean	A Framework for Assessing Climate Adaptation Governance on the Caribbean Island of Curaçao” Esmé de Bruijn & Dieperink (2022)	Transparency, accountability, inclusiveness, connectivity , and government effectiveness

Source: Own elaboration based on Esmé de Bruijn & Dieperink (2022) Katrien Termeer, et. al (2017), Michael Lockwood (2010): Neil Adger, W., Arnell, N. W., & Tompkins, E. L. (2005), Homsey et al., (2018)

Based on this review, here is the list of different aspects that can facilitate a better understanding of governance dynamics for climate change adaptation and that will be applicable in the case study of La Amistad International Park:

Government effectiveness: This concept is related to the objectives and policy implementation, the government’s commitment, the policy coherence, capacity development and regulations in place. It is also related to having adequate capacity in terms of personnel and other resources (Agder et. al, 2005) (de Bruijn & Dieperink, 2022).

Inclusiveness: Refers to the opportunities for all stakeholders to participate in the governing body’s processes and actions. This focuses on diverse actors but mostly

marginalized and disadvantaged stakeholders (Lockwood, 2010) (de Bruijn & Dieperink, 2022).

Connectivity: It is related to the coordination between actors, levels of climate change governance, and also the relationship with government authorities connected with other agendas like agriculture, policy, planning, etc. (Lockwood, 2010) (de Bruijn & Dieperink, 2022).

These principles of effectiveness, inclusiveness and connectivity in this research aim to provide a broader perspective on the current governance situation at PILA. While principles or characteristics, like transparency or accountability, are often mentioned in the same articles, those can be mostly related to government or high-level decision-making.

5 Research design

In this section, it is described the research process to better understand governance arrangements between Costa Rica and Panama.

5.1 Case study

A case study is a methodology that allows research based on a specific context and it is often used to explain issues from a particular to broader perspective. It also opens the possibility of having holistic and meaningful inputs from a group, organization, social phenomena, and even life cycles and behavior (Yin, Robert K., 2009). This is because from individual experiences is possible to enrich the knowledge for building up new ideas or hypotheses and evaluate their consistency (Ford, 2010).

Specifically, in climate change research, the case study method has been largely used and is known for in-depth place-based research that allows to focus on particular climate conditions and vulnerability determinants (Ford, 2010). For this research, the case study of La Amistad International Park is considered, due to its relevance and complexity in terms of governance and the possibility of reaching diverse local actors' perspectives in two different countries and its relevance in providing ecosystem services in Central America.

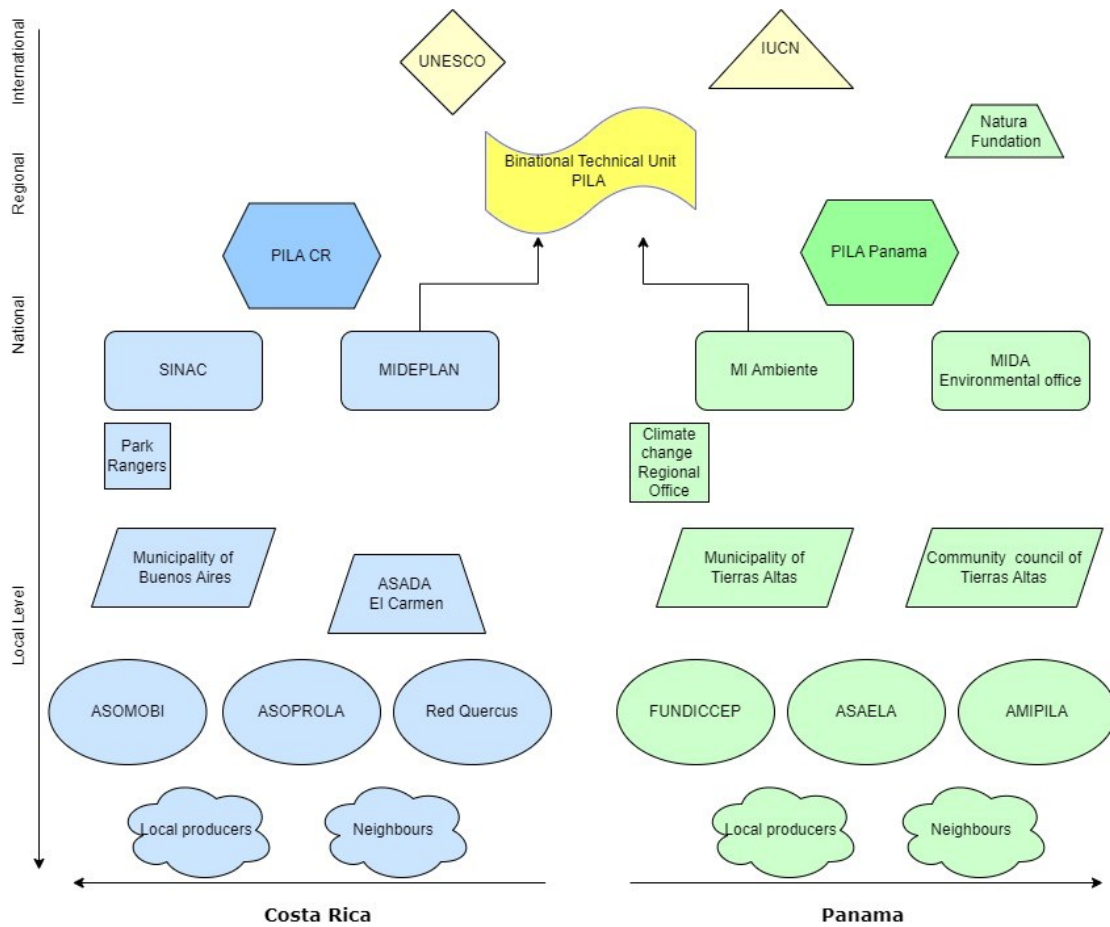
5.2 Data collection

As this is qualitative research, data collection methods play a key role in getting the most detailed and appropriate data to explore a phenomenon. Document review helps to gather background information (CDC, 2018) Interviews provide direct, detailed, and rich data (Barrett & Twycross, 2018), and participant observation which is immersing in day-to-day activities with community members and taking notes about what is occurring (Jorgensen, 1989).

The specific methods for data collection in this research are 1) Document review, 2) Semi-structured interviews with relevant local stakeholders and key informant conversations, and 3) Participant observation in both Pacific Territories of La Amistad Costa Rica and Panamá. The document review took place throughout the whole research process. The empirical data for this research was gathered during the 5-week long fieldwork living in San Jose and Altamira de Biolley in Costa Rica, where in Panama the research took place in Las Nubes, Cerro Punta, Guadalupe, Piedra Candela, and Volcan in The Chiriquí Province. Some interviews had to take place online due to the stakeholder's availability and fieldwork limitations of time and location.

The interviews were requested with similar authorities and stakeholders on each side of the park to have a binational multilevel perspective. The diagram below shows the international organizations, governmental actors from both countries, local authorities, Non-Governmental Organizations, and Inhabitants of the Buffer Zone that participated in this research. All are organized by their level of decision-making.

Figure 5-1 Relevant interviewed stakeholders from different decision-making levels in both Countries



Source: Own elaboration based on the Fieldwork in Costa Rica and Panama

However, the different conditions in each region defined whom actors were interviewed and what possibilities for communicating were granted. For example, in Costa Rica, most interviews took place in person, while in Panama some took place online and even by phone due to the agendas of the participants and the authorization by Mi Ambiente required for interviewing government members. By snowballing, I got most of the references about which actors I could interview for the best understanding of adaptation measures in the region.

To better understand stakeholders’ perspectives on adaptation to climate change as well as the conditions different actors experience within the biosphere reserve, participant observation took place during five weeks of fieldwork. During this period, I lived in the facilities of two different local organizations that coordinate environmental efforts in the buffer zones and inside the International Park: ASOPROLA in Altamira de Biolley in Costa Rica, and FUNDICCEP in Cerro Punta, Chiriquí in Panama. In my time on the Pacific side of the park in Costa Rica, I was able to attend the Annual Evaluation Meeting related to the management of the park, as well as local activities like bird watching with local people, and visit community members to observe the diverse perspectives of living close to an International Park like La Amistad. In the case of Panama, I was able to visit two of the main entrances of the park (Las Nubes and Piedra Candela) to get to know as visitor their current

conditions, the challenges of managing the park, and the pressures the park has on different sides.

5.3 Data analysis

Following the multilevel distribution of the actors involved in La Amistad International Park, I interviewed people from diverse backgrounds and decision-making goals. In the end, twenty-nine interviews were conducted on the Pacific side of La Amistad International Park. These were thirteen in Costa Rica (CR), fourteen in Panama (PM), and two with Binational Actors (BN) that work with both territories respectively. The interview length is between 30 minutes to 2 hours and these were local actors like farmers to international actors like representatives of organizations and national ministries interviewed.

Once the interviews or key informant conversations were done, the recordings were uploaded to be transcribed in the world online. After getting the transcripts in Spanish each interview was listened to once again to fill up a coding format based on the questions survey to be compared within actors in both countries and that was translated to English.

It is known that the thematic analysis method provides pattern recognition once data is collected and categories emerge for analysis (Fereday & Muir-Cochrane, 2006). In this research, a thematic analysis was made following the methodology established by Clarke and Braun consisting of getting familiarized with the information, identifying fashion aspects across the data set, making decisions about why context, governance, and adaptation, that subtopics were coming from the data and their relationship with the main questions and then producing the findings section Virginia Braun & Victoria Clarke (2006).

5.4 Reflections on Methods

The methods used for this research were accurate, but I faced several challenges in all stages. In the delimitation process, it was unclear until the fieldwork which denominations apply for La Amistad International Park, and which are the decision-making implications of it because online documents are not extensive, updated, and available. Regarding the fieldwork, the transboundary territory covers a big extension of land which makes the fieldwork's logistics a challenge to overcome due to the lack of transportation and communication in remote areas. But it must be said community members were very supportive of making the most of my stay on both sides of the country.

The collection of qualitative research was based on stakeholders' conditions to reach them during the fieldwork because of their connectivity and geographical location. Some key actors like indigenous territories on both sides of the park were not able to be contacted because of the limited time frame and fieldwork resources. Actors from other levels of decision-making could not be reached because of time frames, institutional requirements, trust building, and availability of the persons in the 4 months that this research lasts.

In addition to this, a more in-depth policy analysis of binational initiatives between Costa Rica and Panama is suggested for upcoming researchers because of the interesting governance structure built on "the most peaceful border of Central America".

In Panama, I got a confirmation letter from the Regional Office of the Environmental Ministry of Panama to conduct in-person interviews with the Park staff, once I was not in the country anymore. Unfortunately, it was not possible to coordinate the participation of the park rangers there due to the challenging conditions as in their workspace there is no signal to communicate.

During the processing and analysis of data, my backpack with my agenda, fieldwork notes, cell phone, and computer used for the thesis were stolen at the Institute for Industrial Environmental Economics in Sweden three weeks before the thesis deadline. The implications are that recordings from interviews were lost and some were previously uploaded to Google Drive but mostly the archives from the Panama fieldwork were difficult to recover for the analysis. The previous work done in Costa Rica was lost so fieldwork information had to be transcribed, analyzed, and written again. Therefore, it took extra time to restart the coding and analysis, which radically changed the thesis timeline. Interview notes became a main source of information to develop a proper analysis.

For organizing the available data from the 29 interviewees, the context, governance, and adaptation helped me to classify the information but there could be other opportunities for exploring the data in the future. Maybe using the software can provide other lines of analysis in case some specific approaches are needed to look for specific decision-making.

6 Findings from La Amistad International Park

Following the commonalities and differences identified during the data processing, three different categories have been selected for exploring what is happening on each side of the International Park in Costa Rica and Panama. First, the context of the park and surrounding areas to understand the current situation and threats that La Amistad Pacific Side is facing. Second, adaptation initiatives, climate responses and environmental interests from stakeholders. Third, the governance conditions that can enhance adaptation considering the current stakeholders, and collaboration between the other side of the park as well as the countries on the Pacific side.

6.1 PILA (Pacific Side) in Costa Rica

Figure 6-1 View from the administrative office of PILA in Altamira, Biolley Costa Rica



Source: Author's own, photographed in April 2023

6.1.1 Context of the park and surrounding areas

To better understand PILA Pacific in Costa Rica, it is important to mention the changes perceived by stakeholders in the last years, and the link between the economic activities with the conservation goals of the park, as some of the main challenges that stakeholders reported from the Costa Rican side of the Park.

According to most of the actors, landscape and land use changes can be observed in communities near the park. When the park was created the land was private and used for livestock but after being taken by the state, the vegetation was restored through the years so “now there are more conservation areas” (E1, CR) (E6, CR). The biological corridor category was present in several conversations as the PILA buffer zone is integrated by some and their objective in the Costa Rican territory is to promote connectivity between ecosystems.

But also, outside the park, the pressure of land has increased, and it was referred to because more houses have been built with the support of the government (E11, CR) so the vegetation has changed in the buffer zone. In addition, inhabitants changed their crops or cleaned the landscape for other uses (E4, CR).

Local actors pointed out that before there were more wildfires because people used to burn their land for cultivation (E5, CR). Nowadays there are fewer fires because preventive measures are implemented in communities and indigenous territories (E1, CR) with the forest fire program, which involves the participation of local stakeholders like the municipality, the park administration and some brigades integrated by local community members.

Preserving the Park and surrounding ecosystems plays an important role in the economy of the communities that are closer to the park like Altamira, Biolley and El Carmen. Mainly because as an interviewee stated:

“In Costa Rica you sell nature, so you have to preserve the environment” (E1, BN1).

Tourism links conservation goals with local economic goals because most local producer organizations have the right to use tourist trails (Valle del Silencio- Silence Valley) to provide services for visitors who want to hike in the park. This connection has been acknowledged by other levels of decision-making like the Buenos Aires Municipality, as they collaborate with the park in terms of tourism because Biolley recently got declared as a tourist district, and “it is especially important for the International Park” because “it is the only in the Canton of Buenos Aires to have that distinction” (E8, CR).

The use of ecosystem services provided by the park was also mentioned as a link with PILA because in the words of one of the farmers:

“The Park gives us clean air, water and climate regulation” (E6, CR)

Specifically, about the water resources, all interviewees recognized their relevance because the river stream is located inside the PILA. Actors like la ASADA del Carmen work closely with the authorities to provide water to communities by requesting monthly payments to provide the service.

Pineapple production for exportation is an economic activity that takes place in the surrounding ecosystems of PILA. The presence of PINDECO or the transnational pineapple company Del Monte was mentioned by stakeholders in contrasting ways. Some producers

say they are facing the impacts of pollution and agrochemicals in their daily lives because they do not follow environmentally friendly measures and they are just doing greenwashing, (E5, CR). Also, they do not pay a fair price for using the water resource (E8, CR). However other producers, park rangers, and the municipality recognize the transnational company has improved their practices and has an important role in the family's income of the region (E8, CR) (E9, CR).

The biggest concern for inhabitants, park staff and other levels of decision-making is to promote development and create opportunities for people in the surrounding communities of the park. From the administration level is needed to "Reach out to people about the park to use the natural resources correctly and constructively" (E2, CR) and for the local producers it is important to create sources of income like "generating more tourism" (E7, CR) and infrastructure at the community level because as a local producer said:

"With hunger, we do not live" (E5, CR).

This should demand more attention from higher levels of government as the surrounding areas of the park are mostly rural places facing challenging conditions and a lack of education and employment (E8, CR) makes them more vulnerable to changes.

During my stay in Altamira, I observed that the transportation conditions were limited, the distances between communities were huge and there was no medical attention or other facilities for the community members to have a better quality of life. Indeed, there is a lot of pressure on the resources of PILA as well as high expectations about the role of park management in contributing to community development and preserving the environment in the best way possible.

Another big concern for stakeholders in the territory is the lack of personnel in La Amistad International Park because there are just 6 park rangers to fulfil the several aspects that this big conservation area demands (E5, CR). In higher levels of decision making like the municipality, the Ministry of National Planification and Economic Policy (MIDEPLAN) and international organizations that work closely with the park they also agreed on the insufficient personnel they have for a huge and relevant conservation area (E8, CR).

The rangers have expressed that they need support from the government with personnel too (E2, CR) because there is "more information disposition and technological resources but fewer staff members to analyze the results" (E9, CR). The administrative workload is huge and as an alternative, they work with the communities to reach more goals (E2, CR) but even they support the park in some ways: "People cannot take more responsibility like a ranger due to legal restrictions" (E5, CR). This is mainly because in Costa Rica Park rangers also have police faculties, so they carry a gun when they work and have other responsibilities.

That deficit has led the Park staff to work with what they can to fulfil daily tasks, but it is not possible to address other relevant agendas and initiatives in the longer term (E9, CR). Regarding climate change, it means a lack of research (in general) and capacity building for

climate change planning because those are not a priority or cannot be managed even if they want.

Illegal activities including hunting and logging, tourism and more recently drug plantations are also “big problems” (E5, CR) that are difficult to manage inside the park. From the inhabitant’s perspective, it seems that:

“The illegal part is more organized than the rangers” (E5, CR)

In the case of illegal tourism, “these are persons that get into the park and as it is few personal, they gather and take garbage, extract exotic species that is prohibited and create fires” (E8, CR) Even responses to those illicit events have been made with the police, these challenges increase the pressure on the park to be protected but the lack of rangers is a great barrier.

6.1.2 Governance conditions

For this specific research interest, governance conditions like communication and collaboration of local stakeholders were found to be often mentioned by local stakeholders. One phrase that was often repeated by the PILA local stakeholders in Costa Rica is that,

“The luck of the park is the luck of the community” (E6, E 11, CR)

During my stay was possible to observe these attachments and interests in the park depending on the actors and decision-making level. Therefore, the links of diverse stakeholders with the park administration are complex. Some of them see the park as a source of resources to live (E7, E10, E12, CR), others as a part of their house (E6, CR), and some as a challenge for its management. Few actors see the Park as an enemy now because of the updates in the borderlines of the park where 24 people have been requested to live on their properties because they belong to the park (E11, E12, CR).

The relationship between the park administration with the local communities has changed significantly over the years. The oldest community members mentioned that at the beginning the people saw the park as an enemy, (E7, CR) because: “They arrived with the guns, and nobody could get in” (E6, CR), so “it was an imposition because we were not used to see people with guns” (E5, CR). Afterwards, a negotiation era came when the park authorities had to dialogue with people (E5, E6, CR) Nowadays the majority of stakeholders notice more collaboration with park authorities, because

“Now these are more alliances, we have community management and environmental education” (E1, CR)

In this sense, the concept of shared responsibilities (responsabilidades compartidas) was mentioned several times by different stakeholders and authorities on the Costa Rican side of the park. This figure comes from the biodiversity law where people can participate in decision-making at different governance structures and levels within the conservation area. This mechanism is so powerful that the priorities of the community influence the policy

instruments and the community can and through this mechanism remove “a regional director if they want” (E12, CR)

Extra spaces for community members to interact with the park are bird watching and biological monitoring groups (E1, E4, E12, CR) to know better the wildlife and develop knowledge about nature useful for them in the future, as Costa Rica environmental activities are widely spread.

On the other hand, some of the limitations listed are the lack of communication and the flexibility of the park in some of their measures with water management, use of land and the volunteering program. During the evaluation meeting, I had the opportunity to attend, community members raised the need of having access to the most updated management plan, and support to continue the volunteering program inside the park because the insurance required for volunteers is preventing needed action inside the park. Regarding water management, according to la ASADA El Carmen is required more flexibility as the water spring needs maintenance to prevent affectations in the nearby communities (E10, CR).

As collaboration plays a key role in the governance arrangements for adaptation, from what I could observe and document, there is a dynamic relationship between most of the stakeholders in diverse levels of decision-making but is the administration of the park that coordinates several initiatives that might be just focused on conservation. Local Schools and conservation organizations like OSA Conservation were mentioned to be actors also actively related to the park.

Based on geographical administration, it was relevant to ask stakeholders about their connection with the Caribbean side of the park. But even though it is located in the same country, the relationship with PILA Caribbean from the Pacific side is quite/very limited in most levels of decision-making. According to the rangers “There is a good relationship but not much-coordinated work” (E1, CR) (E5, CR) and there is some coordination when it is needed regarding the joint management plan (E6, CR). But most local actors agree that there is not a strong relationship, or it is just reduced to informative purposes (E7, E11) because the park management takes place on the Pacific side and as a local producer pointed out:

“The Caribbean is another world” (E7, CR)

The main relationship of the Caribbean side is not at all related to tourism or conservation because the majority of people in those territories are indigenous and they have other governance systems, beliefs, and interests regarding the park (E9, CR). But also, the long distances between meeting points for the two sides of the park are important to consider as well as the administrative separation acknowledged for all stakeholders.

It was found that the relationship with Panama is closer, and it is more likely to happen once the decision-making level is higher, especially in topics like bordering patrol and the binational meetings of the Binational Technical Unit. Two of the national funding organizations also know each other from working with the park for several years.

For community-based organizations the collaboration exists due to the “long time-sharing PILA anniversaries on each side” (E7, CR) and joint meetings organized by international organizations (E3, E4), but now it needs to be reactivated. Some people in the Costa Rican communities from PILA know the park rangers or institutions in Panama but they do not collaborate. (E5, CR). There is interest between actors like the municipality to collaborate with their homologues on the Panama side. But as the female head of one producer’s association in Altamira mentioned,

“There is a need to find a common line of action with Panama because they are fighting against mega projects and threats that are difficult to imagine in Costa Rica” (E12, CR)

6.1.3 Adaptation

For a more accurate response planning and adaptation action, it is necessary to assess the changes and responses that actors have once they are facing climate change impacts. Here are the main observed changes that were attributed to climate change¹.

Overall, all actors have noticed changes in the temperatures where “Before it was cold” (E1, CR) and people needed to use jackets or adjust their activities to that (E6, CR). At the same time, one of the local producers reported that:

“The summer was not as hot as they are now, because in the past 3 years ago it has been 30 degrees and we are not used to that” (E5, CR)

In line with this, all interviewees in Costa Rica mentioned that the seasons are not clear anymore and it was common to hear expressions like: “The time has become crazy” (E2, CR). Specifically, this year was observed that summer already started the rainy season (E3.CR) which a farmer expressed by saying:

“Now there is summer in the winter and winter in the summer” (E7, CR)

Regarding rainfall patterns, it is reported that the way rain has changed, and the water concentrates in different places (E6, CR). As a result, there is no control over rain cycles. because “Sometimes there is more water but sometimes much less” (E7, CR) That has impacted the water bodies as several stakeholders have noticed changes in the amount of water they have. Inside the park according to one of the rangers, “Rivers have less water due to climate change” (E2, CR) Outside the park local inhabitants report cases like there is less water in small springs near the conservation area as well as close to their houses (E4, CR)

In terms of biodiversity, people have noticed that some flora and fauna have moved “because of climate change” (E6, E7, CR) Birds have moved to higher places to adapt but according to a member of a producer’s association:

“The birds are migrating and they cannot go so fast with the changes” (E5, CR).

¹ There is an ongoing discussion about if changes can be attributed to climate change or these are just climate variability.

It was said that in protected areas like Cerro de la Muerte in the Talamanca Range, “Toucans are climbing and as they eat the smallest birds or eggs, so they are eating the Quetzals” (E5, CR). This has impacted the tourist business because it is more difficult to find the charismatic birds where they are supposed to be, and these are families that rely on this type of tourism.

In line with these observations, “there are fewer amphibians than before” (E7, CR). Meanwhile, biological monitoring brigades and locals have seen that snakes “have gone up as the places get hotter, the sun is stronger, so they go to the shadow” (E7, CR) and they have been observed in other ecosystems too.

It was also mentioned in the evaluation session of the park as well as by a honey producer that “Bees cannot produce honey because they cannot get out to eat (picolear) in times when it does not stop to rain heavily” (E5, CR) so they have to feed the little animals and cover the expenses of it.

Finally, it was mentioned that “The pests have become stronger and its management “is more difficult.” (E5, CR) (E6, CR) These are some insects called Joboto o Gallina Ciega (*Phyllophaga spp.*) that according to farmer's observations:

“They before appeared in May but now they start appearing in January because there is a disequilibrium in the environment, so they do not know in which month they are” (E5, CR) Unfortunately, they are resistant to pest controls and have eaten coffee plants which has impacted coffee producers specifically in Biolley.

The climate change response was not very clear and differed a lot between most of the interviewed stakeholders. This is because the impacts were not evident for the park administration or other institutions while interestingly the municipality has a very complete Adaptation Plan to face climate change in the Buenos Aires Municipality.

In the case of the PILA, the administrator mentioned that from inside “these were not direct observations but just some changes in the seasons which according to the definition is not attributed to climate change” (E9, CR). However, in the evaluation meeting I attended, climate change was an aspect to be evaluated by several stakeholders present in the park. The score for that aspect was really low because there is not yet an instrument or strategy to identify vulnerability, climate change impacts and further actions for increasing resilience. It was mentioned by a regional authority that there was some budget to create a document, but no organizations were interested, and they did not follow up on that. What has been done is using other instruments from high-level decision-making mostly at the national level according to one of the park rangers (E1, CR).

Some reactions to the temperature increase have been done daily like planting more trees and living fences, adjusting crop plantations, and some people have moved to live at the top of the mountain closer to colder places like PILA (E1, E4, CR) But local producers indeed expressed they are seeking some guidance to deal with changes, from other relevant institutions like the Ministry of Agriculture and Livestock Ministerio de Agricultura y Ganaderia (MAG) as well as NGOs with projects to be implemented.

Once the interviewees were asked about what else they consider important to know in terms of climate change, these were different responses. To begin with, it is known that research plays a key role in the park as “it was founded to do research” (E3, CR).

In terms of biodiversity, it is a common idea that the park is yet to be researched because it is huge and unexplored with endemic species not discovered or identified yet (E2, CR) (E4, CR) (E9, CR). Therefore, understanding what happens with species inside the park because of climate change and other changes in the environment should be done too. Water was also proposed as a further research topic mostly because these have been water scarcity moments “It is important to know about that” (E7, CR) and what will come with rivers and other water bodies in the region.

At the municipality level the climate change office it was highlighted the need to have a vulnerability index for better decision-making (E8, CR) while international organizations consider the need to assess people’s knowledge and understanding of climate change in general (E1, BN). At other levels of decision-making, the funding was also commented on as a topic to be explored.

6.2 PILA (Pacific side) in Panama

Figure 6-2 View from the pathway that goes to PILA in Las Nubes, Panama.



Source: Author’s own, photographed in April 2023

6.2.1 Context² of the park and surrounding areas

The International Park La Amistad in Panama was created in 1982 and after the US occupation, the State replaced the military ownership of the land. At that time the main use of the park territories was grazing (E5, PM) but once it was designated a protected area some adjustments to the landscape use were made to preserve the forest. In this sense, people could still live nearby or inside if they were there before (E11, PM) but no ownership documents were issued, and no intensive activities were allowed. One of the oldest interviewees mentioned that in previous times:

“You could take out the vegetation of the land and just plant your crops, but after the park was established now this is prohibited” (E2, PM)

In some way, stakeholders recognize that the park designation prevented more land conversion to fields because:

“If the park did not prohibit logging here it would not be a park, it would be cattle ranch, livestock” (E2, PM) and “this town would be on the other side of the mountain” (E1, PM)

The main economic activity in the buffer zone of the park is crop production, which represents 80% of the agricultural production of the whole of Panama and it is located in the highlands of Chiriquí (Ministry of Foreign Affairs, 2018). From small to industrial-scale farmers, rely directly on the ecosystem services from the park to have their fields in the mountains but also the water resources to irrigate their crops.

While the farming extension is impressive to see in the highlands near the park, most agricultural activities are not new as the production in the area was developed several years ago (E10, PM). During my fieldwork it was possible to observe the diverse crops in every centimetre of the available land, the stores focused on seeds and agrochemical products, farming tools as well as greenhouses for diverse types of vegetables. Also, there is a big road for transporting the products to Panama City that takes to the park entrance, there is no public transportation, the walk is not pedestrian friendly and is always busy with fruits and vegetables transportation trucks. That is the opposite of conservation and sustainable development characteristics that a park like La Amistad might require.

All stakeholders I could interview agree that the biggest challenge that the Park faces is the advance of the agricultural frontier. It was explained to me that now “there is more interest of people to use areas that are supposed to be for conservation” (E4, PM) As one of the oldest interviewees mentioned:

“Crops have been always here but now there is more pressure to produce, so the farmers are going higher into the mountains” (E2, PM)

² Based on the management of protected areas in general by Hockings M. et. al (2006) context includes national context, threats, significance/ values, external communities, stakeholders, and local communities.

This is because the economic benefits of crop production are higher than the “value” people attribute to the conservation area. As an anonymous farmer in a casual conversation said:

“The more land you have the more things you can cultivate and get profit from them”

This “development” model is closely related to other challenges that the park faces like deforestation due to illegal logging to sell wood or “clean de land” and land encroachment to cultivate inside conservation areas for cattle ranching on a small scale.

Deforestation and changes in landscape use are well-known challenges for the park conservation. Logging and burning land are common to see in the farming area next to the PILA and the efforts to stop these activities have not succeeded. The main reason why people prefer to clean their land is that “it has more value without forest” (E4, PM) and this has impacted La Amistad International Park because of the “loss of connectivity and species (E1, BN)”.

Land encroachment is also an issue for the authorities in the Park because “There are people that do not respect the law and get inside” (E2, PM) the conservation area and “When you notice that these are settlements they are already established” (E1, BN). Some of the interviewees mentioned there is a risk of land occupation inside the conservation area with the geisha coffee because it aims to be cultivated in higher lands for the best quality of coffee but the highest territories belong to the park (E5, E9).

From an ecological perspective, the current farming conditions in the buffer zone of PILA are devastating. The head of an environmental organization pointed out that:

“Farmers use the land for intensive agriculture without having specific measures for the type of field, the previous ecosystems, the environmental impacts for the whole basin” (E5, PM).

Due to the intensive farming activity, it has been observed a dramatic change in the quality and performance of cultivation (E10, PM). Now to get production “you need chicken manure, fertilizer and that so much cost and it does not work” (E1, PM). Once the land is eroded, it is impossible to cultivate so farmers move to another land (E4, PM) and the exploitation and degradation cycle continues. Unfortunately, there is not yet a restoration process for the ecosystem that has been exploited (E5, PM). In several conversations, stakeholders agree that:

“These are not strong incentives for farmers to change into a sustainable production system produce in an environmentally friendly way, less polluted, taking care of other resources” (E4, PM)

Environmental actors commented that there is no guidance for farmers to preserve the soil or landscape from institutions like the Ministry of Farming and Agricultural Development and the Institute of Agricultural Innovation, and they are not promoting more eco-friendly production methods (E4, E5). Actors like The Bank for Agricultural Development were reported to promote land change use in PILA Panama as they “provide loans for farmers for

agriculture production inside the Park” (E4, PM) when a land title must be required, and intensive activities are not allowed in the conservation land.

However, the Agriculture representative I interviewed mentioned these are some ongoing initiatives for reducing the agricultural frontier and making production sustainable but it is difficult to reach all farmers and promote a learning process once these are not the resources or incentives for them to do so (E10, PM). It was mentioned by stakeholders that having the closest Agricultural office in Volcan, and not in Cerro Punta, (which this last one is the main production center for the whole country) is a sign of the lack of interest from the central government to follow up on agricultural matters in the region.

Disasters like floods and landslides are also a big challenge not only for the PILA but the surrounding communities that have been already affected. This is because they have been occurring in the last years (2008, 2014, 2018, 2020) and “they are always a challenge to manage when they come” (E3, PM). In the opinion of most local interviews, the causes are that “these are not mountains or threes to protect the land the landslides happen” (E2, PM) (E3, PM) (E4, PM).

This issue affects all community members and farmers but challenges the poor and marginalized inhabitants with not regular housing because in some areas close to water bodies, once it rains a lot and floods happen, the houses are damaged or gone (E5, PM). Specifically, for this region, indigenous temporary workers “have been affected as they usually are located nearby the rivers or are renting rooms in risk areas” (E3, PM). This increases their vulnerability because several of them “do not have access to basic services, so these are fewer possibilities for them to face climate change” (E9, PM)

Another challenge mentioned by several non-state actors is the implementation of mega projects in the region like mining or hydroelectric stations (E5, PM). Modifying the water flow puts pressure on water resources (E1, BN) and changes completely the environment when the benefits are not clear for the local communities (E9, PM). As a response to this civil society has organized a resistance movement against megaprojects in the region because these around 10 hydroelectric stations affecting the Chiriquí Viejo River basin close to the park. Also, as the area concerns The Talamanca Range/ La Amistad Heritage site, it was a request for UNESCO to move this territory to the Heritage site to the List of World Heritage in Danger which will be evaluated in the upcoming year (E2, BN2) In contrast, few state-related actors expressed that the pressure is out of the conservation area or in the Caribbean side (E4, PM, E2, BN) while others acknowledge the mining concessions and plans for exploiting natural resources in the region and the whole country.

The park management conditions in La Amistad Panama side are very limited and that is a significant challenge for its appropriate functioning and future adaptation. From my visit several times to the park, I could observe there just three park rangers at the Las Nubes entrance but there is just one park ranger to be in the administrative office while one is on shift and the other (if possible) has to be patrolling or in the regional office with other duties. At the entrance of Piedra Candela, two other rangers live without any possibility of reaching

out to other personal members if needed for security or emergency reasons because there is no connectivity, and the transport is limited. In terms of park management, this is a very worrying situation considering the several pressures in one of the biggest conservation areas of Central America. As one of the environmental authorities recognized:

“We don’t have capable and enough personnel to cover the parking area, we don’t have the equipment, these are not many cars, there is no fuel to use them” (E4, PM)

The lack of capacity and activities in the park has impacted the level of attachment and interest that people have. As mentioned in one of the interviews

“The people see the park as something that exists, but it is untouchable, they cannot walk any trail, they cannot take pictures, they cannot ask to do something because these are not resources or personnel” (E4, PM)

Finally, another important challenge that can be observed is the pollution from community waste and agricultural discharge in the river basin originating in the park. Most stakeholders recognized the limited work on waste collection in the communities so “The river receives all garbage and there is no collaboration with actors to avoid that” (E3, PM). Unfortunately, its accumulation on the riverbanks has also contributed to the disasters in the area as previously mentioned.

With this list of challenges pressing on the maintenance of the park, climate change is not a priority to be documented by the Park administration and even if there is some interest to know more, it is impossible to monitor changes with the current management conditions. What is true is that many of the main threats to this conservation area are already exacerbated by climate impacts.

6.2.2 Governance conditions

Depending on the diverse stakeholders’ interests and the park management capacity, the relationship with the park varies significantly. For example, agriculture and land tenure are common sources of tensions between actors and the park authorities.

The relationship between the park administration and the local agriculture producers does not exist collaboratively. These are two contrary models for land use: exploiting the highlands for agricultural production vs preserving the ecosystems for conservation purposes. From informal conversations with farmers and crop producers during my fieldwork in Las Nubes or Cerro Punta, they think that:

“The park should allow people to get further into the mountains to produce more for Panama City because the demand is increasing, and they need to sell products for it”

“If tourism is not happening much because there is nothing in the park, it should be used to develop the region”³

³ These are inputs from farmers that did not want to be interviewed but shared their opinion about the Park during my fieldwork visits to the park.

It was mentioned by one of the environmental authorities that the biggest request from farmers is regarding “the habilitation of roads and pathways to produce in that area” (E4, PM) But environmental organizations are against it because the “more roads you open in the area the more chances to invade the park and transport cultivated products to be sold” (E10, E5, PM).

I interviewed one farmer who had been cooperating with the park administration in Piedra Candela and truly believes that the park management needs to be supported by farmers too. It can be explained because he is part of an agroecological organization and, his family and other neighbours have been traditionally committed to preserving the ecosystem for further generations and to keeping the benefits they get in their organic farming activities (E8, PM) on that side of the Park.

In line with the agricultural sector, interviewees mentioned that there is no collaboration between the park administration and the Ministry of Agricultural Development (Ministerio de Desarrollo Agropecuario, MIDA) or the Ministry of Environment (Mi Ambiente) for the effective protection of PILA and appropriate adaptation in the agricultural sector next to the park (E4, PM). And that is indeed important to face the complex challenges of the region with two different land use models.

The land tenure is a source of conflict that makes difficult the relationship of neighbours with the park. This is because, after the creation of the protected area, there are property documents that have been issued when that is not legally possible to own some land inside the park. The tensions with the park have been raised recently with neighbours because of the updates to clarify the limits of the conservation area and incorporate forest into the park. While this measure has an environmental purpose, some actors have questioned its usefulness because:

“What is the point of including more land if you have few people to take care of the Park?” (E4, PM).

The relationship with them for educational and touristic purposes is not very strong because of the lack of personnel and resources. To improve the relationship between the regional tourist sector and the park, several stakeholders agree that there is a need to rehabilitate the trails inside the conservation area to increase tourist activities. Nowadays just a 15-minute trail is open for tourism and that has discouraged tourist development. From the perspective of a member of the civil society organization,

“They need more personnel for habilitating the tourism, they need to be and make the park stronger” (E2, PM)

The relationship between local environmental organizations and the park for conservation purposes has been active since a long time ago but now is very limited because of the lack of trust and resistance movements against megaprojects implemented by the government. Other bigger organizations like Natura continuously work with the Park and environment

activities but mostly due to the funding provided at higher levels of decision-making (E12, PM)

Regarding illegal activities, these have been reported to the authorities, but nothing has been done. In contrast, members of civil society and government bodies have faced reprisals against them for reporting illegal activities (E4, E5, PM) A very well-known activist in the region mentioned:

“People lost respect for the authority, so why report if it will not be a response? I have got enemies in the community because the park is not doing the job of putting exemplar sanctions to prevent more damage” (E5, PM)

Other actors support this by saying that “people pay a fine and then continue to damage the environment, so other people do not trust the authorities anymore” (E4, E5 PM) or there is no clear stop for actors to illegally act, they have no control (E9, PM).

In terms of disaster risk reduction, these are two perspectives. First, the relationship with key actors has been lost due to climate impacts and second, in response, there is more collaboration between local stakeholders for better risk management. Regarding the first, I had the opportunity to interview the founder of a women’s organization that used to work closely with the park administration, but the relationship was interrupted because of the loss of their restaurant at the entrance of the park after the floods in 2014 (E2, PM) (E4, PM). About this episode, she referred that:

“We were at the entrance providing information and helping the visitors because we had offices with internet, a small garden and from there we paid attention to national tourism, international students that used to visit the Park some time ago. But we had bad luck and nature that the river got bigger and once the water fell out, we lost our restaurant at the main entrance of the park. Then everything changed” (E2, PM).

Since those hard times, this women’s organization has contributed sporadically to the park management and nowadays, they are not as active in supporting the park as they were before. But she agrees that the park needs to be reinforced for disaster prevention “because if we let the park be destroyed, worst things will come for us” (E2, PM)

As a response, the park administration and several other stakeholders have reinforced their communication for disaster response and risk reduction in the region. It was reported that there is a close collaboration between the municipal level of Tierras Altas with the park rangers but also with SINAPROC and the Police and civil society once a disaster by floods or fires happens. Also, local civil society and the community board of Tierras Altas have organized diverse cleaning actions in the river and riversides to avoid landslides in the rainy season as well as conscientization campaigns with local populations, farmers and temporary workers.

An actor that is closely related to the park and the surrounding areas is the Environmental police. Interestingly they contribute with the rangers to detect illegal activities but also support touristic and rural activities. Once I had the chance to talk informally with one of

them, he expressed that not having enough rangers limits their action because they both have to patrol together inside the park. They are also not permanent so what happens is:

“Every certain time we are moved to another conservation area within the country so the others that come need to start patrolling again. And that makes the operatives slower, ineffective”.

Finally, an important aspect of improving the relationship with the park with stakeholders and agendas is the continuous change of staff members and their lack of long-term planning. (E1, BN). It was expressed by civil society at different levels of decision-making and Costa Rican actors that the assignation of environmental authorities on the Panama side of the park is not permanent. For local actors, it follows political interests and the positions for taking care of it are political spoils (E4, E5, PM). This does not help to maintain initiatives for the benefit of the environment with authorities in the Park.

Regarding collaboration between the Pacific and Caribbean sides of the PILA Panama, it was mentioned by the environmental authorities that “there is constant communication with PILA Bocas del Toro within the Protected areas system” (E4, PM) At the community level I got informed by the Community Board of Cerro Punta that during COVID there was joint trade between farmers for food products in the Pacific and Caribbean region but nowadays the cooperation ended. (E6, PM)

Local environmental organizations have communication with people from the Caribbean side in terms of megaproject resistance. This happens with women’s organizations and farmer’s associations like the Asociación de Promotores Campesinos de Bocas del Toro (APROTEN) (E7, PM). But as in the Costa Rica side, the big gap existent between both sides of the Park due to the geographical challenges in the same country was often mentioned. Regarding dialogue with indigenous communities like Naso and Ngobe, the collaboration is limited to some extent because of the big difference between their management and governance systems in the Caribbean (E5, E12, PM)

Similar to Costa Rica interviewees on the Panama side refer that the higher levels of decision-making have a closer relationship with the other side of the park than the surrounding communities. It was mentioned that between ministries of the environment:

“There is a constant communication due to binational projects and meetings, these are congress, meetings and bordering patrolling as well as monitoring and exchange in a regional level” (E4, PM)

In the case of The Binational Technical Unit for decision-making about the PILA, the participation is state-based and mostly represented by the conservation authorities (E12, PM). These current days the binational meeting was programmed to have a place in Boquete Panama as they change the host country every time.

Once local environmental and producer organizations were asked about their collaboration with PILA Costa Rica and its surrounding communities, they mentioned that in the past years, there have been few exchanges between them.

“We have invited and that invited us to participate in events like the PILA Anniversaries, we visited Biolley to see their coffee and organic livestock” (E2, PM)

But as well as the other Costa Rican interviewees, they agreed that after COVID there have not been many exchange initiatives and they have not worked with that side of PILA for binational projects. Many of the actors manifested their interest but they were not sure about how to make it happen.

6.2.3 Adaptation

The most significant change attributed to climate change by the interviewees in the PILA and buffer zone of Tierras Altas is that there is an increase in the temperature. Diverse stakeholders have expressed this by saying:

“Before it was very cold, you could not see the mountains but the ice” (E1, PM)

“Now the sun is very intense, and it is hotter where it was not supposed to be like this” (E3, PM)

“The sunny days are more intense than before” (E5, PM)

For one of the local farmers, “there is a general alteration in the microclimates that affect the traditional crop production” (E8, PM) There is a mountain fog that locals called “Bajarel” in the highlands of Las Nubes and Guadalupe that has changed its patterns and there is no explanation for that (E7, PM)

In line with this, it was mentioned that weather conditions are unpredictable (E7, PM), because “Sometimes is so cold sometimes is so hot” (E2, PM) Also one of the oldest interviewees in the region mentioned that “as climate change is global, now these are some colds coming from other places in here” (E2, PM)

Another fundamental change perceived is the extreme or heavy rains in the highlands. Local inhabitants mention that:

“It used to rain a lot, but these were not flooding like now” (E1, PM) “The weather has changed, there is so much precipitation” (E4) “It used to rain always but now we have heavy rains that destroy everything (E10, PM)

Environmental and agricultural authorities have also reported an increase in the volume of the rain when sometimes it rains large volumes of water in a short time (E4, E6, E10, PM) In this sense, some inhabitants perceive that hurricanes “hit them closer because in the case of hurricanes like Eta and Iota:

“The level of destruction in the area was very bad when before hurricanes did not impact in this part of the Talamanca range in this way” (E5, PM)

Regarding Biodiversity environmental authorities report that there is movement of the fauna from their original place “but these are not detailed information about it” (E4, PM). In the case of plants, coffee has been deeply affected because

“As the temperature has raised, the organisms do move and now coffee rust (la roya) has gone up too, and coffee owners have been affected by this” (E11, PM)

Also, a local flower producer reported that the blooming and production cycles of crops have changed (E7, PM). As a response at the National level these are some actions but for an environmental representative “they are very slow and country-based” (E4, PM). At the regional office in the climate change section, some efforts have been made but mostly in mitigation or environmental education (E11, PM)

From the regional climate change office of the Ministry of Environment office, I was informed that they are just a very new office and do not work directly in the PILA but with the surrounding communities. The representative mentioned, “some projects are taking from the conservation perspective about climate change” (E11, PM) but the information was not very clear about how.

The Ministry of Environment in the Agency of Volcan do collaborate to support the park due to their limited conditions (E4, PM) but there is not much information about climate initiatives of projects inside. Regarding the Park personnel, it was not possible to have a formal conversation with the oldest park rangers or administrative staff in person, so it is hard to say how climate has impacted and what actions (if any) have been taking place inside PILA.

At the municipal level, because the municipality establishment is very recent, I was told these are not specific actions on climate change or adaptation but just the Local Risk platform because it is needed to deal with and prevent disasters. This Municipal Platform for Risk Management (Plataforma Municipal de Gestión de Riesgo de Tierras Altas) is a decision-making space that was implemented due to the severity of the recent disasters in the region, once infrastructure and people’s lives have been lost to flooding, landslides recently (E9, E6 PM).

In the community board of Cerro Punta, I was told that these have been not specific actions because of climate change:

“It is not a priority for the community members, and these are not resources designated for it” (E6, CR)

The local farmer's response to the abrupt changes has been experimenting with their crops, and there is one farmer who started doing experiments with organic matter to kill fungi for

strawberry production (E8, PM). Some others have planted live fences (E3, PM) to prevent landslides in the future.

In terms of adaptation monitoring changes in the park with biodiversity, as well as better options for crops to adapt were mentioned in terms of what to do research. In further actions, it was said that “It should be another way for the people to use the land” (E4, PM) as well as research for informed decision-making.

7 Discussion

After reporting the context, governance observations adaptation measures, it is relevant to address the research questions and explore deeper to find appropriate responses.

7.1 RQ1: How has the context of each country influenced adaptation conditions and priorities in La Amistad International Park Pacific side?

The main economic activities linked to the International Park and the buffer zone in each country are quite different but they have a big influence on the adaptation measures that are in place and need to be taken. This is because the more pressure put on natural resources used for economic interests, the fewer opportunities are for restoration and sustainable management and the less support for current and future adapting action.

In the buffer zone of PILA Pacific in Costa Rica, tourism, small-scale farming, and a pineapple transnational company are key sources of income like the rest of the country. People relate to the conservation area for preserving the tourist trails, have visitors and support other organizations' work. Most locally based stakeholders have a close attachment to the park because they participate in activities like fire prevention brigades and biological monitoring brigades as well as birdwatching.

In the case of the Panama side, the main economic activities in the highlands of Las Nubes and Cerro Punta next to PILA Pacific are crop production because as previously mentioned the Chiriquí region provides 80% of the agricultural production of Panama. Also, there are some tourist attractions like strawberry picking, flower cultivation and other activities in Guadalupe. It was clear to me that there is a developing model next to the park that prioritizes agriculture, puts pressure on the natural resources and land change use inside the park and has led to illegal activities without sanctions. This also reduces the resilience of ecosystems that are less ready to recover in a short time and increases the vulnerability of people because it is difficult for them to start again once they are already facing challenging living conditions.

This research found that the main issues reported on both sides might not be directly related to climate change but they show the increasing need for response and adaptation to environmental and human threats. The main challenge faced in the Costa Rica side is the lack of a development model that succeeds in providing opportunities for local inhabitants while preserving the park in the best way possible. The buffer zone of PILA has historical challenges like marginalization, limited transportation options and connectivity between communities, high school dropout levels and unemployment rate in the region, according to the development and municipal authorities.

The main challenges that the Panama side of PILA faces are the advance of the agricultural frontier that changes the landscape by deforestation, leads to erosion and promotes illegal activities like logging, wildlife trade and land encroachment. Also, the frequent disasters like flooding and landslides in the region have deeply affected the living conditions and the

agricultural activities but also reinforced people's vulnerabilities where indigenous temporal workers have been significantly affected because they live in irregular settlements next to rivers or very poor conditions. On top of this, there is a lot of pressure on the ecosystems because of the Megaprojects like hydroelectric stations, dams, and mining concessions for exploiting natural resources that are in place or are expected to be implemented in the conservation area.

All these challenges in the near areas of the park not only can influence the adaptation measures if taken but, reinforce vulnerable conditions for specific groups and relate to bigger issues like inequality, discrimination and natural resources exploitation vs sustainable development and a more inclusive management.

Regarding geographical conditions, on both sides of the PILA, the high mountains that belong to the Talamanca range have water springs inside the park and feed the water basins in the buffer zones and regions. As a result, communities can access water for crops and daily use, benefiting from the ecosystems provided by the conservation area. However, in both areas, several stakeholders mentioned the relevance of addressing the ecosystems in terms of water basins due to the importance of the water resource to be protected and agreed there was a need to improve the management of water bodies inside the park. In Costa Rica, the reasoning was for a better service to communities and in Panama, for a better use of the resources as well as prevention of disasters when heavy rains come to the basin inside the PILA.

In terms of adaptation, water resources and management represent key elements to follow for the changing expected conditions in the region because "the orographic system favours the incursion of humidity from the oceans, which leads to very constant and torrential rains, thereby increasing the risk of landslides and floods" (WCS, 2021). As mentioned on both sides of the park, there is indeed a need to do research on water capacity, changes in water bodies and prevention of conflicts due to the control of water resources.

As there is a need for sustainable development in the PILA Pacific of Costa Rica, it is relevant to identify the vulnerability of groups and ecosystems beyond the park sphere to reduce the pressure on using natural resources while improving the quality of life of people and preparing for upcoming events. Because interviewees mentioned infrastructure for community improvement and tourism development in PILA is needed, that infrastructure could be designed to be resilient to further heavy rains and other possible environmental extreme events.

In Panama, there is a need to transition to a more sustainable agriculture, that stops land degradation and prevents further landslides that can impact vulnerable people already affected. A more integral approach looking for resilience and better conservation implementation can lead to a better response to climate change. Many interviewees considered the need to understand PILA with the Volcan Baru Conservation Area as a whole because of the actions for preserving the environment in this region the bigger adaptation opportunities will be for different risks already known.

7.2 RQ2: How have different stakeholders at different levels implemented adaptation measures in La Amistad International Park (Pacific side)?

The main responses to attributed climate change impacts and other ongoing challenges in La Amistad International Park are different depending on the type of actor and action sphere. In higher levels of decision-making, the institutional response comes from a top-down perspective based on global modelling or predictions while international organizations mostly orient their actions to achieve global targets and connect with local realities. But in reality, for adaptation is not very clear how this is working in PILA and how other urgent matters in both regions are addressed to prevent loss and damage.

It is known that national-level decision-makers have planning as a process that “represents a major resource effort in anticipatory planning and provides a first guide to its potential sustainability” (Adger et al., 2005). In the case of Costa Rica and Panama, national governments have implemented actions to achieve climate change action and also have ambitious conservation and climate goals in their policy frameworks. But even if adaptation is addressed in most national instruments there is a lack of connection with other relevant agendas like water, urban/rural development and ecosystem management. On both sides, it is not always clear how adapting processes are linked with other decision-making levels like local governments and community boards.

Regarding the collaboration between governments through the Binational Technical Unit (UTEB PILA) for the International Park La Amistad, no climate change documents for transboundary management were found, and a binational management plan is an ongoing process according to the national authorities. When interviewing the Coordinator of UTEB-PILA from the Costa Rican side about how climate change and specifically adaptation has been incorporated into the binational agenda, it was mentioned that there is no plan or joint initiative to adapt for the Pacific side and the park in general.

At the park level, the climate change response by the administrations in PILA Costa Rica and Panama has been limited. None of the conservation areas on the Pacific side has a specific climate change framework or strategy, there is no vulnerability assessment or climate change impacts registration with the park rangers. In the Management Plan of PILA Costa Rica, climate change is included as a high threat in both sectors Caribbean and Pacific and some context is provided in terms of rainfall and temperature and biodiversity expected changes. But actions for climate adaptation are expected to be done in 2024 and 2029 and it is not clear how.

In the case of PILA Panama, just a version of management guidelines from 2004 (19 years ago) was found and no other source of information specifically for the park, or the surrounding region included information for conservation or climate change. The Management Plan of the Park is an ongoing process but as there was no opportunity to interview Park rangers from the Pacific side or members of the National Protected Areas

system in the regional office, it was not possible to know if there is any component on climate change, resilience, or vulnerability.

National ministries have a response in their regional offices but depending on the context, their interest, and their resources from central governments. In Costa Rica, the SINAC has a big influence on decision-making but mostly for conservation and it is not clear how they collaborate with the Rural Development Institute or other regional offices for an integral response to climate change. In Panama, the representative of the Ministry of Agricultural Development (MIDA) shared some key actions to face climate change impacts in agriculture, including a bulletin to inform farmers about weather conditions for harvest. For the regional office of the Ministry of Environment (Mi Ambiente) in the region, the climate area was recently established and there is just one person in charge. In both countries their conditions for having an appropriate response to farmer's and other actor's demands were limited.

Local governments from the surrounding areas of both sides of the park have been acting differently because of the willingness and resources to act. The municipality of Buenos Aires in Costa Rica has developed a Municipal Climate Change Plan for addressing the climate change impacts on their territories and is exploring opportunities for its implementation. At the local level in Panama, the authorities of Tierras Altas have integrated a Municipal Platform for Risk Management to face the impacts of extreme meteorological events in the region. The actors involved in this governance body are the regional representation of the Ministry of Environment, the National Civil Protection System (SINAPROC), the Red Cross, Community boards and non-governmental organizations like FUNDICCEP.

The civil society like environmental and producer associations in both countries have contributed to reducing the damage of climate change impacts in their way as they see climate action differently. In Costa Rica, it was possible to observe that most actions are preventive like managing ecosystems and promoting reforestation, small-scale agriculture and education. In Panama, reported actions were mostly reactive in terms of the relevance that disaster risk reduction has, and the impacts people already faced due to the extreme rain, floods, and changes in temperature. During the interviews in Las Nubes, Cerro Punta and Piedra Candela in Panama, experiences about loss and damage for hurricanes and tropical storms were mentioned so people have been contributing to clean water bodies from trees and garbage as well as organizing prevention sessions to inform people in case a disaster occurs.

Most farmers and local producers are the ones who have observed/ attributed climate change impacts in a more detailed way due to their duties in the field. Honey, coffee and organic producers also have relevant experience by living several years close to the park. Their responses to changes are mainly adjustments in their daily practices but, if possible, some request support from local governments or higher decision-makers to face or prevent loss and damage based on experiences and observation.

7.3 RQ3: How governance can contribute to climate change adaptation in PILA?

Based on the previously developed conceptual framework, here there is a more in-depth analysis of the three governance principles that have been used for assessing governance in conservation areas, small island development states, etc. and will guide the discussion about how governance can contribute to adaptation in PILA.

Government effectiveness

On both sides of the La Amistad International Park, these are important challenges related to park management and need to be improved not only for climate change or governance but for their preservation. The lack of personnel is a very important challenge for the well-functioning of the conservation area. In Costa Rica, there are limited personnel, but they have some infrastructure for administrative offices and tools to work (cars, technology) and mostly achieve the administrative tasks as possible.

However, in Panama, the situation is worrying considering the enormous pressure of land change use next to the park, where there are just a few park rangers and environmental police with limited possibilities for patrolling due to the lack of transportation resources, communication infrastructure and administrative guidance. In PILA Panama the administrative offices are under construction but almost finished. The entrance to the park is free but the conditions for the trails are limited so there is no touristic incentive that supports efficient management in the offices.

As a response in Costa Rica, some organizations have contributed to park maintenance, visitor attention and environmental education but these are limitations established by law. In Panama, it was mentioned that before organizations supported more of the park functioning (trail maintenance, visitors' guidance) but after the lack of interest of higher-level authorities, there was little cooperation between environmental organizations and the administration but not as successful as at other times. This could be explained because of the very low capacity for the rangers to collaborate and the huge limited resources for the park even for its daily functioning, but also for the lack of legitimacy and respect for environmental authorities because the illegal activities continue and there is no alternative to stop harmful cultivation practices around the park.

Not having enough personnel, capacity building and resources on both sides has impeded any climate action because it is not on the list of priorities or does not have funding as many of the basic things do not have as well. Also, the lack of appropriate management and security in the park to avoid illegal activities and follow up on criminal action has created issues regarding the legitimacy of authorities with local stakeholders on both sides of the park that deserve further attention. Therefore, better government effectiveness in the park and with other decision-makers involved in the PILA management can support adaptation efforts but it is fundamental to start by ensuring the park's basic functioning conditions for protecting this unique conservation area of Costa Rica and Panama.

Inclusiveness

In terms of climate adaptation, having vulnerable actors participating in decision-making is needed for an accurate response that reduces vulnerability. But in terms of climate justice, it is an opportunity to incorporate the stakeholders that have been historically excluded in governance spaces. And in protected areas of Central America, indigenous communities, rural populations, and women are at the top of the list.

From the interviews with diverse stakeholders regarding improvements for the governance that can lead to better adaptation to climate change, it was frequently mentioned at all levels of decision-making the relevance to incorporating indigenous communities because the relationship with indigenous “is not that close” (E7, CR). Some actors recognize their relevance for environmental management and climate change “because they have been adapting to the environment since always” (E9, PM) and “their inputs are fundamental because of their scientific and cultural heritage” (E12, PM).

But it was also mentioned that these are huge challenges for new governance arrangements in terms of logistics for active participation and effective inclusion. It is important to consider the distances in the huge conservation areas, the efforts of stakeholders to attend the events and resources for providing lunch and ensuring internet and transportation conditions (E8, CR). Many interviewees agree that “attendance is not participation” (E5, PM) and local producers say that “there should be more projects for us to work on” (E8, PM) but according to their realities and needs to avoid divisions between communities and other stakeholders (E7, CR) (E8, PM).

In terms of gender, leadership and active participation of women on both sides of the park and other decision-making levels were seen. In Altamira Costa Rica, Yendry S. the head of ASOPROLA was consistently referred to provide extra information, while in Panama Damaris S. head of FUNDICCEP was consistently suggested to be a relevant person to be interviewed. But overall, a better understanding of gender dynamics and the role of women in protecting PILA Pacific and the buffer zones is needed.

Private actors’ participation and new generations’ involvement are needed to align development and conservation goals to ensure the sustainability of environmental efforts and further actions. Also, actors affected by land tenure issues can be important to negotiate for the best of PILA and the people, increasing support to the park administration and reducing land exploitation and illegal activities.

By including diverse actors in decision-making in conservation and development there are bigger chances of having accurate and more useful adaptation responses that improve the current governance arrangements. It is crucial to make underrepresented and marginalized actors, part of the decision-making for an integral adaptation process for now and the future

Connectivity

Due to the binational nature of the park as well as the multilevel structure of PILA management, connectivity is a fundamental governance aspect to promote inside and in the buffer zones. Because there can be diverse and even opposite interests in the park, the stronger the relationship with actors is, the higher the possibility of having joint efforts for effective action.

In higher levels of decision-making for the park, there are coordinated actions between countries and international or funding organizations, so they collaborate in joint initiatives. The cooperation of Costa Rica and Panama regarding the Park is mainly through the conservation and environmental offices and between countries without other levels of decision-making involved as well as other types of actors. In addition, the Binational Executive Technical Unit (UTEB-PILA) which is coordinated by the Ministry of Planning and Economic Development (MIDEPLAN) in Costa Rica and the Ministry of Finance in Panama, helps to coordinate efforts but not much representation of actors and other topics beyond conservation have been integrated for decision making in the park (E13, CR).

The relationship with the Caribbean side of the park that corresponds to each country's management in the conservation and governmental spaces is also limited. It must be noted that most of the park territory land is located in the Caribbean where the majority of people are indigenous or have a rural profile with development needs. In Costa Rica, there is a clear separation between the Pacific and the Caribbean due to the different interests of tourism vs the governance and land use interests of the people on the other side. In Panama, both national sides are also different but the social resistance movements against the megaprojects have represented a common agenda and source of exchange between civil society in recent times (E7, E9 PM).

Overall, the relationship between park rangers and regional environmental authorities is continuous for border patrolling and other joint activities. But also, the effective action is limited for structural reasons, distances, lack of personnel and resources as well as the different realities they have on each side of the park.

With locally based stakeholders, these can be opportunities for connecting actors at the same or different decision-making levels according to their action goals. For example, in the interviews when asked if actors have collaborated for environmental or climate change agendas, most responses were negative but there were expressions of interest like: "It could be great to collaborate with other local governments from Panama", (E8, CR) and "we have the doors open for with people from Costa Rica" (E6, PM) between municipal government and environmental and producer's organization. Considering the transboundary nature of PILA as well as common climate change impacts already similar in their territories, it could be very useful to have an exchange of experiences between stakeholders.

It is important to mention that because of the clash of interests between development and conservation agendas, as well as historical dynamics of exploitation and conflicts in issues like land tenure and land use related to the park, there are tensions between local farmers,

environmental organizations and even between ministries of environment and agriculture (Panama), or conservation authorities and development institutions (Costa Rica). Addressing a better way to connect for a common goal like adaptation can facilitate the needed changes for tackling the challenges in each country while protecting the area in upcoming years.

8 Conclusion and recommendations

This research helps to provide a binational perspective on climate change response in the Pacific side of La Amistad International Park in Costa Rica and Panama. This study collects information from several stakeholders related to climate change at diverse decision-making levels based on the context, governance conditions and adaptation measures in the PILA and surrounding communities.

The context of the park in each country (current conditions, economic activities, challenges, etc.) greatly influences how climate change impacts are observed and the measures taken. Both sides of the park have different management conditions and in the buffer zones, these are contrasting developing models where nature has diverse meanings for stakeholders. In the Pacific and Caribbean sides these are developing challenges and a great need to fulfil historical demands for a more equal and prosperous region.

In terms of adaptation, this research provides a more detailed description of the challenges that local stakeholders have identified as important, the observed and attributed changes in terms of climate, and the stakeholder's responses depending on their understanding and capacity. The main responses to attributed climate change impacts and other ongoing challenges in PILA are different depending on the type of actor and decision-making level. Actors in higher decision-making levels like the environment secretaries have implemented top-down measures and established a framework in terms of climate change and biodiversity. In contrast, locally based stakeholders like farmers and local producers have not specifically developed adaptation projects but these have been adjustments in their daily practices.

In Costa Rica, adaptation efforts are more preventive based on the conservation and ecosystem management near the park whereas in Panama these are reactive measures in terms of disaster risk reduction and agricultural activities because of the impacts already experienced. With the research, fieldwork was possible to notice that there is a great richness in inhabitants' observations about changes in the environment some attributed to climate change. Therefore, it could be relevant to collect that information for more accurate decision-making on adaptation.

The current governance arrangements are complex on each side of the park because of the pressure on the natural resources used and the benefits of the ecosystem services that actors can obtain. The communication and cooperation between actors differ on each side of the park, where there is no strong relationship with the Caribbean side of each country, and most of the collaboration for the park management takes place in higher levels mostly focused on conservation, where rural development, agriculture and water should also have participation in decision making for the region.

Governance principles like effectiveness, inclusiveness, and connectivity have implications for adaptation on both sides of the park and surrounding areas because they can enhance climate change adaptation. More effectiveness is a starting point for ensuring the park's functioning and managing other relevant agendas to further deal with climate change with a

more prepared staff member as well as more possibilities to cooperate with other actors. This also relates to the appropriate functioning of governmental institutions that have a central role in the park's decision-making.

Inclusiveness plays a key role in avoiding the exclusion of vulnerable actors in decision-making and proving a climate change justice approach in a region where historically marginalized groups like indigenous people, farmers and women have been excluded from decision-making on conservation issues.

Connectivity is fundamental for effective climate change action as there is more collaboration, communication, and possibilities of joining forces for the benefit of people and ecosystems. A better representation of diverse sectors for adaptation in the decision-making spaces can help to avoid contradictory goals that lead to less effective adaptation action or even maladaptation because there is no coordination between agendas.

After this research work, the biggest recommendations start with highlighting the urgency of providing PILA with the best possible tools to face the historical and current challenges on each side of the park in both countries. Better support from central governments and environmental authorities is required to achieve the optimal functioning of the park and then explore climate change as an agenda relevant to the present and future of the PILA.

Due to the lack of infrastructure, resources and even interest in the topic, it is important to consider using common governance spaces or meeting points for stakeholders to exchange impressions about changes and challenges, look for common solutions and explore further actions. In high levels of decision making the Binational Technical Unit can be an option for gathering high-level decision-makers from diverse secretaries not only the environment but also to have other actors represented for an integral decision-making.

At lower decision-making levels, initiatives like the Ecosystems table from the municipality in Buenos Aires Costa Rica and the Platform on Risk Management in Tierras Altas can be spaces for further action and make the most of policy instruments already in place. Within local organizations and surrounding communities, events like the PILA anniversaries on each side can contribute to a better understanding between sides of the park and the exchange of experiences in common interest topics.

Promote research on conservation but climate change agriculture and water management by providing the best possible conditions to the researchers. Signing collaboration agreements with diverse universities in the region for local production knowledge as well as international exchange for more visibility and support. In this sense, these are some topics that can be further developed to have more accurate data on climate change adaptation in La Amistad International Park:

There is an urgent need to explore the Caribbean side of La Amistad International Park in terms of climate change adaptation from an integrated (socio-ecological) approach. This acknowledges it is an inaccessible huge region, poorly administrated by the conservation-environmental systems in both countries, with mostly indigenous populations, where

pressures for megaprojects are increasing and exposed to climate change impacts for being closer to the Caribbean Sea.

Funding is an agenda worth exploring in the future for adaptation purposes in the PILA. This is because most of the diagnosis, changes and monitoring efforts for people and ecosystems in the area require investment. Funding can also support adaptation measures like better infrastructure in the PILA Pacific Costa Rica and more efforts for sustainable agriculture production for a more resilient environment in PILA Pacific Panama.

Research work about vulnerable groups nearby and inside La Amistad International Park is needed to understand their current situation and promote accurate actions to reduce their historically marginalized position on both sides of the park and increase their participation in the governance structures for decision-making on adaptation. This requires, recognizing their knowledge about the park and its changes, assessing their adaptation needs for reducing their vulnerability, and increasing their resilience beyond climate change. Indigenous people, farmers and small producers need to be considered first in terms of research goals from a bottom-up perspective.

A very interesting research line for the PILA and its surrounding area is women's participation in environmental, development and climate change agendas. From my research and participant observation in Pila Pacific, the leadership that most women have by promoting sustainable efforts, leading organizations, and creating meeting points for actors to exchange and build for the benefit of PILA Pacific Side in Costa Rica and Panama is worth exploring.

Finally, a research line needs to consider the diverse types of knowledge that stakeholders have for decision-making in the park and surrounding territories. From observed changes, practices and knowledge validation is fundamental to record the knowledge of elders, farmers, and park rangers in the area as they have seen the evolution of the land through the years. Furthermore, this can encourage people to exchange their perspectives and acquire new tools to face the current and expected changes in both Pacific sides of PILA in Costa Rica and Panama.

Bibliography

- Adaptation Fund 2021. *Increasing the resilience of vulnerable populations in Costa Rica by scaling up Adapt2*. URL: <https://www.adaptation-fund.org/project/increasing-the-resilience-of-vulnerable-populations-in-costa-rica-by-scaling-up-adapta2-3/>
- Adger Neil, W., Arnell, N. W., & Tompkins, E. L. (2005). Successful adaptation to climate change across scales. *Global Environmental Change: Human and Policy Dimensions*, 15(2), 77–86. <https://doi.org/10.1016/j.gloenvcha.2004.12.005>
- Aquae foundation. International Park La Amistad. URL: <https://www.fundacionaquae.org/wiki/parque-internacional-la-amistad/>
- Barrett, D., & Twycross, A. (2018). Data collection in qualitative research. *Evidence-Based Nursing*, 21(3), 63–64. <https://doi.org/10.1136/eb-2018-102939>
- Bauer, A., & Steurer, R. (2014). Multi-level governance of climate change adaptation through regional partnerships in Canada and England. *Geoforum; Journal of Physical, Human, and Regional Geosciences*, 51, 121–129. <https://doi.org/10.1016/j.geoforum.2013.10.006>
- Braun, V. & Clarke V. (2006) Using thematic analysis in psychology, *Qualitative Research in Psychology*, 3:2,77-101, DOI:[10.1191/1478088706qp063oa](https://doi.org/10.1191/1478088706qp063oa)
- Butler, J. R. A., Wise, R. M., Skewes, T. D., Bohensky, E. L., Peterson, N., Suadnya, W., Yanuartati, Y., Handayani, T., Habibi, P., Puspadi, K., Bou, N., Vaghelo, D., & Rochester, W. (2015). Integrating top-down and bottom-up adaptation planning to build adaptive capacity: A structured learning approach. *Coastal Management: An International Journal of Marine Environment, Resources, Law, and Society*, 43(4), 346–364. <https://doi.org/10.1080/08920753.2015.1046802>
- Castillero, G. C., Paton, S., Noriega, R., & Calderón, A. (2022). The dynamics of climate change science and policy in Panama: A review. In *Research Square*. <https://doi.org/10.21203/rs.3.rs-2234975/v1>
- Cattivelli, V. (2021). Climate adaptation strategies and associated governance structures in mountain areas. The case of the Alpine regions. *Sustainability*, 13(5), 2810. <https://doi.org/10.3390/su13052810>
- Candanedo, I. (2010). *Nature – Culture Interactions Among Peasant Communities Near La Amistad Transboundary Park, Panama and Costa Rica* Ph.D. Dissertation. The University of Sussex. URL: https://www.tbpa.net/docs/publications/08_Doctoral%20Thesis%20Indra%20Candanedo.pdf
- Conway, D., Nicholls, R. J., Brown, S., Tebboth, M. G. L., Adger, W. N., Ahmad, B., Biemans, H., Crick, F., Lutz, A. F., De Campos, R. S., Said, M., Singh, C., Zaroug, M. A. H., Ludi, E., Mark New, & Wester, P. (2019). The need for bottom-up assessments of climate risks and adaptation in climate-sensitive regions. *Nature Climate Change*, 9(7), 503–511. <https://doi.org/10.1038/s41558-019-0502-0>
- CDC, (2018) Data collection methods for evaluation: Document review. Cdc.gov. <https://www.cdc.gov/healthyouth/evaluation/pdf/brief18.pdf>
- de Bruijn, E., & Dieperink, C. (2022). A framework for assessing climate adaptation governance on the Caribbean island of Curaçao. *Sustainability*, 14(22), 15092. <https://doi.org/10.3390/su142215092>
- Dicker, Sophie and Kyriacou Georgina *What is climate change adaptation?* (2021, January 15). Grantham Research Institute on Climate Change and the Environment. <https://www.lse.ac.uk/granthaminstitute/explainers/what-is-climate-change-adaptation/>
- Di Gregorio, M., Fatorelli, L., Paavola, J., Locatelli, B., Pramova, E., Nurrochmat, D. R., May, P. H., Brockhaus, M., Sari, I. M., & Kusumadewi, S. D. (2019). Multi-level governance and power in climate change policy networks. *Global Environmental Change: Human and Policy Dimensions*, 54, 64–77. <https://doi.org/10.1016/j.gloenvcha.2018.10.003>
- Dobrowski, S. Z., Littlefield, C. E., Lyons, D. S., Hollenberg, C., Carroll, C., Parks, S. A., Abatzoglou, J. T., Hegewisch, K., & Gage, J. (2021). Protected-area targets could be undermined by climate change-driven shifts in ecoregions and biomes. *Communications Earth & Environment*, 2(1), 1–11. <https://doi.org/10.1038/s43247-021-00270-z>

- Eicken, H., Danielsen, F., Sam, J.-M., Fidel, M., Johnson, N., Poulsen, M. K., Lee, O. A., Spellman, K. V., Iversen, L., Pulsifer, P., & Enghoff, M. (2021). Connecting top-down and bottom-up approaches in environmental observing. *Bioscience*, 71(5), 467–483. <https://doi.org/10.1093/biosci/biab018>
- Embassy of the Kingdom of the Netherlands in Panama (2028) Report Agriculture in Panama. Challenges and opportunities. URL: [agriculture-in-Panama-challenges-and-opportunities-2018.pdf \(rvo.nl\)](https://www.rvo.nl/agriculture-in-Panama-challenges-and-opportunities-2018.pdf)
- Fereday, J., & Muir-Cochrane, E. (2006). Demonstrating rigour using thematic analysis: A hybrid approach of inductive and deductive coding and theme development. *International Journal of Qualitative Methods*, 5(1), 80–92. <https://doi.org/10.1177/160940690600500107>
- Ford, J. D., Keskitalo, E. C. H., Smith, T., Pearce, T., Berrang-Ford, L., Duerden, F., & Smit, B. (2010). Case study and analogue methodologies in climate change vulnerability research: Climate change vulnerability research. *Wiley Interdisciplinary Reviews. Climate Change*, 1(3), 374–392. <https://doi.org/10.1002/wcc.48>
- Füssel, H.-M. (2007). Adaptation planning for climate change: concepts, assessment approaches, and key lessons. *Sustainability Science*, 2(2), 265–275. <https://doi.org/10.1007/s11625-007-0032-y>
- Global water partnership (2016). Integrated water resources management in Central America: the over-riding challenge of managing transboundary waters URL: https://www.gwp.org/globalassets/global/toolbox/publications/technical-focus-papers/ftp_central_america.pdf
- Gruby, R. L., & Basurto, X. (2013). Multi-level governance for large marine commons: politics and polycentricity in Palau's protected area network. *Environmental science & policy*, 33, 260-272.
- Hockings, M., Stolton, S., Leverington, F., Dudley, N. and Courrau, J. (2006). Evaluating Effectiveness: A framework for assessing the management effectiveness of protected areas. 2nd edition. IUCN, Gland, Switzerland and Cambridge, UK. xiv + 105 pp URL: [untitled \(iucn.org\)](https://www.iucn.org/publications-and-reports/evaluating-effectiveness)
- Homsy, G. C., Liu, Z., & Warner, M. E. (2018). Multilevel governance: Framing the integration of top-down and bottom-up policymaking. *International Journal of Public Administration*, 42(7), 1–11. <https://doi.org/10.1080/01900692.2018.1491597>
- Huitema, D., Adger, W. N., Berkhout, F., Massey, E., Mazmanian, D., Munaretto, S., Plummer, R., & Termeer, C. C. J. A. M. (2016). The governance of adaptation: choices, reasons, and effects. Introduction to the Special Feature. *Ecology and Society: A Journal of Integrative Science for Resilience and Sustainability*, 21(3). <https://doi.org/10.5751/es-08797-210337>
- Ishtiaque, A. (2021). Multilevel governance in climate change adaptation: Conceptual clarification and future outlook. In *Climate Change and Extreme Events* (pp. 171–185). Elsevier.
- IUCN (2018). Governance for adaptation in the shared Sixaola River basin. (2018, September 19). Panorama Solutions. <https://panorama.solutions/en/solution/governance-adaptation-shared-sixaola-river-basin>
- IUCN (2019) Protected Areas and Climate Change. Briefing paper. URL: https://www.iucn.org/sites/default/files/2022-07/protected_areas_and_climate_change_briefing_paper_december_2019-final.pdf
- J. R. A. Butler, R. M. Wise, T. D. Skewes, E. L. Bohensky, N. Peterson, W. Suadnya, Y. Yanuartati, T. Handayani, P. Habibi, K. Puspadi, N. Bou, D. Vaghelo & W. Rochester (2015) Integrating Top-Down and Bottom-Up Adaptation Planning to Build Adaptive Capacity: A Structured Learning Approach, *Coastal Management*, 43:4, 346-364, DOI: [10.1080/08920753.2015.1046802](https://doi.org/10.1080/08920753.2015.1046802)
- Jorgensen, D. L. (1989). Participant observation: A methodology for human studies. SAGE Publications. URL: [https://research.utoronto.ca/participant-observation#:~:text=Participant%20observation%20\(PO\)%20is%20a,widest%20range%20of%20possible%20settings.](https://research.utoronto.ca/participant-observation#:~:text=Participant%20observation%20(PO)%20is%20a,widest%20range%20of%20possible%20settings.)

Keskitalo, C., Juhola, S., & Westerhoff, L. (2016). Connecting multiple levels of governance for adaptation to climate change in advanced industrial states. In *Water Governance as Connective Capacity* (1st Edition, pp. 69–88). Routledge URL:

La Pobreza en Panamá. (2020, June 14). La Pobreza en Panamá | Iniciativa Panamá Sin Pobreza; Iniciativa Panamá Sin Pobreza. <https://panamasinpobreza.org>

Lasprilla, C. (2022, May 4). *Increasing the resilience of vulnerable populations in Costa Rica by scaling up Adapta2+*. Adaptation Fund. <https://www.adaptation-fund.org/project/increasing-the-resilience-of-vulnerable-populations-in-costa-rica-by-scaling-up-adapta2-3/>

Larsen, R. K., Swartling, Å. G., Powell, N., Simonsson, L., & Osbeck, M. (2011). DISCUSSION. In *A Framework for Dialogue Between Local Climate Adaptation Professionals and Policy Makers: Lessons from Case Studies in Sweden, Canada and Indonesia* (pp. 24–28). Stockholm Environment Institute. <http://www.jstor.org/stable/resrep00501.9>

Lockwood, M. (2010). Good governance for terrestrial protected areas: A framework, principles and performance outcomes. *Journal of Environmental Management*, 91(3), 754–766. <https://doi.org/10.1016/j.jenvman.2009.10.005>

Moser SC, Ekstrom JA. *A framework to diagnose barriers to climate change adaptation.* Proc Natl Acad Sci U S A. 2010 Dec 21;107(51):22026-31. <https://doi.org/10.1073/pnas.1007887107>

Mission Panama. Panama leads a new coalition of carbon-negative countries. November 2021. URL: <https://missionpanama.gob.pa/panama-leads-new-coalition-of-carbon-negative-countries/>

Mi Ambiente (2022) Se desarrolla proyecto de demarcación del Parque Internacional La Amistad. Ministerio de Ambiente. <https://www.miambiente.gob.pa/se-desarrolla-proyecto-de-demarcacion-del-parque-internacional-la-amistad/>

O'Regan, S. M., Archer, S. K., Friesen, S. K., & Hunter, K. L. (2021). A global assessment of climate change adaptation in marine protected area management plans. *Frontiers in Marine Science*, 8. <https://doi.org/10.3389/fmars.2021.711085>

Paaby & Borge, 2004. Diagnostico Ecologico del Parque Internacional La Amistad Talamanca. En *Diagnostico del area silvestre protegida. Plan de Manejo del Parque Internacional La Amistad.* TNC Borge Carlos. URL: <https://www.scribd.com/document/230847582/Parque-Internacional-La-Amistad>

Pierre and Peters (2020) in Plattoni, Simona. Multi-level Governance: A Historical and Conceptual Analysis. *European Integration* Vol. 31, No. 2, 163–180, March 2009 URL: <https://www.tandfonline.com/doi/epdf/10.1080/07036330802642755?src=getfile>

Rayner, S. (2010). *How to eat an elephant: a bottom-up approach to climate policy.* *Climate Policy*, 10(6), 615–621. URL: <https://sci-hub.ru/https://doi.org/10.3763/cpol.2010.0138>

Saito-Jensen, M. (2015). Multilevel Governance Theory. In *Theories and Methods for the Study of Multilevel Environmental Governance* (pp. 2–6). Center for International Forestry Research. <http://www.jstor.org/stable/resrep02152.5>

SINAC (Sistema Nacional de Áreas de Conservación). 2017. Plan de Prevención, Protección y Control del Parque Internacional de La Amistad (PILA) Pacífico. 123 pp.

Stavins R., J. Zou, T. Brewer, M. Conte Grand, M. den Elzen, M. Finus, J. Gupta, N. Höhne, M.-K. Lee, A. Michaelowa, M. Paterson, K. Ramakrishna, G. Wen, J. Wiener, and H. Winkler, 2014: International Cooperation: Agreements and Instruments. In: *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. URL: https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter13.pdf

- Schliep, R., Bertzky, M., Hirschnitz, M., & Stoll-Kleemann, S. (2008). Changing climate in protected areas? Risk perception of climate change by biosphere reserve managers. *Gaia*, 17(1), 116–124. <https://doi.org/10.14512/gaia.17.s1.9>
- Suraje Dessai & Mike Hulme (2004) Does climate adaptation policy need probabilities? *Climate Policy*, 4:2, 107-128, DOI: 10.1080/14693062.2004.9685515
- Termeer, C., Dewulf, A., Rijswick, H. v., Buuren, A. v., Huitema, D., Meijerink, S., Rayner, T., & Wiering, M. (2011). The regional governance of climate adaptation: A framework for developing legitimate, effective, and resilient governance arrangements, *Climate Law*, 2(2), 159-179. doi: <https://doi.org/10.1163/CL-2011-032>
- Termeer, C. J. A. M., Dewulf, A., Karlsson-Vinkhuyzen, S. I., Vink, M., & van Vliet, M. (2016). Coping with the wicked problem of climate adaptation across scales: The Five R Governance Capabilities. *Landscape and Urban Planning*, 154, 11–19. <https://doi.org/10.1016/j.landurbplan.2016.01.007>
- Termeer, C., van Buuren, A., Dewulf, A., Huitema, D., Mees, H., Meijerink, S., & van Rijswick, M. (2017, October 26). Governance Arrangements for Adaptation to Climate Change. Oxford Research Encyclopedia of Climate Science. Retrieved 14 Aug. 2023, from <https://oxfordre.com/climatescience/view/10.1093/acrefore/9780190228620.001.0001/acrefore-9780190228620-e-600>
- Tigre, M. A. (2019). Building a regional adaptation strategy for Amazon countries. *International Environmental Agreements Politics Law and Economics*, 19(4–5), 411–427. <https://doi.org/10.1007/s10784-019-09443-w>
- Torfin, J., Peters, B. G., Pierre, J., & Sørensen, E. (2012). *Interactive Governance Advancing the Paradigm*. Oxford University Press. URL: <https://doi.org/10.1093/acprof:oso/9780199596751.001.0001>,
- Tortola, P.D. (2017), *Clarifying multilevel governance*. *European Journal of Political Research*, 56: 234-250. <https://doi.org/10.1111/1475-6765.12180>
- United Nations Development Program (UNDP). Governance and Peacebuilding. Europe and Central Asia. URL: <https://www.undp.org/eurasia/our-focus/governance-and-peacebuilding#:~:text=UNDP%20defines%20governance%20as%20%E2%80%9Cthe,civil%20society%20and%20private%20sector>.
- UNDPCC La adaptación al cambio climático en Costa Rica: una estimación de las inversiones necesarias. (2010) URL: <https://www.ndcs.undp.org/content/dam/LECB/docs/briefs/undp-ndcsp-undpcc-iff-brief-span-2010-07.pdf>
- United Nations Development Program. Climate Change Adaptation. Costa Rica. 2023 URL: <https://www.adaptation-undp.org/explore/costa-rica> Retrieved 22 May 2023
- UNDP, Costa Rica. The Biodiversity Finance Initiative 2021. URL: <https://www.biofin.org/costa-rica>
- UNEP-WCMC. (2017, May 22). Talamanca Range-La Amistad Reserves / La Amistad International Park. World Heritage Datasheet. <http://world-heritage-datasheets.unep-wcmc.org/datasheet/output/site/talamanca-range-la-amistad-reserves-la-amistad-national-park/>
- United Nations (2022) Biodiversity - our strongest natural defense against climate change URL: <https://www.un.org/en/climatechange/science/climate-issues/biodiversity>
- United Nations Framework Convention for Climate Change. Introduction to adaptation and resilience. URL: <https://unfccc.int/topics/adaptation-and-resilience/the-big-picture/introduction> s/p
- United Nations Framework for Climate Change Convention. (2023) URL: <https://unfccc.int/topics/adaptation-and-resilience/the-big-picture/introduction>
- van Aalst, M. K., Cannon, T., & Burton, I. (2008). Community level adaptation to climate change: The potential role of participatory community risk assessment. *Global Environmental Change: Human and Policy Dimensions*, 18(1), 165–179. <https://doi.org/10.1016/j.gloenvcha.2007.06.002>

Westman, L. K., Castán Broto, V., & Huang, P. (2019). Revisiting multi-level governance theory: Politics and innovation in the urban climate transition in Rizhao, China. *Political Geography*, 70, 14–23. <https://doi.org/10.1016/j.polgeo.2019.01.002>

Williams, J. (2012). In Mark Pelling *Adaptation to Climate Change: From Resilience to Transformation*. *Scottish Geographical Journal*, 128(1), 83–86. <https://doi.org/10.1080/14702541.2012.692916>

Wild Conservation Society, 2021. La Amistad. URL: <https://programs.wcs.org/5greatforests/Wild-Places/La-Amistad>

World Bank. (2022). *Opportunities for reducing poverty and inequality in Costa Rica: World Bank poverty and inequality assessment*. World Bank. <http://hdl.handle.net/10986/38051>

World Bank. The World Bank in Panama. Overview 2023 URL <https://www.worldbank.org/en/country/panama/overview#:~:text=Panama%20is%20a%20small%20country,made%20wonders%20of%20the%20world.>

Yin, R. K. (2008). *Case study research: Design and methods* (4th ed.). SAGE Publications. http://cemusstudent.se/wp-content/uploads/2012/02/YIN_K_ROBERT-1.pdf

Zen, I. S., Al-Amin, A. Q., & Doberstein, B. (2019). Mainstreaming climate adaptation and mitigation policy: Towards multi-level climate governance in Melaka, Malaysia. *Urban Climate*, 30(100501), 100501. <https://doi.org/10.1016/j.uclim.2019.100501>

Appendix

Here you will find the English translation of the documents related to the fieldwork and the semi-structured interviews:

Student: Ana Gabriela Monroy Chaparro
Email: ana.monroy@mespom.eu
University: Lund University

PARTICIPANT INFORMATION DOCUMENT

Thesis title: Governance of climate change adaptation in La Amistad International Park between Costa Rica and Panama

What is the project about?

This research aims to understand how governance of climate change adaptation works in the International Park La Amistad (PILA) between Costa Rica and Panama. To get some information about adaptation responses, it is necessary to conduct interviews with local stakeholders to understand their experiences facing climate change impacts on the Pacific (Both Costa Rican and Panama) side of the park.

What is to participate?

If you accept to be part of the research, you will be interviewed approximately for 30 minutes to one hour. During this time some questions about climate change will be asked of you and where you can provide as much information related to your daily life/ work in PILA.

What will be the benefits for me?

This study is limited to gathering first-hand information for research without being supported by any organization, company, or international cooperation agency. This aims to better inform decision-makers about the current situation of local climate change adaptation in PILA.

What will happen to the information provided?

This interview will be transcribed to report the overall findings of this Master thesis research and other informative and academic articles (one of them in Spanish for your information). The recordings and transcription will be stored in a personal Google Drive which only the student will have access to.

What should I do if want more information about the research project?

Please feel free to ask the interviewer by email (ana.monroy@mespom.eu) telephone or Whats App (+52 5548721527)

March – April 2023

CONSENT FORM FOR INTERVIEWS WITH LOCAL STAKEHOLDERS IN LA AMISTAD INTERNATIONAL PARK

NAME: _____

Country:

Please select the options you (the participant) consider the best before starting this interview.

- For this study, I want to:

A) Remain anonymous

B) Be identified by my name

C) Be identified by my organization
organization

D) Be identified by my position in the organization

- This master’s research study has been explained to me, and I have had the opportunity to ask questions for clarification. I agree that I understand what this study is about.

YES NO

- I understand that my participation in this study is **absolutely voluntary**, and I **can stop participating at any time**.

YES NO

- I give my **consent** to participate in this study.

YES NO

- I agree that this discussion **will be audio-recorded, transcribed, and safely stored**

YES NO

- I agree that quotations from the interview may be reported in my thesis research, **without mentioning names**, unless otherwise specified by the participants.

YES NO

- I agree this information **will be used for this master thesis research** and further academic and informative purposes (articles, conferences, etc.).

YES NO

Participant’s Signature: _____

Student’s Signature: _____

Date: / / Place:

Date: / / Place:

Interview protocol

Presentation of the student

My name is Ana Gabriela Monroy, I am a Mexican postgraduate Student at Lund University doing my master's in Environmental Sciences Policy and Management.

Explanation of the participant information document including:

- The main goal of the research is
- Explanation of participation role
- Clarification of the benefits
- Description of the data processing
- Further options for contacting

The signing of the consent form

Interview for community members

Aspects to explore	Set of Questions	Consideration for analysis
<p>Perceptions/ Context/ Climate Impacts</p>	<p>1) Who are you and what is your relationship with PILA?</p> <p>1. What are the biggest changes you have observed in the PILA in the last years? Which of these changes do you attribute to climate change?</p> <p>2) What are the most important challenges you face living in the buffer (other) zone of PILA? Are they related to climate change?</p>	<p>Location, main activities, natural resources relationship</p>
<p>Response</p>	<p>3) How have you responded to those challenges?</p> <p>4) What has helped you to do so?</p>	<p>Short- Long term Reactive- Proactive Coping strategies- Adapting or Mal adapting</p> <p>Assumption: Response can be different from top-down (institutions- policy/strategy) to bottom-up (communities- local stakeholders-reaction/ coping) and between countries</p>

<p>Collaboration with other actors</p>	<p>5) Which actors do you collaborate with/ work with/ in these responses?</p> <p>6) How do you communicate with the government or other higher levels?</p>	<p>PILA Pacific (CR)- PILA Pacific (PA) PILA Pacific (CR/PA)- PILA Caribbean (CR/PA) PILA Caribbean (CR)- PILA Caribbean (PA)</p>
<p>Further action needed</p>	<p>7) What do you think needs to be done to face climate change impacts in PILA?</p> <p>8) Who needs to do so?</p>	<p>Guiding lines for climate action</p> <p>Responsibility and Jurisdiction</p>

Interview for local stakeholders

Aspects to explore	Set of Questions	Consideration for analysis
<p>Perceptions/ Context/ Climate Impacts</p>	<p>1) Who are you and what is your relationship with PILA?</p> <p>2. What</p> <p>2) What are the biggest changes you have observed in the PILA in the last years? Which of these changes can be attributed to climate change?</p> <p>3) What are the most important challenges you face working/living in the buffer (other) zone of PILA? Are they related to climate change?</p>	
<p>Response</p>	<p>4) How have you/ your organization responded to those challenges?</p> <p>5) What has helped you to do so?</p>	<p>Short- Long term Reactive- Proactive Coping strategies- Adapting or Mal adapting</p> <p>Assumption: Response can be different from top-down (institutions- policy/strategy) to bottom-up (communities- local stakeholders-reaction/ coping) and between countries</p>
<p>Collaboration with other actors</p>	<p>6) Which actors do you collaborate with/ work with/ in these responses?</p> <p>7) How do you communicate with the</p>	<p>PILA Pacific (CR)- PILA Pacific (PA) PILA Pacific (CR/PA)- PILA Caribbean (CR/PA) PILA Caribbean (CR)- PILA Caribbean (PA)</p>

	communities or other decision-makers levels?	
Further action needed	8) What do you think needs to be done to face climate change impacts in PILA? 9) Who needs to do so?	Guiding lines for climate action Responsibility and Jurisdiction

Comments and something else that could be added to this.

Thanks for your participation in this research study! You will be able to see the results if interested on the University website and once it is ready an article in Spanish will be available for you to see the results.

Governance of climate change adaptation in transboundary territories A Case Study of La Amistad Biosphere Reserve between Costa Rica and Panama

Proposed questionnaire for PILA Fieldwork with community members

1. Can you share who you are and what is your relationship with PILA?
2. What are the **main changes** you have observed in the PILA in the last years? Which of these changes can you **attribute to climate change**?
- 1) What are the most important **challenges** you face living in the buffer (other) zone of PILA? Are they **related to climate change**?
3. How have you responded to those challenges? What do you use and need for it?
4. Which actors do you collaborate with/ work with/ in these **responses**? How do you collaborate with the authorities in the park?
5. **What do you think** needs to be done in PILA to face climate change impacts?
6. Who needs to do so? Who are the actors that need to?
7. **Any other information you might like to share?**

Informal snowballing

- * Do you know about **other actors** that might be relevant to meet?