COMMUNITY PERSPECTIVES:
Loss and Damage in Cahuita, Costa Rica.

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Community Perspectives: Loss and Damage in Cahuita, Costa Rica

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## Acronyms

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<tr>
<td>ADI</td>
<td>Integral Development Association of Cahuita</td>
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<tr>
<td>ACAPRO</td>
<td>Organic Farmers Association</td>
</tr>
<tr>
<td>ASOMEC</td>
<td>Cahuita Association for Female Entrepreneurs</td>
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<tr>
<td>ACLA-C</td>
<td>Caribbean La Amistad Conservation Area</td>
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<tr>
<td>ACBTC</td>
<td>Talamanca-Caribbean Biological Corridor Association</td>
</tr>
<tr>
<td>CONAVI</td>
<td>National Road Council</td>
</tr>
<tr>
<td>CME</td>
<td>Municipal Emergency Committees</td>
</tr>
<tr>
<td>CNE</td>
<td>National Commission for Risk Prevention and Emergency Management</td>
</tr>
<tr>
<td>CGR</td>
<td>Office of the Comptroller General of the Republic</td>
</tr>
<tr>
<td>BIOMARCC</td>
<td>Coastal Marine Biodiversity Project in Costa Rica, Development of Capacities and Adaptation to Climate Change</td>
</tr>
<tr>
<td>EWE</td>
<td>Extreme Weather Event</td>
</tr>
<tr>
<td>ICT</td>
<td>Costa Rican Tourism Board</td>
</tr>
<tr>
<td>IMN</td>
<td>National Weather Institute</td>
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<tr>
<td>MIDEPLAN</td>
<td>Ministry of National Planning and Economic Policy</td>
</tr>
<tr>
<td>PNC</td>
<td>Cahuita National Park</td>
</tr>
<tr>
<td>SINAC</td>
<td>National System of Conservation Areas</td>
</tr>
<tr>
<td>UFCO</td>
<td>United Fruit Company</td>
</tr>
<tr>
<td>UNFCCC</td>
<td>United Nations Framework Convention on Climate Change</td>
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Climate change loss and damage is one of the greatest challenges to the enjoyment of human rights and community well-being in the Global South. Community Perspectives: Loss and Damage in Cahuita, Costa Rica is a case study conducted under the umbrella of the Climate (In) Justice in Latin America project executed by La Ruta del Clima with the support of Brot für die Welt.

The case study seeks to drive collaborative research on the adverse effects of climate change on communities. The objective of this case study is to explore, from a community perspective, climate impacts and their implications in terms of the loss and damage occurring in the community of Cahuita on Costa Rica’s southern Caribbean coast. The community is recognized as the authorized base unit to lead an assessment of the loss and damage caused by climate change.

The study identified preexisting elements that heighten community vulnerability and endeavored to establish the historical, economic, and socio-environmental backdrop to assess the impacts of climate change-related phenomena. This context was essential in determining the effects of climate change and their consequences in the form of loss and damage.

Through field work and dialogue, we were able to observe a correlation between the projected impacts of climate scenarios and the experiences felt in the southern Caribbean. The effects of phenomena, such as increasing ocean temperatures, sea level rise, and coastal erosion, as well as the loss of marine and coastal biodiversity, were evidenced on community well-being. Similarly, there were signs that manifestations of climate impacts like extreme weather events (EWEs) or slow-onset events have caused local organizations and institutions to surpass their response capabilities.

Climate justice is imperative, and harm to our human rights as a result of climate change is a reality. The results of this case study contribute to contextualizing this harm. This publication is one step in facilitating the claim—on more precise and identifiable grounds—for the duty of public authorities to monitor, record, and report all dimensions of loss and damage. Moreover, it furnishes a solid foundation for initiating the claim for justice and redress owed to communities like Cahuita by the international community and UNFCCC with respect to loss and damage.
1. Introduction

Climate change loss and damage is one of the greatest challenges to the enjoyment of human rights and community well-being in the Global South. In the context of the climate crisis, having a structured and just response on the part of the international community that takes into account the principle of common but differentiated responsibility and respective capabilities is imperative.

Unfortunately, global climate governance as regulated by the United Nations Framework Convention on Climate Change (UNFCCC) ignores its responsibility to mitigate the adverse effects of climate change and neglects to respond to the serious or irreversible damage that communities are suffering. Despite representing the third pillar of the Paris Agreement, article 8 on damage and loss does nothing to provide a systematic, fair, and funded response, which jeopardizes the human rights of millions of people living in vulnerable conditions.

Community Perspectives: Loss and Damage in Cahuita, Costa Rica is a case study conducted under the Climate (In) Justice in Latin America project executed by La Ruta del Clima with the support of Brot für die Welt.

The objective of this case study is to explore, from a community perspective, climate impacts and their implications in terms of the loss and damage occurring in the community of Cahuita on Costa Rica’s southern Caribbean coast. The case study opens with a socioeconomic and environmental account of the community context and then moves on to explore the manifestations of climate change that impact the community. Finally, it considers the economic and non-economic loss and damage that has been recorded based on the available data and the testimonies of key community stakeholders.

1.1 Research Methodology

The study employed a number of research techniques to contrast available scientific information and public data with the accounts and local knowledge of community members. During the study, a literature review was conducted on climate impacts and loss and damage, and on the context of the southern Caribbean. Additional activities included sixteen semi-structured interviews with key stakeholders, a mapping of community and institutional stakeholders, a participatory dialogue, several meetings with community experts and representatives, four field visits, a structured survey, and the visualization of climate and socio-environmental data.

The opinions of the persons cited do not necessarily coincide with that of the research team. Semi-structured interviews with key informants will be utilized throughout the study to give visibility to the voices and experiences of community members and have been anonymized pursuant to informed consent to protect their privacy.
2. Cahuita in Context

2.1 Socio-Environmental Factors

The district of Cahuita is a coastal community in Costa Rica’s southern Caribbean region, situated in the canton of Talamanca, province of Limón. The area is known for its dedication to tourism, for being the cradle of calypso music, and as home to one of the most visited protected areas in the country.1 Cahuita belongs to the southern Caribbean climate sub-region of the Caribbean slope.

Cahuita National Park (PNC, for its acronym in Spanish) is part of the Caribbean La Amistad Conservation Area (ACLA-C) and the Southern Caribbean Tourism Planning Unit of the Costa Rican Tourism Board (ICT).2 While it was originally created to protect the coral reef, the process gave rise to a socio-environmental conflict between the local population and state authorities, which was finally resolved in 2016 by means of Executive Decree 40110-MINAE establishing shared governance between the community of Cahuita and the National System of Conservation Areas (SINAC).3 This is a unique model in the country in which the community plays a part in managing the national park and exemplifies the integration of the community’s economic activities and the park’s ecosystem services.

Incidentally, 60% of the territory of the canton of Talamanca is protected, enabling the existence of a great biodiversity, endemic species, and a large number of rivers.4 According to the Holdridge Life Zones classification, Cahuita consists of a tropical rain forest with a wealth of wetlands, mangroves, mixed forest, and coastal vegetation, while the marine area is home to the greatest coral reef of the Caribbean coast.5 Cahuita beach boasts white sand owing to the erosion of this coral reef.6

The aforementioned ecosystem is highly vulnerable. Its deterioration has been well documented since 1981 and, while there are a number of causes, it is known that La Estrella river basin directly affects the reef given its proximity to the mouth.7 In the southern Caribbean, the rivers descending from the Talamanca Mountains make a rapid transition to sedimentary hills, crossing no more than 4 kilometers of alluvial plains before reaching the Caribbean Sea.8 A 2008 study found that 25% of the soils of the basin are overused and that there is a disregard for the forestry and water law in terms of river protection.9 This, in part, explains the large amount of sediment that is discharged. The impacts of climate change also have an important bearing on this ecosystem, especially as a result of sea level rise and ocean acidification (see section 3.2).

The livestock activity carried out in the hamlets of Carbón 1, Carbón 2, and San Rafael, for example, while small, could cause soil erosion and compaction. This illustrates that in studying the environmental conditions of Cahuita, one must also consider its buffer zone. Hence, the efforts of the Talamanca-Caribbean Biological Corridor Association (ACBTC, for its acronym in Spanish) to implement management plans that have improved

1 (COOPRENA R.L. 2015, 47)
2 (COOPRENA R.L. 2015, 28)
3 (L. Corrales and Alemán 2017, 22)
4 (COOPRENA R.L. 2015, 47)
5 (COOPRENA R.L. 2015, 28)
6 (L. Corrales and Alemán 2017, 22)
7 (Retana et al. 2017, 84)
8 (Fournier 2015, 27–30)
9 (Quesada-Román and Pérez-Briceño 2019, 366–68)
10 (Mora-Cordero and Chavarria 2008, 192)
11 (Quesada-Román and Pérez-Briceño 2019, 366–68)
12 (Mora-Cordero and Chavarria 2008, 202)
restoration of the micro-basins. As a geographical space, the corridor functions as a connector between various public and private protected areas and indigenous territories.

The Limón earthquake of April 1991 caused an uplift of the carbonate platform of the Caribbean coast, a process that has been taking place throughout geological history, explaining why the towns of Cahuita and Puerto Viejo are currently situated atop fossil reefs. While the earthquake did not result in an uplift quite as severe as that of the area between Moín and the city of Limón, it did cause breaking and cracking of the Cahuita coral reefs and the deposit of a large amount of sediment from the landslides in the surrounding mountains. In addition to this tectonic uplift, we also see sea level rise as a result of climate change and climate variability in the Caribbean Sea.

Apart from climate change and its impacts, which we will describe in more detail later, the members of the community have other environmental concerns, including deforestation, pollution from agrochemicals and solid waste management, and sedimentation from the port activities in Moín, located at about 40 kilometers from Cahuita. One hundred percent of the stakeholders with whom we held in-depth interviews expressed a concern for the sediment deposited by the currents on the seabed and coral reefs, affecting species of ecological and economic importance.

This situation is compounded by agrochemical pollution. In the words of a Cahuita native:

"Fishing towns are not the problem, the problem is the government [when] all the banana plantations existing anywhere in Costa Rica are on the banks of a river, and they dump everything and fumigate, and what was left over was buried. And when all that is full, it goes into the sea and is now harming the area's coral reef. I blame it on the banana plantations (...) we talk of climate change, but that is where it all began. And then they spray over and over again with poison."

The individuals working to protect sea turtles seem to agree. These same individuals have received soil analyses that indicate contamination by agrochemicals, report drainage into the sea of substances from the aircraft of banana companies, and project an accumulated effect on the life cycle of sea turtles.

Accordingly, as has been suggested in specialized studies, there is still ample scope for action on the pressures on coastal and marine biodiversity, harmful extractive practices, conventional agricultural activity, and the overall impact of coastal settlements. Most of the individuals interviewed believe that responsibility for these aspects is shared, but that there is no comparison to the actions that can be taken by the government and large private enterprises.

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10Member of the Talamanca Caribbean Biological Corridor Association, interview, November 5, 2021.
11(Cortés, Soto, and Jiménez 1994, 191–92)
12(Quesada-Román and Pérez-Briceño 2019, 368)
13Senior citizen from Cahuita, interview, November 6, 2021.
14Turtle Rescue member, interview, November 6, 2021.
15(BIOMARCC, SINAC, and GIZ 2013, 54)
Cahuita's Roots

Cahuita's roots date back to the pre-Columbian era, which helps to understand the depth of its culture. To the north and stretching up to Limón, the archaeological settlements show greater similarity with the central Caribbean, whereas to the south of Cahuita, the sites of the Talamanca Valley show more relationship to those of Bocas del Toro and Costa Rica's South Pacific. An interesting fact is that ceramics from Guanacaste have been found in both Penshurt and Tuba Creek, pointing to the area's participation in regional exchange networks.

Evidence from the Black Creek site (4000–2500 BP) leads to believe that the former settlers of what is now Punta Mona, Manzanillo, and Gandoca engaged in growing local produce, hunting small animals, gathering on land and at sea, and exploiting forest materials and minerals from the immediate surroundings. Investigations around the current Cahuita center have yielded very little evidence of pre-Columbian settlement, however, this is possibly due to the area’s swampy conditions. On the other hand, settlements in the vicinity of Sixaola were established on hills or elevations as a strategy of adaptation to the flooding river.

At the time of European colonization, the Cahuita area was likely under the influence of the chiefdoms of Tariaca and Talamanca, an area in which the Bribri, Cabécar, Ngäbe, Tariaca, Teribe, and Sikwa peoples (a mission from what is now Mexico) interacted. The area withstood the conquest through the 17th century, when a population of African origin was gradually incorporated and the concept of the cacao farm was consolidated. Leading up to the 19th century, there is documentation of the incursion of the Miskito people who approached the area to hunt sea turtles and, after a number of confrontations, gave the area its name: 'Kawe' for the dragonsblood tree or ‘sangrillo’ in Spanish (Pterocarpus officinalis) and ‘ta’ for point: Dragonsblood point.

The Bluff (Cahuita today), Old Cahuita (north of Punta Cahuita), Old Harbor (Puerto Viejo), Grape Point (Punta Uva), Manzanillo, and Monkey Point (Punta Mona) were turtling and rubber tapping settlements that, up to 1915, were fed by continuous migration from places such as Bocas del Toro, San Andrés, Nicaragua, and Jamaica. Even before the establishment of the Limón region, there were two companies in Bocas and warehouses in Cahuita that, among other things, bought hawksbill turtle shells (Eretmochelys imbricata) for export to Europe. In the late 19th century, with the construction of the railway, the Caribbean witnessed the collective movement of Irish, Chinese, Costa Rican Mestizo, Italian, and Afro-Caribbean immigrants disgruntled with the exploitation of labor.

Subsequently, the productive activities of the United Fruit Company (UFCO) prevailed in the Caribbean. In 1930 the company withdrew, but continued to lease land to plant cacao (which was later sold by the same company) until 1980, in pursuit of the most lucrative part of the business. By 1960, the banana activity had rebounded under the control of Chiriqui Land Company, which was renamed Chiquita Brands in 1987, both subsidiaries of the historic UFCO. It was accompanied, however, by greater state intervention, predominantly

16(F. Corrales, Villalobos, and Salazar 2016, 103)
17(F. Corrales, Villalobos, and Salazar 2016, 128)
18(Baldi 2011, 110–12)
19(F. Corrales, Villalobos, and Salazar 2016, 128)
20(F. Corrales, Villalobos, and Salazar 2016, 121–22)
21(Hernández 1998, 132–37)
22(Park ranger at Cahuita National Park, interview, September 7, 2021.)
23(Boza 2004, 82–83)
24(Boza 2004, 145–48)
25(Hernández 1998, 138)
favoring the productive conditions of transnational and national enterprises to the detriment of social and productive investment in other sectors in the area.26

Hence, the territory of Limón is considered to have been strategic for the country’s economic development, while, paradoxically, its role in the construction of the nation state has been buried, instead presenting itself as a territory alien to the country.27

2.2 Social Fabric and Governance

The population of the district of Cahuita, projected to the year 2022, is 13,656.28 While there is no recent population census, the canton of Talamanca has shown a downward trend of the 0-14 age group and an upward trend of the 15-64 and over 65 age groups.29 The canton is also the country’s most ethnically diverse30: almost half of its population belongs to indigenous peoples (the Bribri people in the territory Kékoldi and the hamlet Patiño), there are also non-indigenous people, Afro-descendants, as well as immigrants. In keeping with its history, Cahuita continues to be a multicultural space characterized by the majority of interviewees as a “quiet” place with a singular way of life and interaction and an openness to speak, trust, and support.

It is also considered one of the birthplaces of calypso, which—more than a music genre—is a form of oral literature made popular both in and outside of Costa Rica by calypsonian Walter “Gavitt” Ferguson (1919-), who has lived in Cahuita for 100 years. Limonese calypso was declared an intangible cultural heritage by the Government of Costa Rica in 2012. This cultural expression pertains wholly to the historical development of Cahuita and today is threatened by daily dispossession, the dissociation of its context, and the impacts on the geographical area that sustains it.31

In terms of community decision-making, some interviewees point out that one of the biggest organizational challenges in Cahuita is weak coordination, resulting in duplicate efforts and little capacity to adapt to new needs.32 For example, in terms of the environment, a sort of opposition exists between organizations for collective influence and the most recent trend toward more individualistic climate and environmental action.

Regarding organization, a number of matters are brought before the Integral Development Association of Cahuita (ADI, for its acronym in Spanish) and its respective branches, while other higher-level matters are brought before the Municipality. It is said that as a form of local government, the ADI has the authority and manpower to undertake improvements in the community.33 The Fire Department, Red Cross, SINAC, and Police are counted among the vital forces.

26(Llaguno 2016, 388–92)
27(Gutiérrez, Jiménez, and Martínez 2013)
28According to INEC. demographic statistics. 2011 – 2025. National projections. Total population projected as of June 30 by age groups, according to province, canton, district, and sex. Available at https://www.inec.cr/poblacion/estimaciones-y-proyecciones-de-poblacion
29(Retana et al. 2017, 89)
30(Retana et al. 2017, 85–86)
31(Navarro 2015)
32Turtle Rescue member, interview, November 6, 2021.
33Park ranger at Cahuita National Park, interview, September 7, 2021.
The shared governance of the PNC is conducted through a Local Management Council comprised of representatives of a number of sectors, including artisanal fishing, tourist guides, ADI, and others. This one-of-a-kind model in the country has ample potential for environmental education and climate action, but has not escaped tension due to resource allocation. In the words of a fisherman:

“Conservation and hunger can never co-exist; it creates a number of enemies of the environment instead of friends, and I believe people should not be banned, but rather educated. By educating human beings, you’ll have nature, you’ll have fauna, you’ll have fish, you’ll have everything for a lifetime.”

The ACBTC, as described above, is a non-profit, public interest platform for governance and participation. It is comprised of the following associations from the district of Cahuita: Carbón 2 Conservation Association, El Yue Producers Association, ADI Hone Creek, ADI Puerto Viejo, Talamanca Ecotourism Association, and ADI Kéköldi. There is no association specific to Cahuita center and, instead, the area is coordinated directly through ADI Cahuita, the Fishermen’s Association, the Local Management Council, or SINAC. In Cahuita center, the Cahuita Association for Female Entrepreneurs (ASOMEC) was created in response to the SARS-COV-2 pandemic.

Regarding risk and emergency management, the Municipality recently established a risk management office. Similarly, the National Commission for Risk Prevention and Emergency Management (CNE) established Municipal Emergency Committees (CMEs). As inter-institutional agencies, these committees work year-round at the preparative level to define plans and conduct a coordinated response to emergencies in the canton, in which case they provide support to local or community committees or assume these functions in the absence of a local committee, as is the case of Cahuita. In the event of an emergency, individuals are to report any loss or damage suffered to this agency. However,

“Given that the phenomenon of emergencies is new in the coastal zone, people are not yet organized and don’t know to report the damage. I saw [a man] from a hotel 15 days later and he says to me, “We were completely flooded.” Why didn’t you report it to me? Later, to get help from the ICT, MEIC, we must have figures. But they don’t automatically think to report”

This illustrates how the variability of extreme events in recent years has exceeded the responsiveness of many of the people living in the area and the CME has limited resources to address this situation.
2.3 Economic Activity

Prior to the predominance of tourism, the interviewees describe bartering and local food provision as being commonplace.41 Today, Cahuita’s economic activity is not very diversified and the limited offer of economic activities translates into a narrow selection of job opportunities, unemployment, underemployment, and low-quality jobs.42 Agriculture tends to be dependent on the banana companies and tourism is in a state of recovery following the pandemic. Cahuita National Park is considered the engine of tourism and the main source of income.43

Prior to the pandemic, about 20 per cent of the district’s economically active population was engaged in tourism as a primary activity,44 which currently faces a number of challenges in addition to the consequences of the crisis. The local population is discontent with the telecommunications services,45 which affect the development of new markets, such as digital nomads and remote workers. Additionally, there is some concern within local organizations with bill 22,553: Terrestrial Maritime Zone Law No. 6043,46 which would facilitate the dispossession and concession of coastal lands and has generated concern for the type of tourism that it would enable to the detriment of small ecotourism enterprises.47

Vulnerability in the area is a given, not due to poverty itself, but due to indicators of health, education, housing, employment, land-use planning, drinking water supply, and adaptive capacity, which constrains the scale of exposure and sensitivity.48 For example, given the age of the Bordon Community Aqueduct, with infrastructure dating back 25 years, problems have been detected such as waste from leakage and a lack of resources to find new water sources in the face of growing demand.49 Another example is the road infrastructure, which is accumulating the damage of extreme events, and the lack of alternative roadways to facilitate the design of contingency plans.50

It has been projected that Cahuita does not have a population at high or medium-high risk of extreme dry events, however, water stress is a growing concern in the community.52 On the other hand, risk due to extreme precipitation events is manifested not only in the flooding of the floodplains, but also in health-related issues due to disease outbreaks, drinking water supply, housing in poor condition, and, in the case of Cahuita, economic impacts due to its dependence on affected economic activities.53

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41Farmer and fisherman from Cahuita, interview, December 11, 2021.
42(Retana et al. 2017, 89)
43Member of the Talamanca Municipal Emergency Committee, interview, November 6, 2021.
44(BIOMARCC, SINAC, and GIZ 2013, 45)
45Member of the Cahuita Climate Change group, interview, November 5, 2021.
alori-1&valor2-32006&valor3-96422&amp;strTipM=TC
47Hotel owner, interview, December 11, 2021.
48(BIOMARCC, SINAC, and GIZ 2013, 53)
49Member of the Bordon Community Aqueduct, interview, December 11, 2021.
50Hotel owner, interview, December 11, 2021.
51(Retana et al. 2017, 93)
52Member of the Talamanca Municipal Emergency Committee, interview, November 6, 2021.
53(Retana et al. 2017, 96)
Another important economic activity is fishing, which is linked to tourism and is deeply rooted in the village’s cultural identity. Fishing is a link in the supply chain of the tourism industry by supplying fish products to meet the demand of hotels and restaurants. Some fishermen and women belong to the Subsistence Fishing and Aquaculture Association, which is of further relevance considering that only descendants of fisher families are authorized to fish in the PNC marine area.\(^\text{54}\)

Interestingly, in Cahuita, fishing usually only takes place a few months a year, specifically in March, April, and May and in August, September, and October—the “calm sea” months—when the ocean is the calmest. This is why fishers must diversify their activities to supplement their income throughout the year.\(^\text{55}\)

To understand the last major economic activity—agriculture—one must return to the history of Cahuita. In the late 70s, a fungus known as “Monilia” (Moniliophthora roreri) affected cacao monocultures and destroyed the local economy. As a result, many Cahuita residents lost “faith” in agriculture.\(^\text{56}\) Currently there are commercially important plantain and banana plantations, but these do not contribute significantly to the development of food and nutrition security. A variety of fruit trees, organic bananas, organic cacao, and coconut are also farmed. The Organic Farmers Association (ACAPRO) has a participatory organic certification system, while most other crops are managed conventionally. There are other complementary crops in home gardens, subsistence farms or for small-scale trade, as well as citrus, banana, and cacao companies with larger-scale production. Livestock farming is carried out in Carbón and other remote areas, but not on a large scale.\(^\text{57}\)

\(^{54}\) Member of the Subsistence Fishing and Aquaculture Association, interview, November 6, 2021.
\(^{55}\) Farmer and fisherman from Cahuita, interview, December 11, 2021.
\(^{56}\) Farmer and fisherman from Cahuita, interview, December 11, 2021.
\(^{57}\) Head of the MAG Cahuita Agricultural Extension Agency, interview, January 7, 2021.
3. Climate Change in Cahuita

As previously stated, this case study aims to dive deeper into the impacts of climate change in Cahuita. While efforts are being made at both the national and regional levels to understand how climate change, and its consequences, manifest in Costa Rica, significant gaps still exist in local realities and the perceptions of the affected communities. As such, in this section we will reference information on climate change in Cahuita whenever available.

Climate change as a product of human activity is not a new phenomenon nor one that will only come to fruition in the distant future; it is a global reality. Understanding these changes (both now and in the future) is essential for planning and implementing climate risk prevention strategies, to which end climate scenarios are an important tool. Climate scenarios are representations of expected climate change in the future. The scenarios are calculated using complex mathematical models and are based on greenhouse gas emissions present in the atmosphere. While they project possible future changes, they are not static or guaranteed predictions as they present a high degree of uncertainty due to the complexity of natural systems.

In Costa Rica, the National Weather Institute (IMN, for its acronym in Spanish) has developed climate scenarios by analyzing current weather conditions and changes in climate variables, such as temperature and precipitation (rainfall). The IMN’s most recent climate scenarios were published in a 2021 report, which presents information on the current climate and future forecast based on and then compared to the current climate. The IMN’s climate scenarios were calculated on the basis of two greenhouse gas emission estimates: the first (RCP-2.6) is rooted in the premise that emissions are reduced to near zero in the future; the second (RCP-8.5) is based on a premise that no action is taken to reduce emissions and emissions increase over time. The table below presents the report’s most relevant results, which will facilitate an understanding of the behavior of climate change in the southern Caribbean region.

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58 For more information on climate change in Costa Rica, visit the Climate Change Directorate’s page at: https://cambioclimatico.go.cr/.
59 Agard et al., “Appendix II: Glossary.”
60 Most of the greenhouse gases present in the atmosphere today are due to human activity and their high concentrations are destabilizing the climate.
<table>
<thead>
<tr>
<th>Current climate</th>
<th>Temperature</th>
<th>Precipitation (Rainfall)</th>
<th>Seasons</th>
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<td></td>
<td>The average annual temperature of the Caribbean slope is between 20.3°C and 29.3°C, approximately 68.5°F to 84.7°F.</td>
<td>The climate of the Caribbean slope is characterized by being relatively humid year-round and does not present any completely dry months.</td>
<td>The driest months (receiving between 100 and 200 mm monthly) are February-March and September-October, with the rainy months interspersed between these two periods.</td>
</tr>
<tr>
<td>Future climate in a low-emissions scenario</td>
<td>In the short, medium, and long term, an increase of temperature is expected along the southern Caribbean slope. An increase of 1 to 2°C is projected across the country.</td>
<td>In the short (2010-2039), medium (2040-2069), and long (2070-2099) term, annual rainfall is expected to decline along the southern Caribbean slope.</td>
<td>June-November: A slight increase in rainfall is projected during this time frame over all periods. December-February: A slight increase in rainfall is projected during this time frame in the short and medium terms, with a slight decrease projected in the long term.</td>
</tr>
<tr>
<td>Future climate in a high-emissions scenario</td>
<td>In the short, medium, and long term, an increase of temperature is expected along the southern Caribbean slope. In the short term, a greater rise in temperature is expected in the Caribbean and northern region as compared to the rest of the country. An increase of 3.8-4.8°C is projected across the country.</td>
<td>In the short, medium, and long term, annual rainfall is projected to increase along the southern Caribbean slope.</td>
<td>September-November: An increase in rainfall is projected during this time frame over all periods. December-February: Rainfall is projected to decline over all three time periods.</td>
</tr>
</tbody>
</table>

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62Meteorological Institute.
63“CLIMATE AND THE CLIMATE REGIONS of COSTA RICA.”
64Alvarado Gamboa, “Climate Change Projections for Costa Rica (RCP-2.6 and RCP-8.5 Scenarios).” Page. 29-31
65Alvarado Gamboa. Pag. 32-33
66Alvarado Gamboa. Pag. 33-36
67Alvarado Gamboa. Pag. 45-50
68Alvarado Gamboa. Pag. 50-53
69Alvarado Gamboa. Pag 56
Based on the information presented in the climate scenarios, we can identify the threats posed by climate change in a particular region or community. The Fourth National Communication indicates that the main threats of climate change in the Huetar Caribbean region (to which Cahuita belongs) are the following: hurricanes and tropical storms, heavier rains, gradual temperature rise, loss of biodiversity, soil and forest degradation, ocean acidification, sea level rise, and saltwater intrusion. Climate change risks can be classified into two broad categories: meteorological (such as hurricanes, heavy rains, and droughts) and non-meteorological (such as sea level rise and ocean acidification).

The following sections detail the threats most commonly mentioned by the inhabitants of Cahuita classified into two categories: extreme weather events and non-weather threats.
**Definitions**

Hurricane or tropical cyclone: A strong cyclonic-scale disturbance originating over tropical oceans. A tropical storm becomes a hurricane when it exceeds a certain wind speed threshold.74

Rainstorm: Persistent and variable rainfall lasting more than 24 hours and up to several consecutive days.75

Heavy rains: The rain rate intensity ranges from light to torrential. Heavy rains have an intensity of over 15 mm/h but less than or equal to 30 mm/h; very heavy rains have an intensity of over 30 mm/h but less than or equal to 60 mm/h; and torrential rains have an intensity of over 60 mm/h.76

Flood: An overflowing of the normal confines of a river or other body of water or water accumulation in areas that are not normally submerged.77

Drought: The prolonged absence or marked deficiency of precipitation as compared to the historical average. A period of abnormally dry weather sufficiently prolonged for the lack of water to cause serious hydrologic imbalance in the affected area.78

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**3.1 Extreme Weather Events (EWE)**

An EWE is a weather event whose magnitude falls outside the range of what is considered “normal.”72 EWEs consist of two components: a large-scale atmospheric phenomenon (such as cold fronts or tropical storms) and impact-generating weather events (associated with any element of the climate, such as rain or temperature, including both heavy rains and drought).73

In Costa Rica, the most frequently occurring impact-generating weather phenomena between 1980 and 2017 were: tropical waves, low pressure areas, intertropical convergence zones, and troughs.79 Other impact-generating weather events recorded between 1980 and 2017 include: hail, thunderstorms, rainstorms, and heavy rains.

The province of Limón recorded the greatest number of impact-generating atmospheric phenomena and weather events between 1980 and 2017.80 Most of these events were concentrated between the months of November and February (historically the rainiest months in the area).81 On the other hand, dry events were also recorded in the region between 1988 and 2017.82 It should be noted that the events related to both an excess and deficit of rain were confirmed by the testimony collected.

Below, we detail the main EWEs mentioned by the inhabitants of Cahuita and its surroundings areas during the field visits.
Rainstorms, Heavy Rains, and Floods

The heavy rains that fall during rainstorms can trigger flooding. In the Caribbean, these occur mainly at the beginning of the year, which coincides with the area’s wettest months. Historically, the Huetar Caribbean region has always been prone to events such as flooding, landslides, and soil saturation, which is very relevant in analyzing the impacts of climate change as these events could become worse in light of either climate scenario for Costa Rica. Cahuita center is not as affected by floods due to its topography, which prevents buildings from flooding with heavy rains, however, cases of flooded buildings and roads have been reported in the neighboring areas.

The community’s perception of flood propensity is on the rise, especially in the district’s mountainous areas. Similarly, the residents of Cahuita and surrounding areas have observed a change in the speed at which floods occur given a certain period of rain (i.e., rains are more intense). In response to this reality, the work of the Municipal Emergency Committee now includes new risks, such as floods, landslides, and strong winds.

Cahuita resident testimony about rainstorms, heavy rains, and floods

“We at the Municipal Emergency Committee specialize in floods […] Over the last five years we implemented a number of changes at the canton level in terms of emergency management because the coast is being affected, which was not the case before. […] because we can get floods, we can have landslides, and we are beginning to respond to strong winds.”

Source: Talamanca Municipal Emergency Committee member, Interview, 2021

“It used to rain for four weeks, two weeks before you’d see a flood. Now it only rains for four or five hours.”

Source: Cahuita native senior citizen, Interview, 11/06/2021

“I used to say, ‘we don’t see flooding in Cahuita’ but when it rains, the water—the house itself has never been flooded because it is elevated—but the back yard fills with water and they have cabins there”.

Source: Cahuita Climate Change group member, Interview, 11/05/2021

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85Biomarcc, “VULNERABILITY ANALYSIS OF COSTA RICA’S OCEAN AND COASTAL MARINE AREAS AGAINST CLIMATE CHANGE Technical Series 06.”
86Park ranger at Cahuita National Park, interview, 07/09/2021.
87Member of the Talamanca Municipal Emergency Committee, interview, 2021.
Drought

Despite belonging to a wet region, there is a history of irregular droughts due to climate variability. From 1988 to 2018, for example, there are records of loss and damage due to drought in the canton of Talamanca. In 2020, “moderate to severe drought conditions were recorded in Belize, northern Guatemala, eastern Costa Rica, Honduras, and Nicaragua”. With climate change, it is expected that drought conditions will occur more intensely in the future.

Cahuita center is at moderate-low risk for drought, but the risk increases slightly in the surrounding areas. These droughts affect the agricultural sector, such that the Ministry of Agriculture and Livestock (MAG, for its acronym in Spanish) considers it to be one of the main challenges in the area. MAG also identifies seasonal variations as a challenge for farmers, with drier Decembers and wetter Januaries, as well as a very marked dry season in April.

At the community level, residents have noticed a worsening of the water deficit at certain times over the past ten years. It is worth noting that differences of opinion exist within the community as to the causes of the water deficit. Some residents say it is due to climate change, while others say it is due to human activity and poor management.

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Cahuita resident testimony about droughts

“... because of our two rivers, we don't feel the effects of drought, no. But, perhaps, when the resources of these two rivers are greatly diminished, we can talk about climate effects.”

Source: Member of Bordon Community Aqueduct. Interview, 12/11/2021.

“Over the past ten years, we have absolutely seen climate change in terms of drought. This year, until now, a little less, we've gone almost one year without any rain [...]. We have a huge water problem because of that. Because the population is growing, but also because there is less water, you can feel the difference.”

Hurricanes

Along the Caribbean slope, tropical cyclone or hurricane season runs from June 1st to November 30th. While Costa Rica has been affected indirectly by a number of hurricanes, such as Juana in 1988 and Mitch in 1998, Hurricane Otto in 2016 was the first one to pass directly over the national territory. Since then, the country has been affected by other hurricanes, including Nate and Eta.

In both 2020 and 2021, the Atlantic Ocean hurricane season experienced an above-average level of activity. The year 2020 was unprecedented in terms of hurricanes passing through the Atlantic, with a total of 30 storms (surpassing the 2005 record) that culminated with Hurricanes Eta and Iota, both category 4, within a week of each other.

With climate change, it is expected that the frequency of hurricanes passing through the national territory will increase. On this subject, an expert from IMN says: “Costa Rica’s increased susceptibility to hurricanes is due to global warming—not only are temperatures rising in the atmosphere, but also in the oceans. As a result, these atmospheric phenomena become more frequent because the heat of the ocean is precisely their source of power.”

3.2 Non-Weather Threats Resulting From Climate Change

Given its location along the coast, climate change is manifested not only through weather events, but also through changes to the sea, coastline, and marine and coastal ecosystems. Studies such as project BIOMARCC’s “Vulnerability Assessment of Costa Rica’s Coastal and Ocean Areas to Climate Change” facilitate an understanding of the behavior of climate change in the country’s coastal areas. This study shows that, even before its publication in 2013, there were already signs of climate change and a “clear upward trend in sea surface temperature and coastal erosion” was evident. It is expected that these trends in climate change will exacerbate the adverse effects of other processes that are already leading to the loss of marine and coastal biodiversity, including deforestation, pollution, and overfishing.

Cahuita resident testimony about hurricanes

“Don't forget that before [Hurricane] Otto, Costa Rica supposedly fell outside the hurricane zone. We are now including it in our municipal emergency plans”.

Source: Talamanca Municipal Emergency Committee member, Interview, 11/06/2021.

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96 The Chaotic Future Could Be Reversed by Reducing Carbon Dioxide Emissions - Watch the Climate. Direct quote from Mr. Luis Fernando Alvarado, Coordinator of the Climatological Unit of the National Meteorological Institute (IMN, by its initials in Spanish), a climate exper.
100 BIOMARCC, SINAC, and GIZ. Pag. 1
The interviewees confirmed the phenomena of sea surface temperature rise, sea level rise, and coastal erosion, as well as the loss of marine and coastal biodiversity. The aforementioned non-weather threats resulting from climate change and related testimonies are detailed below.

**Sea Surface Temperature Rise**

Sea surface temperature is rising as a result of the high concentration of greenhouse gases (generated by human activity) in the atmosphere. This has important implications for the behavior of meteorological phenomena, as well as for diverse marine ecosystems, including coral reefs, seagrasses, mangroves, and estuaries.101

The results of project BIOMARCC102 confirm that the sea surface temperature is, in fact, rising. It was found that during the period from 2003 to 2011, the majority of the Exclusive Economic Zone near the Caribbean coast experienced some level of heat stress. Moreover, projections point to high thermal stress by the end of the century.103 Similarly, the seagrasses in some sectors of Cahuita National Park are experiencing moderate heat stress (see Figure 2). Heat stress is projected to increase in these sectors by the end of the century.104

Cahuita resident testimony about sea surface temperature rise

‘Climate change has forced me, at least in my case, to change where I fish for red snapper [Lutjanus peru] at a depth of 70-80 meters; now when I go fishing for red snapper, I have to go down to 250 or 280 meters. At those depths of 80-100 meters, it’s very difficult—when the sea has just calmed down and the water is still cold, you can fish there. But after the sea has been calm for two or three months, the water begins to warm and so the fish go down to 400 meters deep. That is where you can see the impact of climate change’.

Source: Cahuita native farmer/fisherman, Interview, 12/11/2021

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101BIOMARCC, SINAC, and GIZ. Pag. 7
102The Coastal Marine Biodiversity Project in Costa Rica. Development of Capacities and Adaptation to Climate Change (BIOMARCC)
103BIOMARCC, SINAC, and GIZ. “Analysis of the Vulnerability of the Oceanic and Marine Coastal Zones of Costa Rica Facing Climate Change.” Page 15
104BIOMARCC, SINAC, and GIZ. Pag. 26
Sea Level Rise and Coastal Erosion

Another resounding result of project BIOMARCC is in terms of sea level rise. Data covering the period from 1992 to 2011 show a clear rise in the sea level along the Caribbean coast (1-2 mm/year). Projections for this area show an upward trend in sea level of between 2.0 and 2.8 mm/year for the period encompassing 2010-2040.

Rising sea levels can increase the frequency of flooding, salinization of coastal wetlands and aquifers, and erosion and loss of beaches. The vulnerability of the coastal zone (both marine and terrestrial) is important given its role in the local economy, from the operation of Cahuita National Park and tourism, to artisanal and recreational fishing. Sea level rise and coastal erosion also affect endemic wildlife habitats, as well as turtle nesting sites. The towns of Limón and Cahuita are the most sensitive urban centers to sea level rise along the Caribbean coast.

Cahuita resident testimony about sea level rise and coastal erosion

“The center of Cahuita is situated on a rock platform, of dead coral from the rock, so perhaps the village itself is not that affected, but in the middle of the national park, we have lost infrastructure, trails, and rest or picnic areas inside the protected area; for example, 20 years ago, you could go camping in Puerto Vargas, but now all that area is lost—there's nothing.”

Source: Cahuita National Park ranger, Interview, 09/07/2021.

“Another sector that is part of the community of Cahuita, which is Playa Grande in Cahuita and Playa Negra in Cahuita, has had its coastline affected. For example, the soccer field, which used to be 20 meters from the sea, is now much closer. [...] Also, in the case of Puerto Vargas, we've lost the access road.”

Source: Cahuita National Park ranger, Interview, 09/07/2021.

“Manzanillo, for example, was an area, a perfect beach for leatherback nesting [Dermochelys coriacea], but unfortunately in two years, looking back just two years, when before there were maybe 100 turtles, now there are just 20. Erosion has been the main problem there. [...] I make my living from this, so it affects me and makes me sad.”

Source: Member of Turtle Rescue, Interview, 11/06/2021.
Moreover, in Cahuita, there are two critical points of coastal erosion: one in Cahuita National Park and the other in Puerto Vargas. At both points, the erosion rate tripled between 2005 and 2016. During this period, it was shown that Puerto Vargas beach and the surrounding area were two sectors that lost the most surface area of all the beaches studied. While the erosion of these areas cannot be attributed solely to the rising sea level, it does play a significant role.

Lost of Biodiversity

As previously stated, climate change can have varied effects on biodiversity, such as coral bleaching, changes in the behavior of species like sea turtles, changes in coastal vegetation, and habitat alteration, including habitat loss. Similarly, climate change-related phenomena can aggravate or accelerate processes that are already leading to the loss of marine and coastal biodiversity, such as overfishing, habitat destruction, and water pollution. Coastal erosion can lead to changes in coastal vegetation and habitat alteration.

The Cahuita National Park Management Plan classifies climate change as a high threat to the following elements of the park’s biodiversity: coral formations and associated fish, mangroves, patches of yolillo palm, and sea turtle nesting areas. Moreover, the plan classifies climate change as a moderate threat to bird feeding areas.

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*Cahuita resident testimony about the loss of biodiversity*

“In the sector of Playa Negra [...] when I was a child—we’re talking 30 to 40 years ago—you could go out to the reefs and get into the water; there were lots of snapper and lobsters there; there were coral reefs and seaweed, like Irish moss [Hydropuntia secunda].”


“I remember my husband used to go out fishing and he’d come back with a cooler full of fish. Now he goes out fishing and brings back eleven pounds, ten pounds... He has even gone out fishing and come back with less than a kilo.”

Source: Subsistence Fishing and Aquaculture Association member, Interview, 11/06/2021.

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110 Hernandez et al., Adaptation Based on Ecosystems: Alternative for the Sustainable Management of Marine and Coastal Resources of the Caribbean. Page 1
111 Biomarcc, “VULNERABILITY ANALYSIS OF COSTA RICA’S OCEAN AND COASTAL MARINE AREAS FACING CLIMATE CHANGE Technical Series 06.” Page 1
4. Loss and Damage Assessment

The concept of loss and damage is not formally defined within the United Nations Framework Convention on Climate Change (UNFCCC). However, a commonly accepted definition is to refer to loss and damage as the effects that people have not been able to cope with or adapt to, effects that cause irreparable damage or irreversible loss. These effects may be manifested as extreme weather events (hurricanes, floods, and others) or slow-onset phenomena (sea level rise, ocean acidification, etc.).

Loss and damage can be quantified in economic terms, but it also has a non-economic dimension. Aspects that can be considered non-economic include culture, traditions, languages, etc. It is also important to consider that loss and damage affects individual human rights and restricts well-being. Climate impacts can jeopardize civil and political rights, economic, social, and cultural rights, and even collective rights. As such, it is important to take a human rights-approach to our analysis in conjunction with the community to determine which elements of relevance have been affected.

In Costa Rica, there is limited data on the loss and damage caused by climate change. This lack of data is due, in part, to the fact that within the context of international climate governance, loss and damage is one of the least developed and prioritized issues. Moreover, there is a lack of clarity as to how to monitor, report, or respond to loss and damage.

While data are available on the loss and damage generated by major events for which an official emergency declaration was made in Costa Rica, specifically data related to the economic cost incurred, these data are not necessarily related to climate change, nor do they reflect the dimensions we have mentioned. Across Central America, there is a lack of information, especially on non-economic loss and damage and slow-onset events. Against this backdrop, below we break down the information that is available in the records of different Costa Rican public institutions.

4.1 Economic Loss and Damage

The Office of the Comptroller General of the Republic estimated that in 2010, the annual cost of repairing and rebuilding infrastructure affected by floods, rainstorms, and drought in Costa Rica totaled ₡202,681 million (approximately $385,470,000), equal to 1.01% of the national GDP. This represents an increase of over 22 times the annual repair and reconstruction cost incurred due to floods, rainstorms, and drought in 1988. Moreover, for the period encompassing 2011 to 2025, the Comptroller General estimated an increase in the costs incurred due to EWEs. It further states that “by 2025, in a conservative scenario, these costs would absorb between 0.68% and 1.05% of the GDP; while in a higher risk scenario, they would be between 1.64% and 2.50% of the GDP.”

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113(Warner, K., Van der Geest, K., Huq, S., Harmeling, S., Kusters, K., de Sherbinin, A., & Kreft, S. "Evidence from the frontlines of climate change: Loss and damage to communities despite coping and adaptation" 2012, Pag. 20)
114(Adrian Martinez 2021, Pag. 206)
116(Toussaint, P., & Martinez Blanco, A. 2019, Pag. 2)
117(Adrian Martinez 2021, Pag. 6); (Barnett, J., P. Tschakert, L. Head, and W.N. Adger 2016) (Tschakert, P. et al., 2017)
119CGR (Office of the Comptroller General of the Republic). Page 5
MIDEPLAN has a database of natural phenomena-related loss dating from 1988 to 2020 and contains “data on the economic impact of hydrometeorological and tectonic events with an emergency declaration, by territorial unit and sector.” This database contains 16 records of hydrometeorological events in the district of Cahuita between 1993 and 2015, the loss and damage from which totaled more than $3,000 million, approximately $5,700,000 (these costs are broken down by event in Annex 1).

A study conducted by IMN found that between 1980 and 2017, 1,311,024 people in Costa Rica were affected by EWEs, of whom 96,490 came from the province of Limón. Considering that death is the greatest consequence of an EWE, it was determined that the province of Limón is in third place by number of persons who died in this same period. At the provincial level, Talamanca is the canton with the most EWE-related deaths (14 people between 1980 and 2017).

4.2 Red Alert Emergency Situation in Talamanca

In July 2021, the canton of Talamanca was affected by heavy rains. The impact was such that the government of Costa Rica issued an emergency declaration for 14 cantons, including Talamanca. The chronological order of events is shown below.

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121 For more information, visit: https://mideplan.go.cr/perdidas-ocasionadas-fenomenos-naturales
122 MIDEPLAN, “Losses Caused by Natural Phenomena | Ministry of National Planning and Economic Policy.”
124 National Meteorological Institute. Page 84
125 National Meteorological Institute. Pages 87-88
Consequences of the Emergency in Cahuita

The heavy rains caused flooding that affected public roads, aqueduct infrastructure, housing, road infrastructure, and agricultural lands. Moreover, landslides, rising rivers and fluvial floods, falling trees, road and drain undermining, and the undermining of bridges and walls were also reported.

The total expenditure for the red alert response in the canton of Talamanca was ₡73,461,316.26 ($118,600). This amount included fuel, prepared foods, other food, shelter hygiene, office supplies, shelter supplies, pet food, community aqueducts, and fuel for machinery.

The loss and damage reported by the Talamanca Municipal Emergency Committee is detailed below. It should be noted that this information corresponds to the initial emergency response and the immediate consequences of the events in July 2021. However, there is no official record of any long-term effects.

1. Impact on Public Infrastructure

a. Seventeen damaged (blocked and/or waterlogged) road segments were reported in the district of Cahuita, comprising approximately 136.2 km of municipal roadway.

b. In San Rafael de Bordon, Tuba Creek, and Playa Negra, bridge erosion and blockages were reported of both municipal roads and the national highway.

c. Aqueducts were out of commission due to undermining, pipe loss, and damage to water outlets. This left people without access to potable water.

d. Sewer line damage was reported from sedimentation and erosion of the line, erosion and exposure of the heads, pipe displacement and detachment, undermining of the sewer line, and waterlogging and sedimentation.

e. Damage to electrical infrastructure, mainly to posts and power lines, causing blackouts.

f. In Cahuita National Park, the access road to Puerto Vargas was flooded and destroyed.

g. Telephone exchanges were offline and residents had no access to Internet.

h. For road rehabilitation (including roads, bridges, and sewers) a budget of ₡43,727,490 ($70,600) was approved.

Cahuita resident testimony about these events

“...the recent flooding was unprecedented, from Tuba Creek to Sixaola, places that had never flooded before”.

Source: Cahuita Association for Female Entrepreneurs member, Interview, 09/07/2021.

“(…) we never expected such intensity in that season, that was a surprise. It fell to stay and damaged bridges, homes, the entire electrical system, which obviously affected us indirectly in terms of food supply, fuel, construction, all of it”.

Source: Member of Turtle Rescue, Interview, 11/06/2021.

“After the flooding in July, the plantain, banana, and cacao producers were unable to get their production out”.

Source: Talamanca-Caribbean Biological Corridor Association member, Interview, 11/05/2021.

126 All the information detailing the events and consequences of July were obtained from Situation Report N°16.
2. Impact on People

a. No injured, dead, or missing persons were reported.

b. In Cahuita, 1,350 people (270 families) were isolated or incommunicado.

c. At the canton level, 613 persons had to be temporarily relocated.

d. 106 education centers in the canton of Talamanca were temporarily closed due to flooding. In total, 10,761 students, 740 teachers, and 43 administrative staff were affected by the suspension of lessons.

e. At the canton level, 121 people were evacuated and 137 people were rescued.

f. 512 food parcels, 22 foam mattresses, and 22 blankets were distributed in Cahuita to affected persons. Additionally, 1,266 kg of pet food was distributed.

3. Impact on Property and Housing

a. In Cahuita, there were reports of 42 homes that flooded with a low level of damage and 113 homes with moderate damage.

4. Impact on Businesses and Private Property

a. At the canton level, 70 businesses reported being affected. A total of ₡88,414,280 ($142,750) in losses were reported.

b. Two gas stations in Cahuita reported fuel shortages due to the road closures.

c. 300 hectares of agricultural lands were affected.

A member of the Talamanca Municipal Emergency Committee relates her experience in July in an interview held on November 6, 2021:

“In July [2021] we were very affected across the canton: we lost the main access by bridge, without the presence of any support agency—we had neither CONAVI nor the fire department nor the Red Cross, nothing. For 5 days, we handled the emergency with what we had in Talamanca: it was very complicated. The [Municipality] was working 24 hours a day; all the staff was working like crazy, because there were over 600 people in total in shelters; there were some rescues—of which there are videos on Facebook—at the borders, we were pulling out children and grandparents with only a rope and the current was incredible [...] We have seen clearly that, for example, my neighborhood [Bordon] was affected, those in Guayabo, a bit of everywhere, Limonal and everything, there were small landslides; sectors along highway 36 were completely flooded.”
The testimonies of Cahuita residents indicate that the flooding that occurred in July 2021 was unprecedented as areas that had never flooded before became inundated. While it is impossible to attribute a percentage of blame for the events that took place to climate change, what is clear from the literature and observations of the area's residents is that this type of event will continue to occur more often and more intensely.

Below is a visual record of the events of July 2021 in Talamanca.

![Figure 3: Flooded agricultural plantation. Source: Municipality of Talamanca.](image1)

![Figure 4: Damaged road and pipe displacement. Source: Municipality of Talamanca.](image2)

The national highway sustained major damage in July 2021 that has since been repaired; however, the repairs were only temporary and there are still signs of damage to the bridge and main road in February 2022.

![Figure 5: Flooded National Police Station. Source: Municipality of Talamanca.](image3)
Video 1: February 2022, La Estrella river bridge, Penshurt, Source: La Ruta del Clima Association.

Figure 6: September 4th, 2021, national highway near La Estrella River bridge in Penshurt, damage caused by flooding. Source: La Ruta del Clima Association.

Figure 7: February 3rd, 2022, national highway near La Estrella River bridge in Penshurt, damage caused by flooding. Source: La Ruta del Clima Association.
4.3 Non-Economic Loss and Damage

Loss of life, health, territory, traditional knowledge, culture, biodiversity, and ecosystem services are just some aspects with value that are not traded in the market. These are known as non-economic (or intangible) losses and are rarely included in climate change impact assessments and, consequently, are usually not addressed in risk analysis or policy formulation. Economic or physical loss and damage can also cause intangible loss and damage to cultural values, traditions, sense of identity, and sense of place. These losses can occur in three different areas: in individuals, society, and the environment. 

One example is cultural loss and damage, which is also understudied and underestimated, especially in the case of gradual losses—those of which the reproducers of such culture are not immediately aware.

Non-economic loss has a significant impact on human well-being, despite not having a market value. Non-economic losses may become even more significant than economic losses in countries of the Global South, and while methodologies exist to assign “value” to these losses, it is a very challenging task due to the level of uncertainty and the value judgments that must be made with respect to what is lost or damaged.

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Figure 8: Non-economic loss and damage categories. Source UNFCCC (2013)

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Thomas and Benjamin 2020
UNFCCC (2013). “Non-economic losses in the context of the work programme on loss and damage.”
UNFCCC. 2013. “Non-economic losses in the context of the work programme on loss and damage.”

Community Perspectives: Loss and Damage in Cahuita, Costa Rica
Cultural Consequences: Gastronomy

In addition to dietary homogenization, the effects of climate change on biodiversity can impact food and nutrition security by decreasing the quality and diversity of food products available to the detriment of foods rooted in local cultures.

Two Afro-descendant elders with extensive fishing experience in Cahuita commented that traditionally a seaweed, commonly known as Irish Moss, was consumed as part of the local diet; it was dried and then used to prepare nutritious drinks. In Ireland, a similar seaweed exists, with the scientific name Chondrus crispus, that is also edible and used to prepare drinks. However, the seaweed mentioned by the interviewees is likely Hydropuntia secunda or other red algae known for its thickening agents and of which there are references in the Caribbean region, albeit few.

This is an example of an underutilized species today, that is the basis of traditional preparations by indigenous peoples, peasants, or Afro-descendants, and is increasingly less known and more and more threatened by the shifts in climate conditions that are affecting these ecosystems. These statements point to it being a potential loss suffered by the community with non-economic implications due to its ties to the culture.

There are also threats to more common, widely known species, both in and outside the country. A food like the plantain (Musa paradisiaca - AAB hybrid) is a staple of Costa Rican cuisine and a large quantity of its production comes from the southern Caribbean. This crop is affected in at least three ways:

- When there is a water deficit, the fruit fails to grow to the ideal size for sale.
- Changes in temperature decrease yield and contribute to the proliferation of pathogens, especially in conventional crops.
- The marketing chain depends on the road infrastructure for transport.

In this way, the extreme hydrometeorological events that occurred recently caused a plantain shortage even in a producing region. Research entities, MAG, and banana companies are aware of the situation and are studying and disseminating effective practices for crop adaptation, despite the lack of access to documentation supporting this loss and damage.
During the fieldwork conducted, there were signs that this has disrupted the preparation and availability of the Plantintá (plantain tart), a food that is very much enjoyed in Costa Rica: baked wheat flour pastries with a spiced ripe plantain filling.

Both cases demonstrate the need to pay attention to the effects of climate change on Caribbean and Costa Rican cuisine in general, while concrete measures are taken to address cultural loss and damage. While implementing methodologies to quantify loss and damage may become relevant for the international reparation mechanism, it is even more important to monitor the impacts of climate change on the non-economic dimensions to record and attempt to prevent loss and damage.
6. Conclusions

Community perspectives on the impacts of climate change are essential in determining the scale and ramifications of the resulting loss and damage. Similarly, these perspectives help to establish more precisely how these phenomena are manifested and their consequences on the social system.

This case study establishes the underlying historical, economic, and socio-environmental context for analyzing the impacts of climate change-related phenomena, which is crucial in assessing the effects of climate change and its consequences in the form of loss and damage. The community is the legitimate base unit for leading these assessments of loss and damage as it represents the collective whole as the victim of climate change. Any assessment or investigation of the losses and damages caused should include its involvement. In this study, community engagement was actively sought and, in turn, was fostered through meetings and interviews with key community stakeholders. Based on this effort, the study identified evidence of economic and non-economic loss and damage.

The study also identified a number of preexisting elements that heighten community vulnerability, such as the historical exclusion of community members from decision-making processes regarding the development model; lack of diversity in the local economy; limited labor supply; and dependence on large-scale monoculture and tourism as major economic engines. These socio-economic conditions, together with the impacts of climate change, put the community of Cahuita at risk.

Through field work and dialogue, we were able to observe a relationship between the projected impacts of climate scenarios and the experiences already felt in the southern Caribbean. The impact of phenomena such as rising ocean temperatures, sea level rise, coastal erosion, and loss of marine and coastal biodiversity, was evidenced on community well-being. These phenomena are among those projected by the climate scenarios for the area. The study has allowed for these projections to be posed as concrete examples and experiences, which can serve to transform the discussion on the governance of loss and damage into a more pragmatic and local exercise.

The manifestations of climate impacts such as EWEs or slow-onset events have caused local organizations and institutions to surpass their response capabilities. New problems such as flooding in areas that historically have been insusceptible to these events or drought-induced drinking water shortages present new challenges for organizations and individual well-being. The lack of human resources, capacities, or funding to address emerging climate change issues creates stress on the community and institutions. Moreover, the necessary tools to monitor or report climate change-related loss or damage are unavailable.

A key theme of the historical and cultural development of the community of Cahuita has been the struggle for land, identity, and well-being. The impacts of climate change have an adverse effect on several key elements of the community, including the integrity of its main economic engine: Cahuita National Park. Moreover, they threaten the community’s cultural property, lessen the availability of basic resources such as water and food supplies, and have caused the loss of territory at the hands of coastal erosion, thereby threatening the community’s territorial core. Climate change is a threat existing as a result of human action against which Cahuita bears a negligible share of responsibility and a limited capacity to curtail the carbon emissions emitted by the larger northern economies. Still, this study illustrates that climate change is causing loss and damage to life-critical elements. This is an unfair challenge that is jeopardizing the well-being, culture, and future of the community.
The evidence collected through this study creates a basis for deepening empowerment actions and dialogue with community stakeholders in Cahuita on the implications of climate impacts. It also points to the need for further research and data generation regarding loss and damage in Costa Rica. The local testimonies and knowledge, in the absence of a formal climate change-related loss and damage monitoring, evaluation, and reporting system, enable us to draw a preliminary picture of the scale of climate risks facing the people and illustrate the need for reparation for loss and damage. Finally, this case study seeks to drive research on the adverse effects of climate change on communities.

Climate justice is imperative, and harm to our human rights as a result of climate change is a reality. This study seeks to contribute elements to contextualize this harm. This exercise is merely one step in claiming—on more precise and identifiable grounds—the duty of public authorities to monitor, record, and report all dimensions of loss and damage. Moreover, it furnishes a solid foundation for initiating the claim for justice and redress owed to communities like Cahuita by the international community and UNFCCC with respect to loss and damage.
References


Olivia Serdeczny. 2018. "Non-Economic Loss and Damage and the Warsaw International Mechanism," Loss and Damage from Climate Change. https://doi.org/10.1007/978-3-319-72026-5_8


Tschakert, P. et al., 2017. "Climate change and loss, as if people mattered: Values, places, and experiences." Wiley Interdisciplinary Reviews: Climate Change, 8(6), e476. doi:10.1002/wcc.476.


Warner, K., Van der Geest, K., Huq, S., Harmeling, S., Kusters, K., de Sherbinin, A., & Kreft, S. 2012. Evidence the frontlines of climate change: Loss and damage to communities despite coping and adaptation. Pg. 20
### Anexos

#### Apendix 1. Loss and Damage Due to Hydrometeorological Events in the District of Cahuita, 1993-2015

<table>
<thead>
<tr>
<th>Event</th>
<th>Subcategory</th>
<th>Starting Year</th>
<th>Starting Month</th>
<th>Length in days</th>
<th>Amount in Colones</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulation plan for the communities in Turrialba, Jiménez, Paraiso, Sarapiquí, Siquirres, Matina, Limón and Talamanca.</td>
<td>Not specified</td>
<td>1993</td>
<td>12</td>
<td>6</td>
<td>6,979,518.79</td>
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<tr>
<td>Floods in the national territory caused by the tropical depression N° 12.</td>
<td>Water Level Rise</td>
<td>1994</td>
<td>11</td>
<td>7</td>
<td>41,051,464.85</td>
</tr>
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<td>Regulation plan for reconstruction of flood impactas in the Caribbean and northern region caused by heavy rains from Aug. 3 to Aug. 7, 1997.</td>
<td>Not specified</td>
<td>1997</td>
<td>8</td>
<td>5</td>
<td>198,065,269.59</td>
</tr>
<tr>
<td>Mass movement</td>
<td>Not specified</td>
<td>1997</td>
<td>8</td>
<td>5</td>
<td>37,507,490.56</td>
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<tr>
<td>General regulation plan to rehabilitate and reconstruct of damage caused by semi-permanent and variable intensity rainfall on the Caribbean and northern region.</td>
<td>Not specified</td>
<td>2001</td>
<td>11</td>
<td>38</td>
<td>28,248,507.77</td>
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<tr>
<td>Regulation plan for emergency attention due to flooding in the Atlantic watershed.</td>
<td>Not specified</td>
<td>2002</td>
<td>11</td>
<td>11</td>
<td>43,904,109.94</td>
</tr>
<tr>
<td>Flood</td>
<td>Not specified</td>
<td>2002</td>
<td>11</td>
<td>11</td>
<td>44,315,915.40</td>
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<tr>
<td>Flooding on the Caribbean and northern region.</td>
<td>Not specified</td>
<td>2003</td>
<td>12</td>
<td>3</td>
<td>1,617,220.63</td>
</tr>
<tr>
<td>Event</td>
<td>Subcategory</td>
<td>Starting Year</td>
<td>Starting Month</td>
<td>Length in days</td>
<td>Amount in Colones</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-------------</td>
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<td>---------------------</td>
</tr>
<tr>
<td>Flooding in the provinces of Limón, Heredia, Cartago and Alajuela.</td>
<td>Flood</td>
<td>2005</td>
<td>1</td>
<td>14</td>
<td>333,397,132.88</td>
</tr>
<tr>
<td>General emergency plan for flooding on the Caribbean region due to the interaction of a low and high pressure executive orders 34906 and 34973.</td>
<td>Flood</td>
<td>2008</td>
<td>12</td>
<td>15</td>
<td>39,779,095,54</td>
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<tr>
<td>Flooding due to a cold front.</td>
<td>Not specified</td>
<td>2009</td>
<td>2</td>
<td>7</td>
<td>19,111,636.95</td>
</tr>
<tr>
<td>Water Level Rise</td>
<td></td>
<td>2009</td>
<td>2</td>
<td>7</td>
<td>23,480,272.01</td>
</tr>
<tr>
<td>Flood</td>
<td></td>
<td>2009</td>
<td>2</td>
<td>7</td>
<td>524,683,421.15</td>
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<tr>
<td>Flooding and landslides due to heavy rain and low pressure system in the province of Limon and communities of Sarapiqui and Turrialba.</td>
<td>Not specified</td>
<td>2015</td>
<td>6</td>
<td>8</td>
<td>1,445,209,513.82</td>
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</table>

Chart: Accounting for economic losses caused by hydrometeorological events in the Cahuita district.