

LOCAL MONITORING OF CLIMATE IMPACT:

A COMMUNITY APPROACH
IN COSTA RICA



Climate Justice in Latin America Series No. 25

LaRutadelClima

■■■ HEINRICH BÖLL STIFTUNG
SAN SALVADOR
El Salvador | Costa Rica | Guatemala |
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Credits

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Likewise, we extend our gratitude to the members of the community of Cahuita and Puerto Viejo in Talamanca, as well as to the youth and officials of Cahuita Rural High School, who, with their collaboration and enthusiasm, have been an integral part of the implementation of loss and damages monitoring in the context of the climate crisis we are facing.

Their involvement has been key to making the realities of communities visible and ensuring that their voices are heard at a crucial moment for the future of our environment. Thanks to their experience, local knowledge, and commitment to the cause, we have established effective monitoring mechanisms that generate valuable data and contribute significantly to collecting information on climate impacts in these communities.

The accompaniment provided by all the people involved has been indispensable to advancing the implementation of a robust monitoring mechanism, which not only responds to the needs of the communities but also strengthens the process of adaptation and resilience to the effects of climate change.

Their support and collaboration are a clear indication of the importance of community action to face climate change. Thanks to your efforts, we continue to move toward a fairer and more resilient future for us all.

Acronyms:

BD:

Database.

IPCC:

Intergovernmental Panel on Climate Change.

LRC:

La Ruta del Clima.

Basic concepts

Adaptation: In human systems, the process of adjustment to actual or expected climate and its effects to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate and its effects¹.

Biodiversity: "Biological diversity" means the variability among living organisms from all sources including, inter alia, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; it includes diversity within species, between species, and of ecosystems².

Impact chain: The sequence of interrelated effects that are triggered by climate phenomenon or climate change. These chains illustrate how a weather event or climate change, such as rising temperatures or more frequent storms, can generate a series of direct and indirect impacts on different systems, whether environmental, social, or economic³.

Climate change: A change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer.

Climate change may be due to natural internal processes or external forcings such as modulations of the solar cycles, volcanic eruptions, and persistent anthropogenic changes in the composition of the atmosphere or land use. Article 1 of the UNFCCC defines climate change as "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere, and which is in addition to natural climate variability observed over comparable time periods". The UNFCCC thus makes a distinction between climate change attributable to human activities altering the atmospheric composition and climate variability attributable to natural causes⁴.

Disaster: A serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability, and capacity, leading to one or more of the following: human, material, economic and environmental loss and impacts⁵.

Greenhouse gas: A gaseous constituent of the atmosphere, both natural and anthropogenic, that absorbs and emits radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, the atmosphere, and clouds. This property causes the greenhouse effect⁶.

1 IPCC, 2018: Annex I: Glossary [Matthews J.B.R. (ed.)]. In: Global Warming of 1.5°C, An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development and efforts to eradicate poverty [Masson-Delmotte V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor y T. Waterfield (eds.)].

2 United Nations, 1992: Article 2: Use of Terms. In: Convention on Biological Diversity, United Nations, pages 3-4.

3 IPCC (2022). Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press. <https://doi.org/10.1017/9781009325844>

4 Ibid 1.

5 United Nations General Assembly (2016). Report on climate change and sustainable development (A/71/XXXX). Retrieved from <https://www.un.org/es/ga/71/docs/>

6 Ibid 1.

Loss and damages: Damage is defined as the "negative impacts for which remediation or restoration is possible," while loss is the "negative impacts for which remediation or restoration is impossible." This includes both economic and non-economic elements (cultures, traditions, languages and forced displacement to save one's life)⁷.

Drought: A prolonged period of water shortage that could adversely affect natural and human systems. This phenomenon occurs when a region experiences rainfall significantly below its normal level, generating impacts on water supply, agriculture, ecosystems, and the economy⁹.

Heatwave: An extended period of abnormally hot temperatures compared to typical values for a region and time of year. According to the IPCC, a heatwave is characterized by a duration of several consecutive days in which minimum and maximum temperatures exceed certain thresholds that, depending on the local context, could have serious effects on human health, ecosystems, and infrastructure.⁸.

⁷ Ibid 1.

⁸ IPCC. (2021). Climate Change 2021: The Physical Science Basis. The Working Group I contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (V. Masson-Delmotte, P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J. B. R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu y B. Zhou, eds.). Cambridge University Press. <https://www.ipcc.ch/report/ar6/wg1/>

⁹ IPCC. (2022). Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegria, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem y B. Rama, eds.). Cambridge University Press. <https://www.ipcc.ch/report/sixth-assessment-report-working-group-ii/>

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Introduction to Research

La Ruta del Clima (LRC) has developed a methodology that seeks to monitor, report, and build evidence of climate impacts to create the foundations of a community-based Loss and Damages Information System focused on Community Science and Knowledge Management. This methodology integrates gender perspective, community participation, and data management, promoting an active participation of the community in the collection and analysis of information on loss and damages.

Community Science recognizes the right of communities to be protagonists in the generation of knowledge and in the proposal of solutions adapted to their realities.¹⁰

This approach encourages collaboration with local communities as active agents, and values community knowledge, promoting activism and advocacy processes for climate justice.

In the context of the communities of Costa de Pájaros and Manzanillo in Puntarenas and Cahuita and Puerto Viejo in Limón, this methodology has been particularly relevant, given that these communities are vulnerable to various weather events such as storms, floods, and droughts. The information gathered through the process has made it possible to assess the damage caused by these events.

This methodology has been implemented in areas historically affected by adverse weather phenomena, especially tropical storms, rising sea levels, and extreme temperature changes that have severely damaged infrastructure and people's livelihoods. The implementation of the methodology in these areas has provided detailed information on the impact of climate change on various sectors, from agriculture to physical and emotional health. The monitoring of loss and damages in these areas is essential in giving a voice to the communities, allowing them to identify firsthand the effects they suffer.

¹⁰ Golombek, D. (2017, February 16). What is citizen science and how does it promote open knowledge? Open to the public. Retrieved from <https://blogs.iadb.org/abierto-al-publico/que-es-la-ciencia-ciudadana>

1. "The disaster is not natural, it's political."

The loss and damages caused by climate change are the result of the economic actions of certain people groups. The economies of the Global North have grown rich for decades by burning fossil fuels, the main source of climate change-causing emissions. The gases released to generate the energy needed for large economies produced tangible profits and benefits for certain countries.

The release of these gases changed the constitution of our atmosphere and, consequently, has generated a series of changes in the climate and other geophysical systems that interact with our ecosystems and human systems. This change has adverse effects that manifest in a differentiated manner, i.e., the negative consequences are not necessarily suffered by those who released the greenhouse gases (GHG).

Regions like Central America that historically have had a low carbon footprint are experiencing a disproportionate manifestation of these adverse effects. This differentiated and non-linear impact passes the bill for the negative externalities of the large economies of the North to communities that have not enjoyed or used a large number of sources of greenhouse gas emissions. This unequal interaction sets the basis for discussing two issues: loss and damages and climate justice.

Since 1992, the United Nations Framework Convention on Climate Change (UNFCCC) has had the objective of stabilizing greenhouse gas concentrations in the atmosphere.¹¹

However, GHG concentration levels continue to rise, surpassing the levels that existed in the last 2 million years.¹²

The continued increase of GHG in the atmosphere leads to greater climate change. In the near term, global warming is set to exceed 1.5 °C in the lowest GHG emissions scenario and will fall below this temperature through the end of the 21st century in some scenarios and trajectories.¹³

GHG concentrations have not stabilized in over 30 years and ecosystems have been unable to adapt naturally. The IPCC AR6 mentions, with high confidence, that when global warming reaches 1.5 °C, natural adaptation will face hard limits. These limits drive a high risk of biodiversity decline, mortality, species extinctions, and loss of livelihoods.¹⁴

The Paris Agreement, whose purpose is to improve implementation of the UNFCCC and its objective, has also made little difference in the threat of climate change.¹⁵ In fact, the IPCC states that climate change has caused "widespread adverse effects and related loss and damages to nature and people beyond the natural climate variability, have reduced vulnerability."¹⁶ It is also a fact that across sectors and regions, the most vulnerable systems and people are disproportionately affected. Some of these impacts are already irreversible, given that both human and natural systems have exceeded their capacity to adapt.¹⁷

¹¹ UN, 'UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE' Art. 2.

¹² Katherine Calvin and others, 'Summary for Policymakers. IPCC, 2023: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (Eds.)]. IPCC, Geneva, Switzerland.' (First, Intergovernmental Panel on Climate Change (IPCC) 2023) <<https://www.ipcc.ch/report/ar6/syr/>> accessed 30 September 2024 A.1.2.

¹³ 3

¹⁴ Intergovernmental Panel On Climate Change (Ipcc), Technical Summary. Climate Change 2022 – Impacts, Adaptation and Vulnerability: Working Group II Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. (1st edn, Cambridge University Press 2023) <<https://www.cambridge.org/core/product/identifier/9781009325844/type/book>> accessed 30 September 2024 TS.C.1.2.

¹⁵ UNFCCC, 'Paris Agreement' (UNFCCC 2015) Art. 2.

¹⁶ Calvin and others (n 2) B.1

¹⁷ *ibid* B.1.

2. What is loss and damages?

In this context and from a political perspective, we can say that loss and damages result from the failure of the UNFCCC and the Paris Agreement, which have been unsuccessful in preventing dangerous anthropogenic interference in the climate system. From a technical perspective, loss and damages is the result of climate impacts and the risk of extreme or slow-onset events.¹⁸

The literature defines loss and damages as impacts with which people cannot cope or to which they cannot adapt, repairable damage, or irreversible loss.¹⁹

These climate impacts that affect people and their territories can mean the loss of economic and non-economic elements such as culture, traditions, languages, and even forced displacement.²⁰

Damage is considered "reversible through risk reduction, repair or restoration initiatives" and loss is considered "irreversible, in the sense that they cannot be restored or repaired".²¹

"The severity, intensity, and frequency with which these losses and damages materialize in the lives of the most vulnerable communities is testimony to the limits of adaptation to climate change, the lack of funding to address the loss and damages, and the absence of a fair and effective structural response from the international community to deal with the results of residual risk".²²

18 Reinhard Mechler and others, Loss and Damage from Climate Change (2019) ch Chapter 1 Science for Loss and Damage. Findings and Propositions <<https://doi.org/10.1007/978-3-319-72026-5>> 1.3.1.

19 Koko Warner and others, 'Evidence from the Frontlines of Climate Change: Loss and Damage to Communities despite Coping and Adaptation' (United Nations University Institute for Environment and Human Security (UNU-EHS) 2012).

20 Mechler and others (n 8) ch Non-economic Loss and Damage and the Warsaw International Mechanism.

21 Petra Tschakert and others, 'Climate Change and Loss, as If People Mattered: Values, Places, and Experiences' (2017) 8 Wiley Interdisciplinary Reviews: Climate Change 1.

22 Adrián Martínez Blanco, 'LOSS AND DAMAGE: An Introduction to Paragraph 51 and Compensation' <https://larutadelclima.org/wp-content/uploads/2024/03/Danos_y_Perdidas_lrc.pdf>.

3. Reparations in a context of Loss and Damages

Loss and damages from climate change are increasingly evident in vulnerable communities, especially in coastal areas such as Manzanillo and Cahuita, Costa Rica. The loss and damages not only affect ecosystems but also negatively affect key economic activities such as fishing and ecotourism, making local economies and people's quality of life more vulnerable. The scale of this loss and damages requires urgent and long-term measures to restore ecosystems and ensure the adaptive capacity of communities. To face this, communities have the right to climate reparations.²³

According to the report of the Intergovernmental Panel on Climate Change (IPCC), there is a need to address knowledge gaps around the implementation and strengthening of the global response to climate change.²⁴ In light of the above, it is necessary that developed countries assume their responsibility to finance climate reparations in developing countries, as part of their commitments under the **Paris Agreement**.

Simon Stiell, secretary of UN Climate Change, has highlighted the importance of climate finance as a key issue for achieving climate goals such as protecting vulnerable communities from the effects of climate change.²⁵

Various climate finance mechanisms, such as the Green Climate Fund, Biodiversity Finance Initiative, and the Adaptation Fund, allocate resources to projects that help affected communities. However, challenges remain for the effective implementation of these mechanisms, including bureaucratic obstacles and lack of access to information on available funds or how debt funds are to be delivered to the most vulnerable countries. The involvement of local communities, along with an inclusive and transparent approach, is crucial to the success of climate reparations and to ensuring that resources reach those who need them most. Considering this, the collection of evidence for the various reparation request processes is crucial and, with this in mind, we built the **Community Loss and Damages Information System** methodology.

Community Loss and Damages Information System

La Ruta del Clima (LRC) is developing a **Community Loss and Damages Information System**. This system is an initiative that proposes three fundamental processes, which facilitate **observation, identification, and registration** actions **at the community level**. These actions are essential to make phenomena visible that could otherwise be normalized due to lack of information, the systematic violation of human rights in local contexts, and the absence of comprehensive care. integral.

Figure 1. Community Information System



Prepared by the authors. Base structure of La Ruta del Clima's Community Loss and Damages Information System

The construction of this process allows an understanding of the magnitude of the loss and damages caused by climate impacts and the adaptive capacities of communities, highlighting how they generate solutions and responses to climate challenges. This process contributes to strengthening social awareness and collective action against climate change and its implications. The evidence generated from a community base validates the experiences of the people directly affected and reinforces the human dimension of

²³ The Climate Route (2023) Our Right to Climate Repairs. https://larutadelclima.org/wp-content/uploads/2024/03/ClimateReparations_ESP_compressed.pdf

²⁴ IPCC. (2019). An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development and efforts to eradicate poverty.

²⁵ UNFCCC (2023) Why Climate Finance Matters: Remarks by UN Climate Change Executive Secretary Simon Stiell Por qué el financiamiento climático es importante | CMNUCC

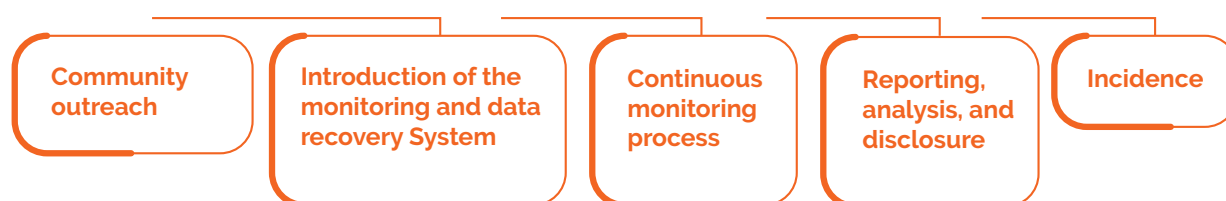
loss and damages. This is essential in advocacy and demand for reparations, as many cases require tangible evidence of adverse effects and their impact on human rights, livelihoods, health, infrastructure, and local ecosystems.²⁶

The ability of communities to manage their own Community Loss and Damages Information System grants the data legitimacy and makes it a first-hand source of information validated by those living with adverse climate effects in their territories. The implementation of this System, in addition to potentially becoming evidence for possible legal claims, empowers communities to defend their rights and promotes the creation of effective public policies that respond to their needs with accessible tools in the face of climate crisis. This system, developed from a community science approach, seeks to empower communities as key agents in defending their rights, allowing them to document the adverse effects of climate change on their lives and territories.

Methodology for monitoring, reporting, and evidence building

The community monitoring, reporting, and evidence-building methodology developed by La Ruta del Clima (LRC) is the first step in the Community Loss and Damages Information System process. This initiative enables the documentation, in an organized and detailed way, of the evidence of the adverse effects of climate change in vulnerable communities through various tools. The methodology facilitates capacity generation and seeks to foster collaboration between communities and organizations to build support networks, track cases, and access justice. In addition, it is key in view of the need to demonstrate a correlation between climate impacts and direct impact in specific communities. The methodology not only helps to document loss and damages but also allows the establishment of a solid and continuous database that gives communities a voice in political, financial, or judicial spaces that have traditionally been out of reach. The methodology implemented includes the following phases to ensure sustainability over time:

Figure 2. Methodology tools for monitoring, reporting, and evidence building.



Prepared by the authors

²⁶ NYU Review of Law & Social Change. (2024). Rights, Resilience and Community-led Relocation: Creating a National Governance Framework. Retrieved from <https://socialchangenyu.com>

Phase 1. Community Outreach

In this pilot run, the communities were selected and characterized to maintain the continuity and coherence of the LRC's work in communities where a bond had already been built. In addition, socio-demographic factors, threats and vulnerabilities, livelihoods, and existing climate disaster response mechanisms were considered. This comprehensive view of the territory allows for adjustments of the working methodology to the particular characteristics of each community, aiming for strategies to be effective and culturally appropriate and enabling the conditions for the initial approach.

For this project, four central working communities were defined:

- Cahuita and Puerto Viejo in Talamanca, Limón
- Costa de Pájaros and Manzanillo, Puntarenas

In the communities, LRC has worked on the development of different kinds of research and projects with members and organizations from the communities. For this process, these members were the local counterparts who facilitated the entry into the area and the project's development. During this approach with the counterparts, a series of logistical arrangements were made to determine safe places, schedules, and needs to facilitate an active participation of the people. This approach was designed to integrate communities into the monitoring and reporting process, ensuring that proposed solutions would meet their specific needs and vulnerabilities. We developed a holistic approach where active participation and local empowerment are key to successful implementation.

Phase 2. Introduction to the monitoring and data collection system

This process can be divided into three stages: A) Capacity building on climate change; B) Recognition of climate events and impacts through impact chains and timelines; and C) Download, acknowledgement, and use of the mobile application. Each stage generates key inputs for developing a post-data collection analysis and data integration.

These stages and their tools are presented below to make the process visible:

Stage 1. Capacity building on climate change

During this stage, three techniques were developed for capacity building and data collection with communities. Through focus groups, in-depth interviews, and workshops with the community, the work of establishing baseline concepts was proposed and, from this, their reinforcement.

In the case of focus groups and workshops, the first step was applying an initial test to identify the level of knowledge on climate change of the participants. Then, we would analyze the degree to which they internalized the concepts at the end of the process. For this end, a pre- and post-test tool was built, applied at the beginning and at the end of the implementation workshops (see the evaluation tool in Annex 1).

On the other hand, we observed that, in practice, the categories of Loss and Damage, both economic and non-economic, are beginning to be more clearly understood after identifying specific examples for reporting. However, in the theoretical field, the other definitions linked to Climate Change still tend to cause confusion, which leads communities to use other classifications instead. This aspect is reinforced throughout the accompaniment process in the territories.

After applying the pre-test tool, we opened a space to share and build knowledge together with the understanding that some people in the workshop may not have heard the term "climate change" or some related definitions before. In this space, concepts such as climate change, mitigation, adaptation, loss and damages, climate events, and their possible consequences were addressed, aiming that all people have a common basis of concepts that allow them to participate fully in the initial workshop and subsequent spaces.

In the case of the interviews, an interview guide was made linked to the application categories, and it was defined with the community counterparts, profiles of people who handle the subjects and could contribute with their knowledge to the analysis of the situations around the community's loss and damages. These interviews allowed us to dig into the consequences they live with in the communities through stories and the perception of these changes over time.

Stage 2. Recognition of climate events and impacts through impact chains and timelines

It is important to emphasize that the participatory process depended on the fact that workshop participants would identify the value of reporting weather events and the resulting loss and damages. For this reason, we developed together a historical mapping exercise of extreme climate events in recent years. These maps allowed us to capture what the community knew about this topic by listening to their historical knowledge.

The mapping activity commenced with the joint construction of the "impact chains", which allowed a comprehensive analysis of the territory and helped us to understand climate hazards and their direct impact. Climate impact chains make it possible to draw a link between the climate hazard, the problem it causes, and its impact on the community. During this exercise, we were also able to identify vulnerabilities that increased the risk of climate impacts in the communities, such as pollution, extractivism, and monoculture plantations.

The impact chains were constructed collectively with workshop participants through brainstorming in each community. This made it possible to reconstruct the sequence of impacts resulting from climate events and their effects on various categories, including health, mobility, education, and infrastructure.

Another tool used in the process was the timeline, which was also developed on a participatory basis as the participants recalled recent weather events and how they affected them. This activity allowed the identification of extreme weather events and slow-onset processes, which have impacted communities on different levels, thus identifying economic and non-economic damages and loss. Upon completion of these activities, participants better understood the importance and value of reporting these types of events and the lack of existing information from the perspective of their territories and realities.

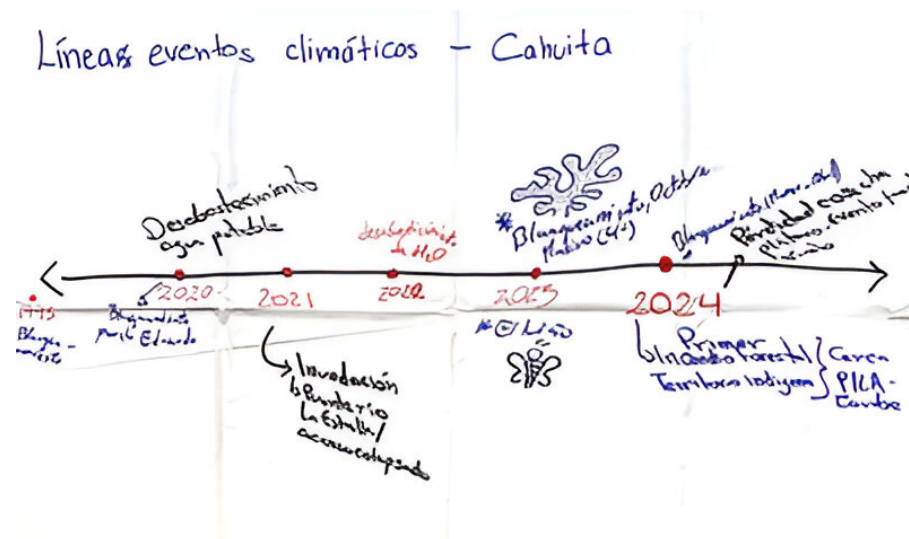
In both communities from the South Caribbean and the Pacific, one of the topics that were mentioned the most during the workshops was the increase in sea temperature, weather events causing emergencies, and how this impacts their livelihoods. By examining the timelines collected in these territories with the impact chains, we can observe the interaction between sudden and slow-onset events, as well as the differences in their perception and awareness of them.

Illustration 1. Logical Order of Impact Chains



Prepared by the authors. Impact Chain structure used in phase 2 of the Methodology for monitoring, reporting, and evidence building of La Ruta del Clima.

Photography 1. Example of the impact chain made in Cahuita



Prepared by the authors during the workshop in the community of Cahuita

Stage 3. Download, acknowledgment, and use of the mobile application

The mobile application P51 is incorporated as a monitoring and complementary reporting tool at this stage. The dialogue with the participants begins by explaining the purpose of the application and the expected results. In addition, participants are told how the data is managed and how the mobile application is used. The first step in using the application is to explain how to identify and find the mobile app store, connect to the Internet, and proceed to download the application.

This space of technological alignment allowed for more effective progress to be made in using the P51 digital tool in later stages of the workshop. The following section details the application design process and its reporting and monitoring functions.

Mobile app design

The digital community loss and damages monitoring tool is a mobile application called P51, which is available for both Android and Apple devices. It was designed to be didactic, easy to use, and user-friendly. In addition, it contains easy-to-understand language, requires only 18MB of storage space and is available for use offline, making it easy to access the tool on most smartphones.

By observing, recording, and systematizing changes in climate patterns, as well as loss and damages, communities are involved in creating scientific knowledge. This periodic, orderly recording process helps to give dimension and visibility to these impacts, thus strengthening the communities' capacity to anticipate and respond to the effects of climate change. It also allows people to build a collective historical memory of experiences in face of climate impacts of various categories.

The application is designed to generate a report from the selection of a climate event in a territorial space. The data received is classified under four categories of Loss and Damages to be reported. The design of these categories aims to obtain reports on the different dimensions of the effects of climate change. Loss and Damages are usually interrelated, which is why the application also allows reporting in various categories. The categories are listed below:

Health: This category includes two subcategories: psychosocial and physical health. Psychosocial health refers to mental health and how it affects the social relationships of app users. Physical health refers to conditions related to the body and well-being.

Community: This category is for reporting social and cultural impacts. The social aspect includes human mobility dynamics, gender issues, racism, violence, discrimination, etc. Cultural loss and damages include the effects of climate change on the representative traditions of the communities and their ancestral practices.

Infrastructure: This category encompasses economic loss and damages to buildings, homes, roads, public and private infrastructure, among others.

Environment: This category includes three subcategories: the first is biodiversity, which includes ecosystem dynamics and their species, as well as their relationship with humans in terms of ecosystem services. The second is agriculture, which allows for reporting damages at the productive or self-consumption level. Lastly, tourism includes impacts on this productive sector and the economic services it offers.

The P51 tool could be used in the different communities during the methodology implementation processes. This enabled data generation on different climate events in the abovementioned categories.

The use of P51 is a gradual process that progresses in parallel with capacity building through integrating the methodologies described in previous stages. The selected communities were able to identify several climate impacts, both recent and past events, which remain in the collective memory due to their significant consequences for the community. This facilitates access, understanding and informed decision-making on actions to be implemented based on the data obtained from the community.

In preparing these reports using the P51 tool, we used the climate events timeline tool mentioned above to use participants' memory to identify key events they wished to report, along with their corresponding loss and damages. Based on the selected event, each participant defined the area of impact (health, environment, community, or infrastructure) on which they wished to report. They had the option of reporting in all categories or only in those they considered relevant. This response collection process across different categories not only facilitated data collection but also made it possible to identify key information more accurately.

Phase 3. Continuous monitoring process. Follow-up mechanisms

From the very first meeting with the communities, we compiled a list of participants and their respective contact numbers to create community WhatsApp groups to maintain constant, direct communication with the participants of this training and app use process.

The purpose of these groups is to create a safe, comfortable, and respectful environment where everyone can share their experience in real-time by using the application and talking to their neighbors about any doubts or recommendations for generating reports. Then they can also ask any questions about this topic even after the workshops.

In addition, the space allowed the LRC team to continue promoting the use of the mobile application and the generation of constant reports from each community. Images, videos, interactive activities, and messages, among others, were used to achieve this continuous participation.

Phase 4. Data reporting and analysis from the pilot run

The appropriation of the Monitoring and Community Data Collection System has been strengthened through the methodological process. The appropriation of the System enables the collection of evidence and first-line information from the communities.

It is important to emphasize that this pilot run allowed the identification of improvement opportunities, for example, the need for greater accompaniment, the adaptation of information and tools to the context and realities of each community, and the implementation of more actions to overcome certain levels of digital illiteracy.

We present below an analysis of the reports from three sources, 1) characterization from sources available online, 2) reports made by communities and interviews, and 3) community workspaces.

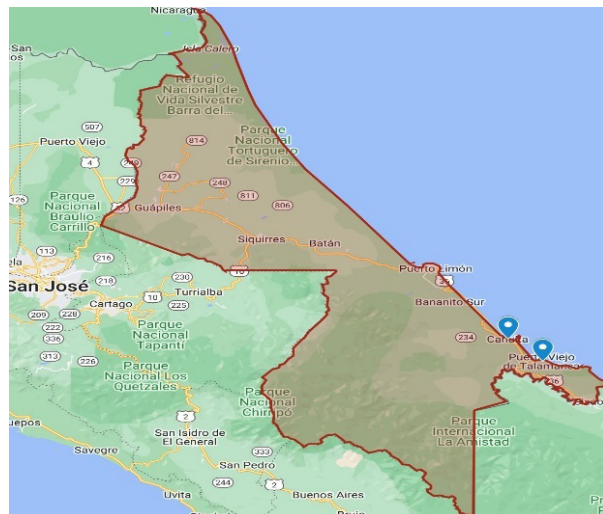
Illustration 2. Reporting points in P51



Source: P51 application

Caribbean Coast - Cahuita and Puerto Viejo

Illustration 3. Map of the district of Cahuita



Prepared by the authors based on Google Maps

Cahuita is a district in Talamanca County in the province of Limón. It has a diverse population, with a significant Afro-Caribbean and indigenous presence, which influences its cultural identity. According to Costa Rica's National Institute of Statistics and Census (INEC, 2022), the district of Cahuita has a population of about 8,000 inhabitants and is characterized by a mixture of cultures and languages, including Spanish, English Creole, and Bribri, a local Indigenous language.

Cahuita's economy is mainly based on tourism, especially because of the attraction of the Cahuita National Park, which contributes to the income of local communities through ecotourism and associated activities.²⁷ However, there are also fishing and agriculture activities, albeit on a smaller scale. There are community initiatives and sustainable development projects that seek to improve the living conditions of the community.

Cahuita is characterized by a humid tropical climate with a rainy season extending from May to November and a relatively dry period from January to April. The average annual rainfall in Limón is approximately 3,500 mm²⁸.

Due to its coastal location and topography, Cahuita is vulnerable to extreme events such as floods and hurricanes. Climate change has exacerbated these phenomena, causing damage to infrastructure, tourism losses, and damage to marine ecosystems such as coral reefs.²⁹ Cahuita faces growing challenges due to climate loss and damages that affect the community's quality of life. Sea level rise has accelerated coastal erosion, which threatens homes, tourist infrastructure, and natural spaces such as Cahuita National Park, rich in marine and terrestrial biodiversity³⁰. Prolonged droughts have reduced drinking water availability, affecting the population's agriculture and daily activities. In addition, the increase in average temperature has altered weather patterns, intensifying heat waves and affecting ecosystems such as corals³¹.

These conditions affect the community's main sources of income, such as tourism and fishing, deepening their socioeconomic vulnerability. The results of applying the monitoring methodology in the community are presented below:

27 Main impacts reported in Cahuita

28 National Meteorological Institute of Costa Rica, IMN, 2023

29 National Biological Corridors Program. (2024). Parque Nacional Cahuita – Adaptación al Cambio. Retrieved from <https://www.biocorredores.org/corredoresbiologicos/recursos/parque-nacional-cahuita-adaptacion-al-cambio>

30 Calderon, Castillo (2024) Sea level variation in the Caribbean of Costa Rica, Central America.

31 Cortéz, Jimenez (2003) Past, present and future of the coral reefs of the Caribbean coast of Costa Rica

Main impacts reported in Cahuita

During this first phase, the work performed in the community produced a series of reports, which are summarized below:

Table 1. Number of reported impacts in Cahuita

Reported Climate Impacts	Number of Reports
Rainfall changes	3
Coastal erosion	2
Drought	6
Extreme temperatures	12
Floods	5
Landslide	1
Sea level rise	1
Storms	2
Tidal surge	1
Warming of sea temperature	3
Water salinity	1

Prepared by the authors. Based on the P51 BBDD data

According to community reports and data collected, impacts in this region have been recorded in all climatic categories: floods, droughts, heat waves, coastal erosion, and extreme storms, highlighting the complexity and diversity of risks its inhabitants face.

The record of climate impacts in all categories positions Cahuita as a community that represents the climate vulnerabilities in tropical coastal areas. This case demonstrates the importance of combining community, scientific, and government efforts to reduce risks and increase the resilience of communities.

Within the application, after the training and accompaniment processes, participants had the option to report in four main categories. In this section, the data is disaggregated according to the area affected and the main effects:

Effects on the category of Health:

In the health category, people from the Cahuita community have reported physical and psychosocial effects related to adverse weather conditions, highlighting their link to droughts, changes in rainfall patterns, and extreme

temperatures. In total, four specific problems were recorded in this category: general health problems, heat strokes, anxiety, and loss of sleep.

Table 2. Number of reported effects in the Health category

Category	Number of Reports
Physical health	6
Psychosocial health	1
Physical and psychosocial health	4
Total Reports:	11

Prepared by the authors. Based on the P51 BBDD data

It is important to note that most of these reports come from minors, which highlights the vulnerability of this population to climate impacts. These findings are significant because they show that effects on health are occurring and happening relatively quickly after exposure to extreme weather events.

This panorama shows the urgent need to strengthen measures to address climate impacts at the community level, prioritizing the care for vulnerable groups such as children and adolescents and developing strategies to mitigate public health risks related to climate change.

In one of the reports, a person stated, "Yes, I got sick from so much heat."

Effects reported on the Community category:

Climate impacts on communities manifest as a combination of physical, social, and economic impacts that profoundly alter their development and well-being. These situations increase preexisting inequalities by limiting access to basic services, causing displacement and jeopardizing local cultural practices and traditions.

Understanding these impacts is essential to design comprehensive strategies that promote adaptation, adaptability, coping, and, finally, to take action for climate justice in these territories.

Table 3. Number of reported effects in the community category

Impacts	Number of Reports
Access to education	1
Tangible goods	3
Loss of employment	5
Human mobility	2
Racism	1
Loss of traditions	1

Prepared by the authors. Based on the P51 BBDD data

Social:

The reports show several effects related to climate impacts, with floods being a recurring factor that aggravates the vulnerable conditions of communities. Among the problems reported more often, unemployment stands out, which appears as the most prevalent consequence, followed by loss and damages in real estate and, to a lesser extent, difficulties related to mobility. In addition, they mentioned significant impacts on access to education, limiting opportunities for long-term development, as well as signs of racism and discrimination, which exacerbate preexisting inequalities and disproportionately affect certain social groups.

Cultural:

In coastal communities, the impacts of climate change are reflected in economic loss and in the cultural sphere, where the alteration of ancestral traditions and practices is an emerging concern.

Local celebrations and cultural activities, deeply linked to natural cycles and coastal dynamics, have been altered by phenomena such as erosion, sea level rise, and changes in climate patterns. For example, the availability of certain essential natural resources for rituals and celebrations has been reduced, while floods and storms have affected symbolic and communal spaces.

This situation threatens the continuity of traditions and the collective identity of these communities, underlining the importance of integrating the protection of cultural heritage into climate adaptation strategies in coastal areas.

Reported impacts in the Infrastructure category:

Climate impacts on infrastructure resulting from slowly evolving events and climate emergencies are becoming increasingly evident and alarming. Gradual phenomena, such as sea level rise, water salinization, and extreme temperatures gradually weaken critical infrastructure such as roads, bridges, drinking water systems, and electrical grids, affecting their long-term functionality. On the other hand, climatic emergencies such as heavy storms, floods, and landslides cause immediate and severe damage that cripples entire communities, disrupts access to basic services, and creates high repair and reconstruction costs. These impacts not only jeopardize the security and well-being of people but also represent an obstacle to sustainable development, especially in vulnerable regions with limited capacities to meet these challenges. Therefore, it is crucial to implement measures for adaptation and resilience that integrate urban planning and risk management to minimize these impacts and ensure the sustainability of infrastructure in the context of climate change.

Table 4. Number of reported impacts in the infrastructure category

Infrastructure	Number of Reports
Housing	3
Streets and roads	2
Sewers	2
Bridges	2
Telecommunications	1
Electricity	1
Drinking water	1
Sewers	1

Prepared by the authors. Based on the P51 BBDD data

Effects reported on the Environment category:

In the context of Cahuita, Costa Rica, the effects on the environment category are particularly visible due to the richness and sensitivity of its coastal and marine ecosystems. This territory, recognized for its biodiversity and importance as a protected area, faces significant challenges in the face of climatic events, such as storms, hurricanes, increased temperatures, and rising sea levels.

These phenomena have led to the degradation of coral reefs, beach erosion, and the loss of mangroves, which are essential for coastal protection and local biodiversity. Changes in climate patterns are also affecting freshwater availability and alter the balance of ecosystems, negatively impacting species that depend on these habitats.

"I haven't seen white-faced monkeys on beaches in many years. The disappearance of their food affects them and makes them go elsewhere."

Comment taken from the P51 app

From the community, 20 reports were received for impacts in the category of biodiversity linked to extreme temperature changes, floods, storms, warming of the sea, droughts, and tidal surges.

"Look at Barra del Colorado. When I was a little girl, the river was immense. Immense. It was deep. Because the estuary was so close to the river, many species, such as the bull shark, entered the river a lot, and there was a huge number of fish. When you go today, it's dry. Many islets have been made along the river. Islets have been made. And there are species you don't see anymore."

Raquel, a woman member of the Cahuita community.

Reported impacts in the Biodiversity category:

Table 5. Number of reported effects in the environment category

Impacts	Number of Reports
Ecosystem services	5
Marine-coastal ecosystems	4
Loss of protected areas	1
Endangered species	11

Prepared by the authors. Based on the P51 BBDD data

In interviews with community members, they mentioned the direct effects caused by the bleaching and loss of corals, a phenomenon that has negatively impacted marine biodiversity. They highlighted how the increase in water temperature is causing damage to coral ecosystems, which are essential for marine life. As one local fisherman commented:

"Corals, for example, feel heat, that is, they are burning, they are being damaged precisely because the temperature has increased so much."

Coral bleaching, which occurs when corals eject their symbiotic algae due to thermal stress, has had a devastating impact on marine ecosystems.

Effects reported on the Agriculture category:

Three specific reports related to the effects on agriculture and livestock have been recorded, highlighting the impact of climate change on agricultural production and food security in local communities. Among the most serious problems are crop loss and lack of water for irrigation, two factors closely related to rising temperatures and alterations in rainfall patterns. An illustrative testimony mentions the following:

"There used to be sometimes three, four days of rain, and two days of sun in a rainy season. Now we are in the middle of the rainy season and there is a lot, a lot, a lot of sun. The sun has an abnormal temperature; there are very high temperatures."

(Anthony, Puerto Viejo. Interview)

"On the economic side, for example, tourism. Come on, let's say that if for a moment, there's a natural event that enters, floods, or erodes. Then we must limit access to tourism. For example, when the Suárez River, which is one kilometer from the entrance of Blanca Beach, is flooded, we see that people already have a limited access to the whole park"

Mirna, a woman member of the community of Cahuita.

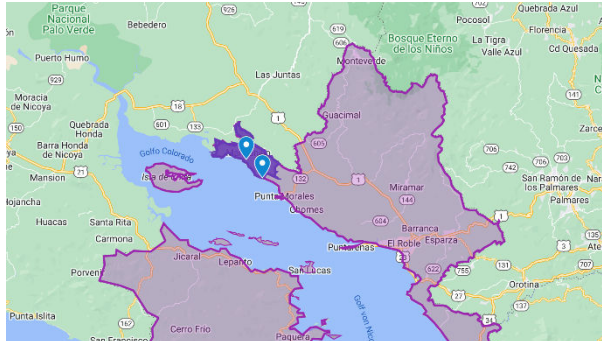
In addition, by linking these reports with those of impacts to biodiversity, the loss and damages are not limited to emergencies but also includes phenomena such as warming and rising sea levels, which directly affect one of the main sources of income of the community: Cahuita National Park. Local communities that depend on these resources face increasing economic vulnerability. Declining tourism not only reduces employment opportunities, but also restricts investments needed for recovery, including restoring natural ecosystems, and improving climate-resilient infrastructure.

Effects reported on the Tourism category:

The loss of natural attractions due to weather events has caused a significant impact on the tourism sector in communities highly dependent on this sector. This has implications for family incomes and seriously affects employment in this area. Phenomena such as heavy storms, floods, rising sea levels, and rising sea temperatures have deteriorated key ecosystems and recreational areas essential to attract visitors. The loss and damages not only affects natural resources, such as beaches and coral reefs, but also the tourism infrastructure and ecosystem services that are necessary for the community.

7.1 Pacific Coast - Costa de Pájaros and Manzanillo

Illustration 4. Map of the District of Manzanillo in Puntarenas



Prepared by the authors based on Google Maps

Manzanillo is a district in Puntarenas characterized by a small and mainly rural community. According to the National Institute of Statistics and Census, the population of this region is predominantly coastal. It is largely engaged in activities such as artisanal fishing and small local tourism enterprises, which include food services and accommodation³².

Manzanillo, Puntarenas, has a tropical dry forest climate, with temperatures between 24°C and 32°C throughout the year. The region experiences a marked dry season, which spans from December to April, and a rainy season from May to November, with an average annual precipitation of 1,500 mm³³.

The economy in Manzanillo, Puntarenas, has fishing as its main means of subsistence³⁴. In recent years, various organized community groups have sought to diversify their means of subsistence with ecotourism projects. Since 2013, in the surroundings of Costa de Pájaros and Manzanillo, the responsible fishing area was determined to be in Costa de Pájaros and Punta Morales³⁵ to deal with the over-exploitation of the ecosystem service that has existed for 30 years³⁶. Projects dedicated to preserving and generating

good tourism practices in the area were also started, such as MUDECOOP, Mariposas del Golfo, and Group of Organized Women La Montañita-El Coyolito. Global warming is significantly impacting fishing productivity and tourism in the Gulf of Nicoya. The increase in sea surface temperature, sea level, and wave energy is causing changes in marine ecosystems. This directly affects fishing productivity and the communities that depend on this activity. In tourism, coastal erosion and loss of marine habitats are deteriorating natural resources that are key tourist attractions, such as beaches and unique ecosystems. The salinization of wells and the displacement of coastal communities also threaten tourism infrastructure and the quality of services.

The area faces increasing challenges due to climate change given its geographical location and means of subsistence. The increase in the frequency and intensity of extreme events, including droughts and tropical storms, as well as slowly evolving effects such as rising sea levels and temperature, directly affect fishing and tourism; they are a long-term threat to coastal infrastructure³⁷.

32 National Institute of Statistics and Census (INEC, for its acronym in Spanish). (2022). Results of the 2022 National Population and Housing Census: Socioeconomic characteristics by district. Retrieved from <https://www.inec.cr>

33 National Meteorological Institute. (2023). Weather conditions in Costa Rica: Regions and seasonality. Retrieved from <https://www.imn.ac.cr>

34 Ministry of Agriculture and Livestock (MAG, for its acronym in Spanish). (2023). Progress Report on the Sustainable Management of Marine and Coastal Resources in Costa Rica. Retrieved from <https://www.mag.go.cr>

35 NCOPECA (2014) Fisheries Management Plan for the Costa Pajaros Responsible Fishing Marine Area.

36 Arias Sidey (2008) Poverty on Costa Rica's coasts and aquaculture potential. AMBIENTICO Journal, National University of Costa Rica (UNA, for its acronym in Spanish).

37 Lizano (2019) Global warming and its relationship with the impact on fisheries in the Gulf of Nicoya, Costa Rica.

Climate impacts reported in the communities of Manzanillo and Costa de Pájaros.

During the work performed in this community, we received a series of reports, which are summarized below:

Table 6. Climate impacts reported in the communities of Manzanillo and Costa de Pájaros in Puntarenas

Reported Climate Impacts	Number of Reports
Hurricane	2
Extreme temperatures	2
Floods	7
Sea level rise	1
Storms	5
Tidal surge	1

Prepared by the authors. Based on the P51 BBDD data

In the context of Manzanillo, Puntarenas, the reported climate impacts show significant social, economic, and environmental losses, underlining the need for comprehensive climate risk management.

This panorama highlights the need to strengthen community loss and damages monitoring systems to generate data to support the planning of adaptation and mitigation actions.

There is also an urgent need to promote investments in resilient infrastructure and promote access to climate finance to implement effective strategies to reduce future impacts. The analysis of the reports in these communities are detailed below.

Effects reported on the Health category:

In the health category, the people of the community reported 11 incidents, which show the direct impact of climate change on its inhabitants' physical and psychosocial well-being.

These incidents include six cases related to physical health effects, combinations of physical and psychosocial problems, and exclusively psychosocial conditions.

Table 7. Number of reported effects in the Health category

Category	Number of Reports
Physical health	6
Psychosocial health	1
Physical and psychosocial health	4
Total Reports:	11

Prepared by the authors. Based on the P51 BBDD data

Physical health effects include heat-related conditions such as heat stroke, an increase in the incidence of respiratory viruses, gastrointestinal diseases or dengue fever, and malnutrition. On the other hand, recorded psychosocial problems include anxiety, insomnia, stress, and exhaustion.

Testimonials gathered through the monitoring app reinforce evidence of impacts:

“People suffer a lot because their blood pressure rises due to excess heat.”

“People tend to become dehydrated by excess heat.”

In addition, during the community training sessions, the lack of access to drinking water in drought increases the incidence of gastrointestinal diseases, heat strokes, and blood pressure problems were discussed. In contrast, in periods of storms, respiratory viruses and psychosocial problems worsen, which are associated with the fear of material damage, economic losses, and the interruption of basic services such as education.

These findings provide evidence to argue that the violation of fundamental rights, such as the right to health, water, education, and access to basic resources, is occurring in the context of the climate crisis.

The data collected, supported by testimonies from the people affected, make the causal link between climate events and the effects on community health visible, providing key evidence to demand reparations.

This evidence is essential to substantiate demands for reparations and reinforce the need to implement public policies that prioritize the protection of the most vulnerable communities from climate impacts.

Effects reported on the Community category:

In this category, we obtained seven reports related to the loss of employment and material goods linked to climatic events such as floods, storms, and hurricanes. These phenomena have generated significant impacts on communities, particularly those with high social and economic vulnerability rates.

Although Costa Rica has not experienced direct hurricane impacts in recent years, the indirect consequences of these events have been evident.

Nearby hurricanes have intensified rainfall, increased river levels, and saturated soils, causing adverse effects such as landslides, river floods, or changes in sea conditions, causing people in the communities to lose their livelihoods or affecting their material goods.

During the workshops, participants shared experiences about how, during the flooding of rivers, they were forced to leave their motorcycles "on the other side" and cross on foot, with the water reaching their knees, to get to their homes.

This situation risks their lives and generates uncertainty since they may not find their vehicle where they left it.

These accounts reflect the adverse conditions and daily challenges they face due to climate impacts.

Reported impacts in the Infrastructure category:

In the community, there were reports of loss of infrastructure related to weather events such as storms and floods. Climate impacts on infrastructure cause immediate and severe damage that paralyzes entire communities, disrupts access to basic services, and generates high repair and reconstruction costs that must be borne by the communities.

In Costa Rica, the National Commission for Risk Prevention and Emergency Response (CNE, for its acronym in Spanish) manages the reconstruction and repair of public infrastructure affected by climate events, such as roads, public buildings, and bridges. It uses significant funds, including

a \$700 million loan from the Central American Bank for Economic Integration (CABEI).³⁸

However, there is currently no formal system for quantifying the economic losses of communities in terms of private movable and immovable property. This gap is critical, as the focus is on public infrastructure, not wider personal or community-level damage.

These impacts not only jeopardize the safety and well-being of people but also pose an obstacle, especially in vulnerable regions with limited capacities to face these challenges.

Table 8. Number of reported effects on infrastructure

Infrastructure	Number of Reports
Housing	6
Streets and roads	3
Bridges	1
Schools	1
Electricity	2

Prepared by the authors. Based on the P51 BBDD data

Effects reported on the Environment category:

Climate impacts in the community that fall within this category are particularly visible because coastal and marine ecosystems are one of their main economic sources.

This territory's main means of subsistence is artisanal fishing and, in recent years, they have worked on projects linked to ecotourism and the conservation of their environment.

Climate change affects ecosystem services linked to provisioning, regulation, support, and culture, causing direct negative impacts on the community. In this stage, 10 reports were obtained in the category of environmental impacts, linked to storms, floods, and the indirect impacts of hurricanes.

³⁸ Central American Bank for Economic Integration (CABEI). (2024). Emergency loan for infrastructure reconstruction after extreme weather events in Costa Rica. Retrieved from <https://www.bcie.org>

Reported impacts on biodiversity

Table 9. Number of reported impacts in the biodiversity category

Impacts	Number of Reports
Ecosystem services and effects on species dependence	1
Endangered species	2
Impacts on marine ecosystems	1
Effects on species dependence	1

Prepared by the authors. Based on the P51 BBDD data

One of the recurring concerns was the gradual disappearance of previously common species on beaches. As one participant put it:

“There were clams just walking on the beach; now it’s hard to find a couple of them.”

This change is partly attributed to rising water temperatures, pollution, and disruption of marine ecosystems. This ecosystem change directly impacts local communities that depend on these species for their livelihood, either as food or as a source of income.

This type of change reflects economic, cultural, and environmental loss, as the traditional connection of communities with their natural environment and marine resources is damaged.

Effects reported on the agriculture and tourism sector

In agriculture, there were reports of six impacts on fishing and two related to agriculture, highlighting the direct impact of climate phenomena on the livelihoods of coastal communities. The towns of Costa de Pájaros and Manzanillo depend heavily on artisanal fishing. This activity has been severely affected by changes in marine ecosystems, such as rising temperatures, pollution, and the displacement of species into deeper waters.

Testimonies from fishermen during the workshops illustrate this reality: “Two months of throwing the net and coming back with nothing” or “Now we find all kinds of aguamala (jellyfish) every time the net comes up, but no fish.” These phrases reflect economic frustration and the transformation of marine ecosystems, which now have a greater presence of species such as jellyfish, which is typical of altered environments. These challenges compromise the food security and the economic sustainability of the communities that depend on these resources for their livelihoods.

In the field of tourism, there are reports of important impacts that compromise its development, which has become a key to improving the living conditions of these communities. Notable impacts include the loss of natural attractions essential for ecotourism and damage to basic services needed to provide shelter and food such as access to drinking water, electricity, and roads. There is also a loss of commercial goods, such as tourism equipment and supplies, which directly affects the sources of income of families relying on this sector.

These problems are exacerbated by the structural vulnerabilities of the communities, such as the pollution of the Gulf of Nicoya, which degrade ecosystems and reduce their attractiveness for tourism. The high poverty rates, which limit the ability of communities to adapt and recover from these impacts, also exacerbates these problems. In particular, the accumulation of debris in the gulf affects marine biodiversity and visitors' perception of the environment's quality, reducing the destination's competitiveness against other less affected ones.

Despite the challenges and negative impacts, the women of the community, organized into groups such as MUDECOOP and Mariposas del Golfo, continue to fight tirelessly to improve living conditions and preserve their livelihoods. Their work seeks to mitigate the effects of climate change and strengthen community adaptability through innovative and collaborative projects that promote sustainability and local empowerment.

Conclusions

The communities of Manzanillo, Costa de Pájaros, and Cahuita and their surroundings share a common goal in the face of Climate Change: To improve their adaptive capacities and have the tools to deal with loss and damages. To achieve this goal, communities must have access to adequate financing to implement and sustain long-term adaptation strategies and address the loss and damages.

Access to finance is crucial to implement projects that may strengthen resilient infrastructure, diversify economic activities, and protect local ecosystems. Without financial resources, communities cannot develop effective solutions to the climate impacts they face. The fundamental pillars to strengthen responsiveness to climate events include training, sustainable entrepreneurship, and environmental monitoring. Similarly, communities need full enjoyment of their human rights in the context of climate change.

Unfortunately, the climate crisis puts their rights at risk and infringes on them, so access to justice through political claims or legal channels is a path that must be built. Community science is essential in this process, and the work communities do to monitor and report their loss and damages is an essential step in fighting for climate reparations.

Although both communities face similar risks from climate change, such as coastal erosion, sea level rise, and extreme weather events such as droughts, changes in precipitation, and floods, impacts vary depending on the economic activities prevailing in each region.

Adaptation in fishing and ecotourism: In Manzanillo and Cahuita, adaptation strategies are urgently needed in key productive sectors, such as artisanal fishing and ecotourism. This includes promoting sustainable fishing practices and training in ecotourism, which not only helps diversify local incomes but also strengthens the adaptive capacity in the face of climate variability.

Resilient infrastructure: Both communities require significant investment in resilient infrastructure, especially in coastal areas. Improving drainage systems and protecting coasts through measures such as coastal reforestation and the restoration of marine ecosystems (e.g., coral reefs in Cahuita, the restoration of mangroves in the Pacific, and wetlands in the Caribbean) can reduce the effects of flooding and erosion.

Monitoring and preparations to face climate risks: Strengthening monitoring mechanisms and response capacities is essential to face climate risks. Extreme weather events, such as storms and tidal surges, need to be managed more effectively on a local level to minimize damage to infrastructure and ecosystems.

Direct impacts and specific vulnerabilities

Manzanillo faces severe climate impacts, such as prolonged droughts, tropical storms, floods, and rising sea levels, affecting artisanal fishing and ecotourism. Overexploitation of resources for fishing and restrictions resulting from protected areas are already factors pressuring the local economy. Climate change aggravates the situation.

Cahuita is experiencing a comparable situation with floods and droughts intensified by climate change. In addition, the loss of marine ecosystems, such as coral reefs, directly impacts ecotourism, which is one of its main sources of income.

It is necessary to record, quantify, and detail these impacts through empirical data and community testimonies to gather evidence focused on quantifying direct and indirect economic and non-economic loss and damages such as reduced income in fishing and ecotourism and the negative effects on public health, education, and community infrastructure.

In this process of gathering evidence for climate reparation claims, inclusiveness was encouraged, involving local communities. Testimonies and observations from the residents, fishermen, and ecotourism entrepreneurs are essential to comprehensively understand climate impacts.

Manzanillo, Costa de Pájaros, Cahuita, and Puerto Viejo community reports are a key starting point. These reports should be complemented in the following phases with more data, which will be collected and analyzed to identify patterns.

This will help us establish a database, allowing us to identify the magnitude and complexity of the loss and damages. From this evidence base, we can generate proposals for reparations, including compensation or other measures. The collection of evidence is crucial to show the adverse effects of climate change on our communities, strengthening the international demand to allocate funds and resources for climate reparations and adaptation.

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