LaRutadelClima

LOSS AND DAMAGES MONITORING:

AN X-RAY OF CENTRAL AMERICA

Sweden Sverige

OXFAM

ASEDE
Por un Desarrollo Integral

ASONOG

unes

Credits

Editorial ©La Ruta del Clima –
Loss and Damages Monitoring: An X-Ray of Central America; by Asociación La Ruta del Clima with the technical and financial contribution of OXFAM, and support from the Swedish Embassy.

ISBN:

ISBN: 978-9930-9817-7-1

Authors: María Paula Calvo, Angélica Cordero, Adrián Martínez, Jennifer Rojas y Adriana Vásquez
Publisher:: La Ruta del Clima

Graphic design, layout, and cover: María José Roldán, Jennifer Rojas

Picture credits: La Ruta del Clima

Published in San José, Costa Rica, 1st edition, October 2024.

To order a publication or download the text: www.LaRutadelClima.org Asociación La Ruta del Clima. San José, Costa Rica

Acknowledgments

We deeply acknowledge the work and commitment of **UNES, ASONOG, ASEDE** and the local offices of **OXFAM** in the implementation of loss and damages monitoring in Guatemala, Honduras, and El Salvador. Their accompaniment has been fundamental in bringing visibility to the realities of the most vulnerable communities and in allowing their voices to be heard in the midst of the climate crisis.

Their experience and collaboration have enabled us to set up effective monitoring systems that generate valuable data and contribute to the efficient collection of information on community impacts caused by climate events.

Table of Contents

Index of figures

Photo index

Table index

List of Acronyms

ASONOG: Asociación de Organismos No Gubernamentales de Honduras (Association of Non-Governmental Organizations in Honduras)

ASEDE: Asociación para la educación y el desarrollo (Association for Education and Development)

UNES: Unidad Ecológico El Salvador (The Salvadoran Ecological Unit)

GHG: Greenhouse gases

App: Mobile application

P51: Name of the mobile application designed by La Ruta del Clima

LRC: Asociación La Ruta del Clima (La Ruta del Clima Association)

INSIVUMEH: Instituto Nacional de Sismología, Vulcanología, Meteorología e Hidrología de Guatemala (Guatemalan National Institute for Seismology, Volcanology, Meteorology and Hydrology)

CENAOS: Centro de Estudios Atmosféricos, Oceanográficos y Sísmicos de Honduras (Honduran Center for Atmospheric, Oceanographic and Seismic Studies)

MARN: Ministerio de Medio Ambiente y Recursos Naturales de El Salvador (El Salvador's Ministry of Environment and Natural Resources)

Basic concepts

Adaptation: In human systems, the process of adjustment to actual or expected climate and its effects in order 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 effects[1].

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 ecosystems.[2]

Impact chain: The sequence of interrelated effects that are triggered by a 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 economic.[3]

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 in 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 causes.[4]

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 losses and impacts (United Nations General Assembly, 2016).

Greenhouse gas: A gaseous constituent of the atmosphere, both natural or 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 effect.[5]

Loss and damage: 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) (La Ruta del Clima).

Heatwave: An extended period of abnormally high 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.[6]

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 economy.[7]

1 IPCC, 2018: Annex I: Glossary [Matthews J.B.R. (ed.)]. In: Global Warming of 1.5°C, IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and corresponding trajectories that global greenhouse gas emissions should follow, 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 and 4

3 Based on 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 Ibid 1.

6 I 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/

7 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. Alegría, 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/

LOSS AND DAMAGE MONITORING REPORTS

1. Introduction to research

Communities in Honduras, Guatemala and El Salvador face increasing vulnerability to climate change due to their geographic location, widespread poverty and high dependence on land for crops. Extreme weather events like hurricanes, droughts and floods have intensified in recent years, exacerbating living conditions in the region.

In recent decades, Central America has experienced high-impact natural disasters of climatic origin, mainly storms and hurricanes, causing loss and damages for communities in the region. Rural communities, whose subsistence is deeply rooted in farming, are particularly vulnerable, as extreme weather events severely impact their crops and livelihoods.

It is important to mention that the communities that are currently impacted by these climate events tend to contribute very little to global greenhouse gas emissions, representing less than 0.5% of the total. However, they are disproportionately affected by the impacts of climate change.

Communities in Honduras, Guatemala and El Salvador are on the front line of climate change, suffering the impacts of increasingly frequent and severe natural disasters. It is from this crisis that project P51 was born, responding to the need to generate knowledge from the perspective of these communities to convey the voices and needs of those who are currently being affected by climate change.

Given the lack of current, continuous data on climate impacts in Central America, project 51 (P51), a mobile application developed by La Ruta del Clima with the collaboration of several organizations, seeks to collect community knowledge about the impact climate change has on their ways of living in order to identify from their perspective how their communities are transformed after each climate event, as they lose not only their territories but also their cultural identities.

P51 represents loss and damage monitoring aimed at systematic data collection from communities in real time to determine the level of impact in different areas.

In the context of Honduras, Guatemala and El Salvador, this methodology has been particularly relevant, given that these countries are vulnerable to a number of natural phenomena, including hurricanes, floods and droughts. The information gathered through the app has made it possible to assess the damage caused by these events. This methodology has been implemented in areas that historically have been affected by adverse weather phenomena, especially hurricanes and tropical storms that have left in their wake severe damage to infrastructure and livelihoods.

The implementation of monitoring in these areas has provided detailed information on the impact on various sectors, from agriculture to physical and emotional health. The monitoring of loss and damage in these areas is essential in giving a voice to the communities, allowing them to identify first-hand the effects they suffer.

2. "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 in producing the energy needed by large economies have generated profits and tangible benefits for some countries; however, the release of these gases has changed the constitution of our atmosphere and, consequently, there have been a series of changes in climate and other geophysical systems that interact with our environmental 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 amount of sources of greenhouse gas emissions. This unequal interaction sets the basis for discussion to address two issues: loss and damage, 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.[8] However, GHG concentration levels continue to rise, surpassing the levels that existed in the last 2 million years.[9]

The continued rise of GHGs in the atmosphere leads to further climate change that prevents dangerous anthropogenic interference in the climate system. 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.[10]

LGHG concentrations have not stabilized in over 30 years and ecosystems have been unable to adapt naturally. The IPCC AR6 affirms with high confidence that at 1.5˚C warming, natural adaptation faces hard limits, driving high risks of biodiversity decline, mortality, species extinction and loss of livelihoods. [11] 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.[12]

In fact, the IPCC states that climate change has caused "widespread adverse effects and related loss and damage to nature and people beyond the natural climate variability. Some development and adaptation efforts have reduced vulnerability."[13] 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.[14]

8 UN, 'United Nations Framework Convention on Climate Change' Art 2.

9 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.

10 3

11 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.

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

13 Calvin and others (n 2) B.1

14 ibid B.1.

What is loss and damage?

In this context and from a political perspective, we can say that loss and damage is 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 damage is the result of climate impacts and the risk of extreme or slow-onset events.[15] The literature defines loss and damage as impacts with which people cannot cope or to which they cannot adapt, repairable damage or irreversible loss.[16]

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.[17] 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."[18]

"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 damage, and the absence of a fair and effective structural response from the international community to deal with the results of residual risk."[19]

15 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.

16 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).

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

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

19 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. Methodology for monitoring, reporting and evidence building

In light of the above, La Ruta del Clima developed a methodology for monitoring, reporting and building evidence of these climate impacts.

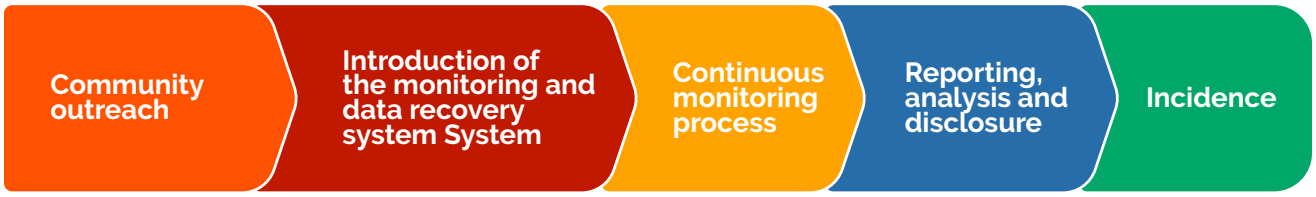
This methodology was developed as a framework, guide and reference for the design and implementation of a grassroots system for monitoring and reporting climate change-related loss and damage and is based on the approaches of citizen science and knowledge management. From the very beginning, the methodology took into consideration the gender perspective, participatory processes with communities, observation, work with key partners, awareness raising processes and data analysis.

Citizen science proposes that communities and civil populations have the power and capacity to generate and produce knowledge from their contexts and social spaces, as well as the right to generate and advocate for solutions in response to that context and knowledge.

This approach establishes that knowledge can be produced collaboratively, with the civilian population being involved as an active stakeholder and agent of the research processes. It recognizes the existence of other ways of creating science outside the traditional spheres of academia, and validates knowledge that is generated from collective, community and participatory logics, which further promotes processes of social activism, advocacy and public policy implementation, in this case focused on climate justice..[20]

This model allowed for development of a grassroots reporting and monitoring system that includes a variety of tools, techniques and processes to ensure usability, functionality and sustainability over time as detailed in a diagram below.

Figure 1. Grassroots reporting and monitoring system tools



In this report, we will explore the use of these tools with communities as well as the progress made, challenges faced and how they have impacted the building of evidence on loss and damage resulting from climate impacts.

20 Senabre Enric, Nuria Ferran-Ferrer y Josep Perelló (2018). Ciencia Ciudadana. Diseño participativo de experimentos de ciencia ciudadana. Revista Científica de Educomunicación, n.54(26): 29-38. DOI: https://doi.org/10.3916/C54-2018-03

4. Community outreach

During the community outreach stage, our focus was on two key lines of work: implementation in conjunction with local organizations and characterization of the selected communities. 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.

For this pilot, we implemented the project in conjunction with local organizations in the three countries of implementation: ASONOG in Honduras; ASEDE in Guatemala; and UNES in El Salvador. Collaboration with local organizations is essential to ensure that efforts are sustainable and relevant to the particular context of each community. These organizations, with their in-depth knowledge of the social, economic and cultural dynamics, reinforce community confidence in the process and allow for capacity building at the local level, promoting autonomy in data collection on long-term climate change loss and damage.

Additionally, project partners were responsible for selecting and characterizing the communities, which included collecting information on socio-demographic factors, identifying threats and vulnerabilities and analyzing existing infrastructure, means of subsistence and climate disaster response mechanisms. This internal understanding makes it possible to adjust the work methodology to the particular characteristics of each community, seeking to ensure that the strategies are effective and culturally appropriate.

5. Introduction to the monitoring and data collection system

We base our work with the communities on two approaches: citizen science, which consists of involving non-specialists and specialists in participatory research projects that encourage anyone to contribute from their experience; and social diagnosis, which provides inputs and information to decision-makers and community members to propose or establish work priorities within their territories.

Based on these approaches, we developed a methodological process to facilitate community outreach and allow for building a grassroots context analysis with key social stakeholders from within the territory.

We established links between the environmental and climate factors of a given territory and the loss and damage that has affected community livelihoods through a participatory characterization with different community stakeholders.

This stage can be divided into three phases:
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.

5.1. Capacity building on climate change

As a first tool, we developed a pre- and post-workshop evaluation (see evaluation tool in Appendix 1) in order to determine the communities' starting knowledge on climate change and their level of understanding at the end of the session.

Through this tool, we concluded that most communities still only associate the concept of climate change with natural causes. This perception is deeply connected to their spiritual and cultural relationship with nature, where changes in weather patterns are interpreted as a manifestation of nature itself, without regard for human influence.

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, theoretically, definitions still tend to cause confusion, leading communities to use other classifications instead.

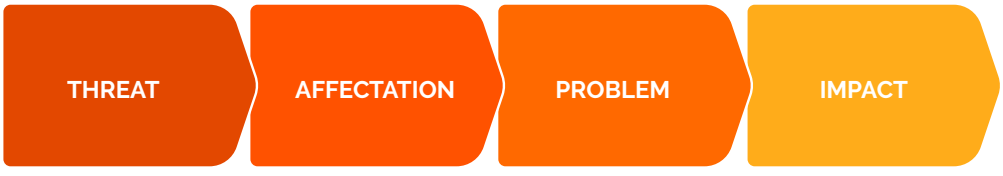
Following this dynamic, we opened a space to share and build knowledge together in the understanding that some people in the workshop may not have heard the term "climate change" or some of the related definitions before. We discussed topics like climate change, mitigation, adaptation, loss and damage, climate events and possible consequences. The idea was for everyone to have common base concepts that would allow them to participate fully in the workshop.

5.2 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 conducted a joint historical mapping activity of extreme weather events that have occurred in recent years. This created a space for hearing the communities' tacit knowledge and for visualizing and charting it out clearly using the timeline and impact chain tools.

The mapping activity commenced with the joint construction of the "impact chains", which allowed for a comprehensive analysis of the territory and helped 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.

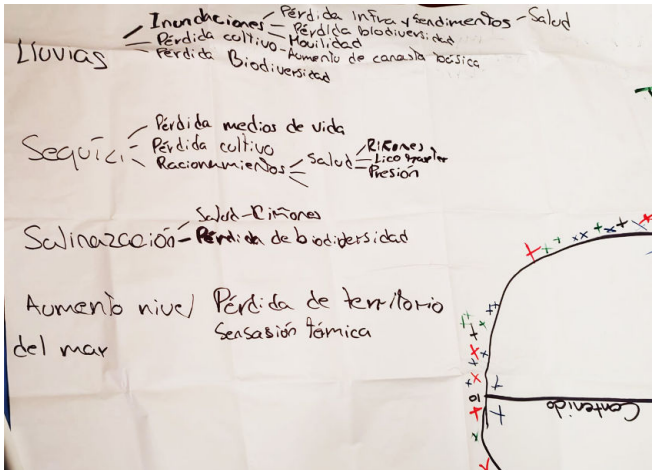
Figure 2. Logical order of impact chains



Prepared by the authors. La Ruta del Clima system methodology

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

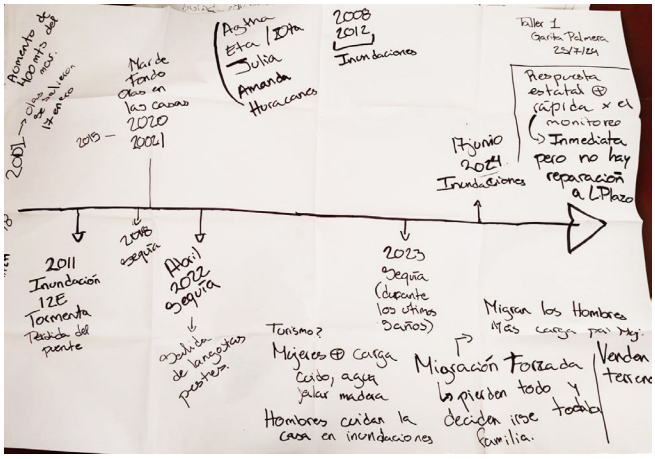
Photograph 1. Impact chain: Guaymango, El Salvador



Prepared during the workshop in the community of Guaymango.

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 tool seeks to identify climate events and changes in patterns that have affected the community in different ways. During these spaces, we identified slow-onset changes and climate emergencies and each of the communities mentioned both economic and non-economic impacts.

Photograph 2. Timeline: Garita Palmera, El Salvador



Prepared during the workshop in the community of Garita Palmera.

It is important to note that 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.

5.3 Download, acknowledgement, and use of the mobile application

To enable automated reporting of loss and damages from within territories, we implemented a mobile application developed by La Ruta del Clima called P51.

During this phase, we incorporated the mobile app as a monitoring and reporting tool, starting with an explanation of its objective and expected results. We explained how data is managed and how to use the app, helping participants to identify and find the app store, connect to the Internet and proceed to download the app.

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 process of app design and reporting and monitoring through it.

Mobile app design

In many of the communities visited, human rights violations are frequent and normalized, making it difficult to assess the impact of climate change. In this context, the sustained use of monitoring tools could enhance the adaptive capacity of participating communities. By observing, recording and systematizing climate changes as well as loss and damage, communities could become more aware of the real impacts they face. This process of periodic, orderly recording helps to give dimension and visibility to these impacts, thus strengthening the communities' capacity to anticipate and respond to the effects of climate change.

The 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 without an Internet connection, making it easy to access the tool on most smartphones.

The application is designed to generate a report based on the selection of a weather event that occurred in the community from which the report is made. There are four Loss and Damage categories in which to report, which are designed to obtain reports from different community perspectives regarding the effects of climate change. Loss and damages are generally interrelated and so the application also allows for reporting in several categories at once, making it possible to show the full effects of an extreme weather event on the most vulnerable communities in the region. 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 damage includes the effects of climate change on the representative traditions of the communities and their ancestral practices.

Infrastructure: This category encompasses economic loss and damage 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.

Monitoring and reporting

During the implementation process, P51 was successfully used in the different communities. This enabled data generation on different climate events in the various categories mentioned above. Each of these reports provides information not only on the category itself, but also on the economic or non-economic impact to communities, families and individuals.

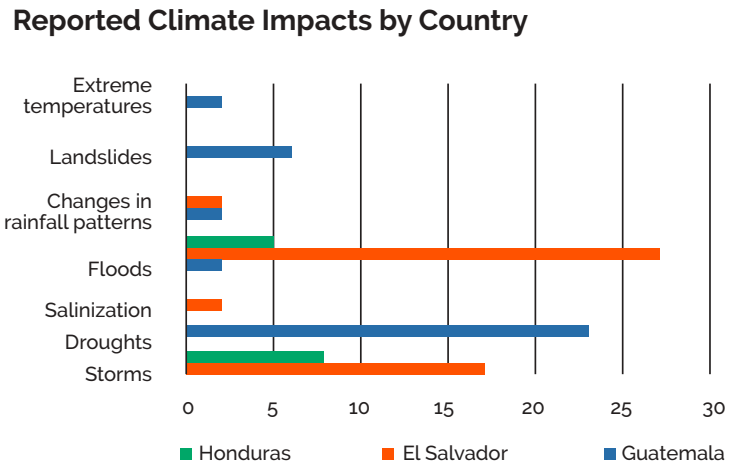
The use of P51 is a gradual process that progresses in parallel with capacity building through the integration of the methodologies described in previous chapters. The selected communities were able to identify several climate impacts, both recent and past events that remain in the collective memory due to their significant consequences for the community.

This highlighted the importance of developing a monitoring and reporting system through a tool that would allow for the collection and analysis of information based on a citizen science approach. 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, we utilized the climate events timeline tool mentioned above with the objective of participants using their memory to identify key events they wished to report, along with their impacts. Based on the event selected, 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.

Figure 3. Reports by country based on climate impact



Prepared by the authors based on the app P51 database.

6. 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 in order 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 with using the application in real tile, talk to their neighbors about any doubts or recommendations in generating reports and ask any questions they may have on the subject.

It is also a space for local partners and the LRC team to continue promoting use of the application and the generation of reports from each of the communities, through images, videos, interactive activities, messages, etc.

7. Data reporting and analysis

Through this methodological process, we are able to strengthen appropriation of the tool, which allows for improved data collection. This objective is fundamental in building evidence from the communities.

It is important to emphasize that this pilot project allowed for the identification of opportunities for improvement so that the evidence can generate valuable information and amplify the voices of the communities, bringing visibility to their needs and ways of coping with climate impacts.

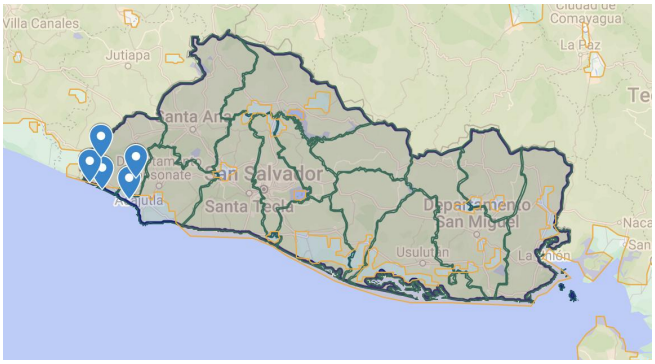
Illustration 1. Reporting points in P51.

Source: P51 application

Below, we provide a summary of the information collected from the communities, broken down by country. This section takes into account the information available for each country according to the national institutions in charge of reporting climate data, namely the National Institute of Seismology, Volcanology, Meteorology and Hydrology (INSIVUMEH) of Guatemala; the Center for Atmospheric, Oceanographic and Seismic Studies (CENAOS) of Honduras; and the Ministry of Environment and Natural Resources (MARN) of El Salvador, as well as the data generated by the communities in the workshops held in 2024.

The three countries report disaggregated data in different ways, so standardized information is not available for all cases. The main characteristics of the study areas are detailed below.

7.1 El Salvador

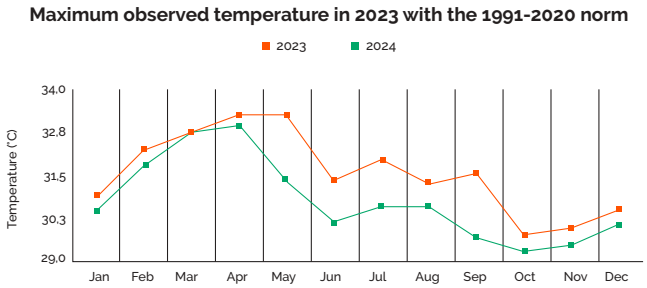


In El Salvador, we visited the departments of Ahuachapán and Sonsonate, both coastal regions with very similar climate conditions. According to the Ministry of Environment and Natural Resources (MARN), El Salvador sets climate zones based on the department's altitude in meters above sea level (m.a.s.l.). In this case, both departments fall within the 0 to 800 m.a.s.l. category. For this climate zone, average temperatures range from 22°C to 27°C in the coastal plains and from 22°C to 28°C in the internal plains.[21]

These temperatures have been rising in recent years. In 2023 the annual average temperature was up to 2°C higher as compared to the norm observed in the period from 1991 to 2020.[22]

This information is detailed in Figure 8 below:

Figure 4. Maximum observed temperature in 2023



Source: MARN, 2024[23]

21 MARN, 'MARN - Clima En El Salvador' <https://www.snet.gob.sv/ver/meteorologia/clima+en+el+salvador/> accessed 25 September 2024.

22 'MARN - Resumen Climatologico Anual' <https://www.snet.gob.sv/ver/meteorologia/clima/resumen+climatologico+anual/> accessed 25 September 2024.

23 ibid.

During the wet season from May to October, El Salvador is usually affected by meteorological drought, which, according to MARN, is a process that occurs when there is a prolonged period without rainfall or with less-than-average rainfall. Droughts are classified by days of duration. They are considered weak when they last between 5 and 10 consecutive days; moderate when they last between 11 and 15 days; and severe when they exceed 15 days.

This decrease in the amount of annual rainfall is also reflected in the statistics for 2023, with a reduction of -148.6 mm per year in the countrywide average. Specifically for the study area in Ahuachapán, there was a decrease of -71.4 mm in 2023 compared to the expected historical norm.

This information is detailed in Figure 3 below.

Figure 3 Decrease in rainfall in 2023 compared to the expected norm

Station - Day		Annual		
		2023	Normal	Anomaly
A-15	Güija	1492.7	1408.6	84.1
A-18	Finca Los Andes	1926.1	2336.4	-410.3
A-27	Candelaria La Fontera	1450.2	1426.8	-174.6
A-31	Planes de Montecristo	2192.0	2237.1	-45.1
A-37	Santa Ana-UNICAES	1481.3	1804.8	-323.5
B-01	Chorrera El Guayabo	1926.5	2029.3	-102.8
B-06	Sensuntepeque	2281.6	1937.0	344.6
B-10	Cerrón Grande	1933.4	1920.9	12.5
C-09	Cojutepeque	1898.0	1712.1	185.9
G-03	Nueva Concepión	1651.9	1709.1	-57.2
G-04	La Palma	1902.4	2379.0	-476.6
G-13	Las Pilas	1690.5	1612.2	78.3
H-08	Ahuachapán SM	1478.3	1549.7	-71.4
H-14	La Hachadura	1584.1	1786.4	-202.3
L-04	San Andrés	1366.4	1674.6	-308.2
L-27	Chiltuipán	2137.0	2159.1	-22.1
M-24	San Miguel UES	1358.5	1520.9	-162.4
N-02	La Unión/CPI	1135.8	1677.8	-542.0
S-10	Aeropuerto Ilopango	1434.0	1781.3	-347.3
T-06	Acajutla, Puerto Nuevo	1509.0	1741.0	-232.0
T-24	Los Naranjos	1710.8	2327.9	-617.1
U-06	Santiago de María	1818.2	2105.9	-287.7
V-09	Puente Cuscatlán	1705.9	1712.9	-7.0
Z-02	San Franscisco Gotera	1920.1	1945.9	-25.8
Z-03	Perquín	2753.5	2758.1	-4.6
	Average	1749.5	1898.1	-148.6

Source: MARN, 2024[24]

24 ibid.

The main climate threats identified for this zone include tropical waves that cause an increase in the amount of precipitation in the area; hydrometeorological droughts that affect production dynamics; and heatwaves[25], which are more and more frequent in the country and have resulted in the need to warn the population about these events, especially with temperatures reaching 42.4˚C, endangering the health of the population.[26]

In the communities of El Salvador, the impact chains, timelines and reports showcase changes in rainfall patterns, storms and drought. Participants recall how, since 2022, they have faced droughts and storms in the same year and the implications of this not only for farming and fishing, but also for other areas like health.

During the fieldwork conducted in El Salvador, one of the most impressive stories we heard was the community's reaction to tropical storm Beryl. In order to save the blue crab species (called "punches"), members of the Barra de Santiago community took out their fishing boats and collected the crabs, transferring them to the mangroves where they would no longer be in danger, despite what this could mean for them in the midst of an emergency.[27] They made this decision not only as a means to protect the species but also to protect one of their main sources of income, demonstrating how climate impacts force these communities to make life and death decisions.

Main impacts reported in El Salvador

During the work performed in the territories, we received a series of reports, which are summarized below.

Table 1. Reports from July 29, 2024, from the workshops with the communities of San Francisco and Barra Santiago

Reported Climate Impacts	Number of Reports	Major Impacts
Storms	7	7 reports in environment
Floods	22	8 reports in community 5 reports in the four categories 1 report in environment, health and community 1 report in community and environment
Salinization	1	1 report in environment

Table 2. Reports from July 29, 2024, from the workshops with the community of Guaymango

Reported Climate Impacts	Number of Reports	Major Impacts
Floods	5	1 report in community and environment 3 reports in infrastructure and environment 1 report in environment
Storms	11	4 reports in environment 7 reports in infrastructure and environment
Rainfall changes	1	1 report in environment

Prepared by the authors based on the P51 database.

25 ibid.

26 'MARN - Boletín Temperaturas Extremas' <https://www.snet.gob.sv/ver/meteorologia/clima/boletin+temperaturas+extremas/> accessed 25 September 2024.

27 Díaz, 2024. Lluvias afectan a población de cangrejos punches en Barra de Santiago. https://www.elsalvador.com/noticias/nacional/lluvias-afectan-a-poblacion-de-cangrejos-punches-en-barra-santiago/1150425/2024/.

Photograph 3. From the P51 database. Flood report in El Salvador

Photograph 4. From the P51 database. Flood report in El Salvador

Photograph 5. From the P51 database. Storm report in El Salvador

Participants were able to make a report in four main categories. In this section, we break down the information by affected area and main impacts.

7.1.1 Community

We received 20 reports in this category, which we can further break down into five reports on cultural and social loss; 13 reports on social loss only; and two reports on cultural impacts only.

Social

The social impacts reported are related to access to education, tangible assets, loss of employment or days of work (the most common), community unity, discrimination, gender impacts and human mobility.

Table 3. Number of reports related to the category Community-Social in El Salvador

Impacts	Number of Reports
Access to education	14
Tangible goods	6
Loss of employment	16
Human mobility	4
Gender impacts	2
Community Unity	1

Prepared by the authors based on the P51 database.

Four people reported that they were forced to move within the country or abroad due to the amount of flooding. They reported the displacement of groups of various ages, with a total of 14 people being displaced due to flooding. In the comment boxes, in response to the question of if this is fair, they responded

> "No, because the worry makes us sick and it is a wasted effort."

- Source: Comment from P51 application

The social impacts reported in the context of climate change and natural disasters are significant and encompass several dimensions, highlighting the vulnerability of the communities and the urgent need for attention and support. These are usually effects with long-term impacts, as is the case of education, which limits development opportunities for children, as well as the loss of employment, which leads to greater economic vulnerability for the affected families..

The 18 reports on social impacts in El Salvador show a series of relationships between access to education, loss of tangible assets, employment instability, community cohesion, gender inequalities and human mobility. These aspects reflect the profound vulnerability of communities

to the effects of climate change and natural disasters, requiring a comprehensive response that not only addresses economic recovery, but also strengthens the social fabric and promotes equal access to opportunities.

Cultural

The six responses on flood-related cultural loss and damage highlight a pattern: the disappearance of traditional foods, the erosion of traditions and the loss of ancestral languages, all fundamental elements of the cultural identity of the affected communities. These cultural damages are not only a direct consequence of extreme weather events, but also exacerbate pre-existing vulnerabilities, especially in terms of food security and social cohesion.

7.1.2 Environmental

We received 32 reports in this category, which we can further break down into 15 reports on loss of biodiversity and agriculture; 15 reports on loss and damage in agriculture and livelihoods; 1 report on agriculture and tourism; and 1 report on all three categories. The main results of the analysis are presented below:

Agriculture

In agriculture, loss and damage is reported in three main categories: agriculture, subsistence farming and fishing.

Table 4. Number of reports related to the category Environmental-Agriculture in El Salvador

Impacts	Number of Reports
Agriculture	29
Subsistence farming	10
Fishing	7

Prepared by the authors based on the P51 database.

The comment section included the voices of several individuals that reported the devastating consequences of climate events, evidencing the magnitude of the losses faced by their communities.

One testimonial is worth highlighting:

> "On June 17, it started raining in such a way that we experienced the loss of our crops, chickens. The house is affected by all of the rain.!"

- Source: Comment from P51 application.

This account not only reflects the immediate economic loss related to the destruction of crops and the death of animals, but also underscores the impact on housing, a fundamental element for family security and stability. The interrelationship between the health of the natural environment and family well-being is palpable, since the destruction of crops—a source of food and livelihood—also affects access to an adequate diet and food security, as well as financial stability and income-generating capacity.

Another comment expressed:

> "There was a storm that affected agricultural production, loss of agroecological gardens, loss of basic grains. There was no support from the government. There was no help."

- Source: Comment from P51 application

This testimony reveals not only the economic losses related to agriculture, but also the frustration and abandonment felt by those affected by the lack of government response. The disappearance of agroecological gardens, which are crucial for sustainability and food security, highlights the non-economic loss related to the loss of agricultural knowledge and practices that foster diversity and adaptability.

Both comments illustrate how, during and after the climate event, the loss generated can span multiple dimensions. Economic losses, such as reduced income and food insecurity, are intertwined with non-economic losses, such as the erosion of the social fabric, loss of cultural identities and diminished trust in institutions. The feeling of vulnerability and abandonment generates a state of discouragement that can affect mental health and the social cohesion of communities, further hindering resilience.

In summary, these testimonies demonstrate that the consequences of climate events are not only quantifiable in economic terms, but also have a profound impact on the daily lives, culture and resilience of affected families and communities. It is essential to recognize and address these losses holistically, considering economic, social and cultural aspects, in order to develop effective adaptation, recovery and response strategies for communities.

Biodiversity

In terms of biodiversity, we received 18 reports related to multiple subcategories. The following is a breakdown of the affected areas specifically as they related to El Salvador:

Table 5. Number of reports related to the category Environmental-Biodiversity in El Salvador

Impacts	Number of Reports
Ecosystem services	2
Ecosystem services and effects on species dependence	4
Loss of protected areas and effects on species dependency	1
Endangered species and protected areas	4
Endangered species, protected areas and effects on species dependence	1
Effects on species dependence and marine ecosystems	1
Loss of protected areas	4
Endangered species	1

Prepared by the authors based on the P51 database.

Biodiversity in rural coastal communities faces significant loss due to the combined effects of climate change, environmental degradation and extractive activities. These communities rely heavily on natural resources for their livelihoods, such as fishing, farming and ecotourism, so the loss of key ecosystems like mangroves, coral reefs and coastal forests has a profound impact on their food security, economy and well-being.

Sea level rise, coastal erosion and ocean acidification aggravate these problems by altering marine and terrestrial habitats, affecting species that play essential roles in the ecological balance.

Moreover, deforestation and the unplanned expansion of tourism and urban development generate additional pressures on fragile ecosystems, further reducing the capacity of these communities to adapt and recover from damage.

Despite local and international efforts, the lack of comprehensive conservation and adaptation policies, coupled with weak enforcement of environmental laws, perpetuates this crisis, leaving rural coastal communities in a highly vulnerable situation.

Tourism

Two reports mentioned impacts to tourism, specifically the loss of employment, damage to basic services and loss of trade goods due to flooding.

The impacts of climate change on the tourism sector are increasingly evident, manifesting in the loss of employment, the disruption of basic services and a decrease in trade goods.

Several reports pointed out how extreme weather events, rising sea levels and changes in weather patterns are transforming traditional tourist destinations, especially in coastal areas and small islands. These changes not only reduce the influx of visitors, but also put tourism infrastructure and the livelihoods of local communities at risk.

7.1.3 Health

For the communities in El Salvador, we received a total of 13 reports in the category of health, ten of which were related to physical health and three to psychosocial health.

In terms of physical health, all ten reports were related to flooding and mention human loss, food shortages and health problems like diarrhea, dengue fever and respiratory diseases.

The reports describe feelings of concern and sadness, indicating the unjustness of having to go through these situations. The growing frequency and severity of these climate phenomena increase cases of disease and aggravate cases of malnutrition or food deficiency, which negatively affects the physical health of the community and its possibilities for development.

The three reports that mention psychosocial health are also related to flooding and report feeling anguish, loss of sleep and tiredness, deep sadness and anxiety. Psychologically, the stress caused by loss of livelihoods, forced displacement and uncertainty about the future contributes to a rise in disorders like anxiety, depression, and post-traumatic stress disorder. Vulnerable communities, especially in rural areas, face greater difficulties in accessing adequate medical care and psychosocial support, which aggravates these conditions and this is reflected in the reports received.

7.1.4 Infrastructure

We received 20 reports in the category of infrastructure. This category identifies the loss of buildings experienced by the communities. Reports in this category are related to two specific climate impacts: floods and storms.

The following is a list of infrastructure loss and damage as reported by the communities of El Salvador:

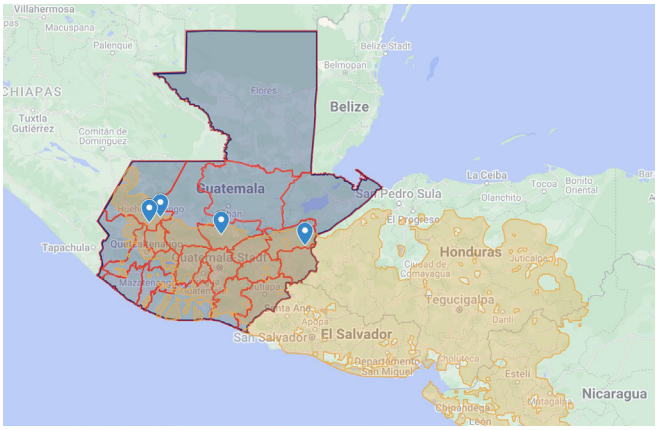
Table 6. Number of reports on Loss and Damage related to Infrastructure in El Salvador

Infrastructure	Number of Reports
Housing	11
Streets and roads	16
Sewers	1
Bridges	2
Telecommunications	2
Electricity	1
Loss of land	2
Loss of cultural spaces	2

Prepared by the authors based on the P51 database.

Damage to infrastructure often means that communities have to rebuild or repair their homes, often without economic support from the State, which in many cases increases their economic vulnerability. In addition to the above, the reconstruction and repair of public infrastructure is often delayed, representing a greater risk for affected families and difficulties for mobilization or access to basic services.

7.2. Guatemala



In general, climate change estimates in Guatemala indicate reduced precipitation from July to September, which could intensify the heatwave, also known as veranillo [little summer], and, in turn, could have serious implications for agriculture.[28]

Our work in Guatemala focused on the departments of Huehuetenango and Baja Verapaz. Based on the data available, below we present the specific climate characterization of these areas and how the country's reality is reflected in these territories.

Huehuetenango

For this department, we used a study conducted in the Chenxul micro-watershed as a general characterization since there is no segregated data for the municipalities of Malacatancito and Aguacatán.

Huehuetenango is characterized by average annual temperatures of between 12°C and 27.2°C and a wet season that runs from May to October with an average annual rainfall of 800 mm to 1,800 mm. These characteristics can be seen in the areas surrounding the micro-watershed.[29] In other more remote areas, however, average temperatures reach 16°C with an average annual rainfall of 1,310 mm.[30]

In the area, the Famine Early Warning Systems Network conducted climate modeling, where the analysis indicated a trend of increasing temperatures and decreasing rainfall. For some municipalities of Huehuetenango, there will be a greater risk of drought due to higher temperatures and prolonged rainfall deficit.[31]

According to reports from the National Climate Change Information System (SNICC), this department is at high risk of drought, which is the main climate threat affecting the communities visited during this project.[32]

This information also coincides with climate incidents reported by Guatemalan newscasts in June 2024, when a number of tributaries in Huehuetenango dried up completely, such as the Magdalena and El Chivo lagoons, along with the Yula'xaq waterfalls. This is a worrying situation for the community, as it had never been experienced with such severity in the department.[33]

Baja Verapaz

In the department of Baja Verapaz, we specifically visited the municipality of Salamá, an area characterized by high vulnerability to drought due to its location within the Central American Dry Corridor. Climate parameters for this area include a range of precipitation from 701 mm to 2,501 mm (data from 1960 to 1990). The area with the highest precipitation is the northeastern part of the municipality.[34]

The average annual temperature is 18.8°C but can range from 10.5°C to 25.7°C. There is a very marked dry season between January and April and, historically, the wet season begins in May and ends in December.[35]

The Tropical Agricultural Research and Higher Education Center (CATIE) made climate change projections for the municipality of Salamá under the RCP2.6 (favorable) and RCP8.5 (unfavorable) scenario.[36] Figure 1 shows the estimated data for precipitation and temperature:

28 'Escenarios Futuros de Cambio Climático Para Guatemala | Inter American Dialogue' <https://globaltrends.thedialogue.org/publication/escenarios-futuros-dee-cambio-climatico-para-guatemala/> accessed 25 September 2024.

29 ASOCUCH, 'Análisis de Vulnerabilidad, Comunidades Adaptadas al Cambio Climático, Microcuenca Chenxul, San Rafael La Independencia y San Miguel Acatán, Huehuetenang' (2019) <https://www.asocuch.com/wp-content/uploads/2020/06/11-AV_Chenxul_San_Rafael_08.07.19.pdf>.

30 'Clima Huehuetenango: Temperatura, Climograma y Tabla Climática Para Huehuetenango' <https://es.climate-data.org/america-del-norte/guatemala/huenuetenango/huehuetenango-53821/> accessed 25 September 2024.

31 ASOCUCH (n 14).

32'Proporción de municipios por tipo de amenaza Sequía' <https://app.powerbi.com/view?r=eyJrIjoiNmVhZmFhZGQtYmU5MC00ZWUwLTliNmYtYWU5Mjg5ZmFmNTlmIiwidCI6IjhmYmFhNWJmLTJlY2MtNGRjOC1iNTZiLThmOTJlMzA3ZjA3NiIsImMiOjR9> accessed 25 September 2024.

33 'Población de Huehuetenango expresa preocupación por los estragos de la falta de lluvia' (Prensa Comunitaria, 5 June 2024) <https://prensacomunitaria.org/2024/06/poblacion-de-huehuetenango-expresa-preocupacion-por-los-estragos-de-la-falta-de-lluvia/> accessed 25 September 2024.

34 CATIE, 'Análisis de Riesgo Climático y Recomendaciones Para Desarrollar Un Plan Local de Adaptación al Cambio Climático (PLACC) Aplicación al Sector Agropecuario y de Seguridad Alimentaria Municipio de Salamá, Departamento de Baja Verapaz, Guatemala' (2022) 443 186.

35 ibid.

36 ibid.

Figure 5. Climate change projections for Salamá, Baja Verapaz, Guatemala

Scenario	Average	Q33	Q50	Q66	Minimum	Maximum
			Rainfall (mm)			
Línea Base	1485.44	1155.89	1395.00	1719.04	701.00	2501.00
RCP26_50	1477.87	1153.26	1388.50	1708.52	694.00	2490.00
RCP26_80	1475.09	1150.52	1387.00	1708.26	695.00	2479.00
RCP85_50	1371.67	1069.63	1290.00	1591.26	641.00	2309.00
RCP85_80	1251.17	973.63	1175.00	1458.52	580.00	2101.00
			Temperature (°C)			
Línea Base	18.9	17.0	18.7	21.1	10.5	25.8
RCP26_50	20.5	18.6	20.4	22.8	12.2	27.4
RCP26_80	20.4	18.5	20.3	22.7	12.1	27.3
RCP85_50	21.6	19.7	21.4	23.8	13.2	28.5
RCP85_80	23.2	21.3	23.1	25.4	14.9	30.1

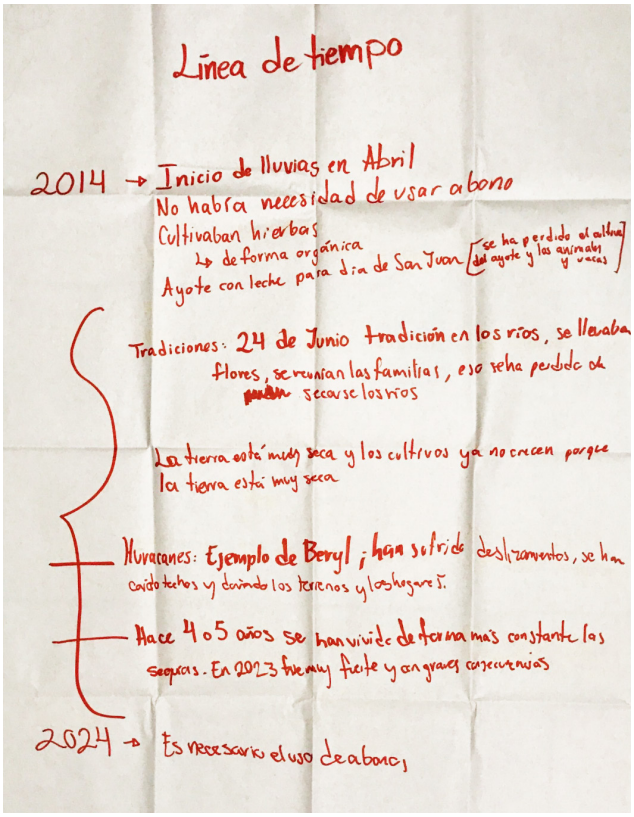
Source: CATIE, 2022[37]

The RCP8.5 scenario shows a decrease in precipitation by 2050 of between -60 mm and -192 mm, and in the long term, by 2080, shows a range of decrease between -121 mm and -400m. For this same scenario, temperatures rise by up to 4.36°C in the long-term RCP8.5 scenario.
According to SNICC reports, this municipality is at very high risk of drought, which is the main climate threat affecting the communities visited during this project.[38]

In the communities of Guatemala, the reports related to changes in rainfall patterns are very similar to those of Honduras. On this subject, the participants recall how in 2014, they knew that in April the rains would start; it was not necessary to use fertilizer and they had greater crop diversity. However, now they indicate that the land is very dry and that crops are no longer growing due to water scarcity. For the last four or five years, they identified that droughts have been more constant.

During our visits to Guatemala, the participants made reference to the tradition of the "Celebration of the last day of hunger", once celebrated on August 15th. This celebration consisted of the communities harvesting and eating their crops together after the wet season ended. Today, they are unable to define a specific date coupled with lower harvests, putting at risk not only food security but also the community's culture and traditions. Through the use of impact chains and timelines, we were able to trace the evolution of the problem and demonstrate these changes.

Figure 6. Example timeline for Pino Solo, Guatemala



Prepared by the authors during the community workshop in Pino Solo.

37 ibid.

38 'Proporción de municipios por tipo de amenaza Sequía' (n 17).

An important note regarding these territories is that given their conditions of vulnerability, they require humanitarian aid, which is the main focus of our partner ASEDE.

Additionally, one of the challenges identified in the process is that the communities do not use Spanish as their primary language, which implied difficulty not only in capacity building but also in the use of the application. This characteristic should be evaluated with our partners in the future to take the appropriate measures for ideal implementation.

Photograph 6. From the P51 database. Landslide in Guatemala

The two tables below summarize the climate impacts that were reported.

Table 7. Reports from July 30, 2024, from the workshops with the communities of Tuixcox and Pino Solo

Reported Climate Impacts	Number of Reports	Major Impacts
Drought	20	5 reports in environment 4 reports in environment and health 5 reports in the four categories 5 reports in environment, community and health 1 report in environment and community
Extreme temperatures	1	1 report in environment
Rainfall pattern changes	1	1 report in environment and community
Landslide	1	1 report in environment and community

Prepared by the authors based on the P51 database.

Table 8. Reports from August 01, 2024, from the workshops with the communities of El Sauce and Xesiguan

Reported Climate Impacts	Number of Reports	Major Impacts
Drought	3	3 reports in community, health and environment
Flooding	1	1 report in health
Landslides	5	3 reports in community, health and environment 1 report in infrastructure 1 report in the four categories

Prepared by the authors based on the P51 database.

7.2.1 Community

In terms of community, participants made 11 reports of social and cultural impacts and nine reports of social-only impacts. The main results of the analysis are presented below.

Social

The communities reported impacts in the areas of access to education, employment and mobility, and tangible assets. There were 15 reports related to two climate impacts: 1) drought and 2) landslides. The following is a breakdown of the reports for Guatemala:

Table 9. Number of reports on Loss and Damage related to the category Community-Social in Guatemala

Impacts	Number of Reports
Access to education, employment and mobility.	6
Access to education, employment, mobility, tangible goods.	1
Access to education, genre impact, mobility, tangible goods.	1
Mobility.	1
Employment.	2
Access to education.	4

Prepared by the authors based on the P51 database..

In terms of mobility, five people reported having to move from their community due to drought. This is a growing phenomenon in rural areas where communities depend on subsistence farming and water availability. The intensification and prolongation of droughts, exacerbated by climate change, is pushing thousands of people to migrate in search of better living conditions. In rural communities, lack of water not only affects agricultural production, but also deteriorates living conditions by limiting access to drinking water and causing conflicts over scarce resources. This displacement is not always voluntary, but rather a survival strategy in the face of a lack of opportunities and growing food insecurity.

This data highlights not only the tangible consequences of socioeconomic deterioration in vulnerable regions, but also the deepening of structural inequalities that, in many cases, remain unaddressed by public policies.

The impact on access to education, for example, is not only the result of immediate factors like the destruction of infrastructure or forced displacement, but also reflects the historical precariousness of investment in education in rural or marginalized areas. Lack of technological resources, transportation or qualified teaching staff exacerbates educational exclusion, perpetuating the cycle of poverty and limiting long-term development opportunities.

In terms of employment, the impacts are not only limited to job loss, but also expose the fragility of local economies that are overly dependent on sectors vulnerable to climate shocks, such as agriculture, fishing and tourism.

The lack of economic diversification policies and support for small-scale farmers leaves communities without sustainable employment alternatives, forcing them to migrate or adapt to insecure and informal jobs, which makes their living conditions even more precarious. In addition, barriers to mobility, whether due to a lack of infrastructure or conflicts related to access to resources, accentuate the isolation of these communities, impeding not only their integration into broader labor markets, but also their access to basic services and training opportunities.

Finally, the loss of tangible assets, while a visible consequence of disasters or economic crises, also reflects the lack of social safety nets and effective mechanisms for redress or compensation. Communities often lack access to insurance, subsidies or credit for reconstruction or recovery, leaving them chronically vulnerable. This reality highlights the inequality in resource distribution and the ineffectiveness of state interventions, which tend to be palliative and temporary, rather than addressing the structural causes of poverty and vulnerability in these regions.

Cultural

Eleven reports were related to cultural impacts, specifically the loss of traditions, languages, ancestral foods and spaces for religious or spiritual practices, showing the profound and multidimensional impact of climate change on local and indigenous cultures.

These losses not only compromise the collective identity of affected communities, but also have long-term consequences on their resilience and ability to adapt to climate crises.

7.2.2 Environment

We received 29 reports in this category, which we can further break down into 17 reports on biodiversity, agriculture and livestock; six reports on biodiversity only; three reports on biodiversity, agriculture and tourism; and two reports on agriculture and livestock only. The main results of the analysis are presented below.

Agriculture and livelihoods

In terms of agriculture, 23 impacts were reported in three main categories: agriculture, subsistence farming and livestock.

Two reports indicate impacts to fishing.

In the context of Guatemala, rural communities face significant challenges due to climate impacts that affect their livelihoods. Together, these losses and damages in agriculture, subsistence farming, livestock and fishing create a domino effect that aggravates the vulnerability of rural communities in Guatemala.

Families face not only the loss of their livelihoods, but also an increase in poverty, food insecurity and malnutrition and the weakening of social cohesion. It is essential to implement climate change adaptation policies and programs to help these communities strengthen their capacities and resilience in the face of these challenges, ensuring a more sustainable and secure future.

Biodiversity

Regarding biodiversity, we received 25 reports in multiple subcategories. The following is a breakdown of the impacts reported;

In the context of rural communities in Guatemala, the two categories with the highest number of responses include loss of protected areas and species extinction as well as impacts on ecosystem services. These issues are interconnected and have a profound impact on biodiversity and community well-being.

Loss of protected areas, species extinction and impacts on ecosystem services are interrelated problems that have a profound impact on the environmental and social health of rural communities in Guatemala.

These impacts not only threaten biodiversity and ecological balance, but also jeopardize the food security, economy and culture of the communities. Addressing these challenges requires integrated management that includes the conservation of ecosystems, the promotion of sustainable practices and the strengthening of community capacities to face the effects of climate change.

Tourism

In the context of the rural communities in Guatemala, there were three reports that highlighted impacts on tourism. These reports show that loss and damage in this sector is closely linked to access to basic services, employment and loss of natural attractions.

The three reports on the impacts to the tourism sector highlight the interconnection between access to basic services, employment and the loss of natural attractions. These factors not only influence the viability of tourism as an economic engine, but also affect the well-being of rural communities in Guatemala.

Table 10. Number of reports on Loss and Damage related to the category Environmental-Agriculture in Guatemala

Impacts	Number of Reports
Number of Reports	10
	1
Agriculture, livestock and subsistence farming	5
Fishing	1
Agriculture, fishing and subsistence farming	1
Agriculture and subsistence farming	5

Prepared by the authors based on the P51 database.

Table 11. Number of reports on Loss and Damage related to the category Environmental-Biodiversity in Guatemala

Impacts	Number of Reports
Species extinction, loss of protected areas and ecosystem services.	7
Species extinction, loss of protected areas and effects on species dependence.	1
Extinction of species and ecosystem services.	4
Ecosystem services	8
Extinction of marine species and ecosystems	1
Species extinction and effects on species dependence.	1
Loss of protected areas and effects on species dependence.	1
Species extinction	2

Prepared by the authors based on the P51 database.

7.2.3 Health

From the communities in Guatemala, we received a total of 22 reports related to health: 13 reports were related to both categories (physical and psychosocial); five to only physical health; and four to psychosocial health.

Física

In terms of physical health, 14 reports were related to drought, noting that the main impacts on physical health were heat stroke, food shortages and other issues like irritations, allergies and kidney or urinary diseases.

The other nine reports were related to flooding and mention human losses, food shortages and health problems like diarrhea, dengue fever and respiratory diseases. There are also four reports related to health problems due to landslides, which mention food shortages as the main impact, and one report related to flooding that also reported health impacts.

The reports describe feelings of concern and sadness, noting that they feel it is unfair to have to go through these circumstances. The growing frequency and severity of these climate phenomena increase cases of disease and aggravate food insecurity, which negatively affects the health of the community.

> "It's not fair because the village doesn't understand why they are affected in this way and doesn't receive institutional or governmental support."l"

- App P51 user

Psychosocial health

In terms of psychosocial effects, 17 people reported experiencing significant emotional impacts related to climate phenomena like droughts, landslides and floods. The most common impacts include loss of sleep, anxiety, deep sadness and stress.

Taken together, these psychosocial impacts weaken the community, affecting collective mental health and hindering their capacity to cope with climate challenges resiliently, further weakening support networks and resilience and aggravating conditions of vulnerability to future climate impacts.

7.2.4 Infrastructure

In terms of infrastructure, eight reports indicated different types of related damage. This category identifies the loss of buildings experienced by the communities. Reports in this category are linked to two specific climate impacts: droughts and landslides.

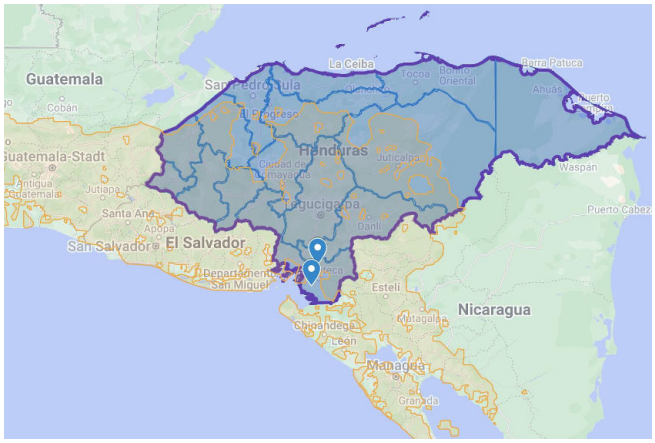
The following is a list of infrastructure reported as lost or damaged by the communities in Guatemala:

Table 12. Number of reports on Loss and Damage related to Infrastructure in Guatemala

Infrastructure	Number of Reports
Housing	4
Streets and roads	8
Sewers	5
Bridges	4
Telecommunications	1
Electricity	4
Loss of land	2
Loss of cultural spaces	1
Schools and others	1

Prepared by the authors based on the P51 database.

7.3 Honduras

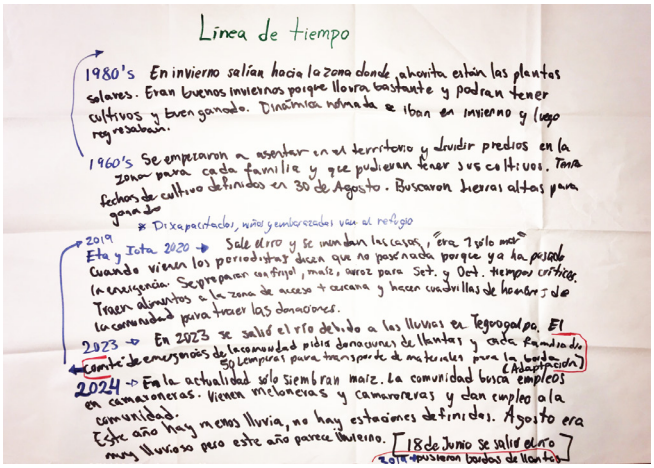


In Honduras, we visited the department of Choluteca. According to data from the Center for Atmospheric, Oceanographic and Seismic Studies (CENAOS), this area is characterized by very low average rainfall compared to the rest of the country. For example, from January to September of 2024, there was only 127.6 mm of rainfall, equal to 1% of the country's total rainfall for that same period[39]. The area of Choluteca is also characterized by a tropical savanna climate, with average temperatures of 28.1˚C.[40]

Choluteca has been greatly affected by the El Niño Southern Oscillation (ENSO) phenomenon. According to CENAOS, "this phenomenon considerably affects wind circulation and ocean currents, sea surface temperature and precipitation in the tropical Pacific". In Honduras, the effects of this phenomenon are more intense in the departments of Choluteca, Valle, El Paraíso, Francisco Morazán, La Paz and Ocotepeque, where effects are felt from the end of June to the beginning of September with droughts across this territory.

The country is currently under a La Niña watch alert, as the phenomenon is expected to begin between September and November of 2024 and last until January or March of 2025. This has been reported through the weather alert system of the Climate Prediction Center/NCEP/NWS, which maintains constant alerts for the use and preparation of the Honduran population to these weather phenomena.[41]

Figure 7. Timeline for Palenque, Honduras



Prepared by the authors in the community workshop in Palenque, Honduras

In developing the timeline, it was possible to identify key moments for the communities of Honduras when extreme weather events occurred. In 2020, for example, the community of Palenque identified how Hurricanes Eta and Iota caused flooding in the community. In 2023, they reported that due to the rains in Tegucigalpa, the river overflowed its banks. In 2024, they identified changes in rainfall patterns and how rainfall has decreased across the territory. Due to these impacts, community members commented how they were incommunicado for up to a month or how they had to move their livestock long distances due to the effects of extreme weather (intense rains that caused flooding or droughts that burned the grass on which the livestock fed).

Development of the participatory process with the communities allowed them to internalize how the frequency of these impacts has increased in their communities and how this has had economic and non-economic impacts on their households.

During the workshop, we identified technological gaps ranging from difficulties in the use of cell phones to a total lack of access to one. To address these differences, we applied certain techniques, such as dividing participants into two groups: one for those who had access to the app, allowing them to make their reports individually; and a second for those without access, who worked on a collective report on the workshop facilitator's cell phone.

39 CENAOS, 'CENAOS Mapas' <http://cenaos.copeco.gob.hn/MapaPyTM.html> accessed 25 September 2024.

40 'Clima Honduras: Temperatura, Climograma y Tabla Climática Para Honduras' <https://es.climate-data.org/america-del-norte/honduras-48/> accessed 25 September 2024.

41 CENAOS, 'El Niño Oscilación Del Sur (ENOS)' <http://cenaos.copeco.gob.hn/elnino.html> accessed 25 September 2024.

Despite these challenges, in both communities, the level of understanding of the application was considerably high. Many of the participants had more modern phones and Internet access, and even had WiFi networks at home.

While the connection was unstable, there were points within the community with better access, allowing for continued use of the app in the future, especially with follow-up and support, and they showed interest in continuing to use the tool.

Photograph 7. From the P51 database. Flooding

Elaboración propia en Taller en comunidad El Palenque Honduras

The two tables below summarize the climate impacts that were reported.

Table 13. Reports from August 20, 2024, from the workshop with the community of Quebrachal

Reported Climate Impacts	Number of Reports	Major Impacts
Storms	8	7 reports in all categories 1 report on community health and infrastructure

Prepared by the authors based on the P51 database

Table 14. Reports from August 21, 2024, from the workshop with the community of Palenque.

Reported Climate Impacts	Number of Reports	Major Impacts
Flooding	5	5 reports in the four categories

Prepared by the authors based on the P51 database.

7.3.1 Community

The impacts reported at the social level are tied to access to education, tangible assets, loss of employment or days of work, community unity, discrimination, gender impacts and human mobility. There were 13 reports in this category related to thunderstorms and floods.

Social

At the social level, we received 13 reports. The main impacts reported in this category are related to human mobility, employment, tangible assets and access to education.

Table 15. Number of reports on Loss and Damage related to the category Community-Social in Honduras

Impacts	Number of Reports
Access to education	12
Tangible goods	12
Loss of employment	13
Human mobility	10
Community Unity	1
Violence	6

Prepared by the authors based on the P51 database

Honduras had the highest number of reports related to mobility, with ten people reporting that they had to move due to flooding in their country. One person commented: "The houses were flooded, they left their homes and later came back, after a week." In the case of Honduras, it is worth noting that in the opinion tables, seven people stated that **one possible remedy to these impacts is to have access to a shelter within their communities.**

Cultural

Regarding community impacts related to culture, three responses referred to flooding and the loss of traditions, ancestral foods and religious and/or spiritual practices.

This analysis shows how flooding and other climate impacts not only cause material damage, but also erode the cultural fabric, threatening the continuity of ancestral knowledge and practices essential to the identity of these communities.

7.3.2 Environment

We received 12 reports in this category, including nine reports on biodiversity and agricultural losses; two reports on loss and damage related to agriculture and livelihoods; and one report on biodiversity only. We share the main results of the analysis below.

Agriculture and livelihoods

In terms of agriculture, loss and damages are reported in three main subcategories: agriculture, subsistence farming and fishing. Two reports indicate impacts to livestock.

Table 16. Number of reports on Loss and Damage related to the category Environmental-Agriculture in Honduras

Impacts	Number of Reports
Agriculture, fishing and subsistence farming	3
Agriculture, livestock and subsistence farming	2
Subsistence farming	2
Fishing and subsistence farming	3
Fishing	1
Subsistence farming	2

Prepared by the authors based on the P51 database.

These reports show how climate impacts, both during and after their occurrence, seriously affect key sectors such as fishing, agriculture and subsistence farming, generating significant losses in economic and non-economic terms for affected families.

From an economic standpoint, extreme weather events like storms, floods and droughts destroy crops, damage agricultural and fishing infrastructure and limit access to markets. This results in the direct loss of income for families who depend on the sale of their products from farming and fishing. In the case of fishing, storms and other events can damage or carry away boats and nets, affecting the ability of families to maintain their livelihoods. Likewise, subsistence farming, which is vital for feeding many rural families, is severely affected, leading to food insecurity when the crops that provide daily sustenance are destroyed. These impacts are exacerbated by the appropriation of livelihoods by shrimping industries that have monopolized the activity on the coast and have damaged their lands and limited access to the sea.

In addition to economic losses, there are equally devastating non-economic losses. The disappearance of traditional livelihoods has profound effects on the communities, as it not only affects their income, but also erodes the culture and traditional practices associated with fishing and agriculture. For example, the loss of local crop varieties due to climate events reduces agricultural biodiversity and with it the knowledge transmitted from generation to generation on the management and cultivation of these species. This knowledge is essential for food resilience and the cultural identity of the communities.

Biodiversity

In terms of biodiversity, we received nine reports in multiple subcategories. The table below breaks down the areas of impact reported in Hondur

Table 17. Number of reports on Loss and Damage related to the category Environmental-Biodiversity in Honduras

Impacts	Number of Reports
Species extinction, ecosystem services and marine ecosystems	3
Marine ecosystems	1
Extinction of marine species and ecosystems	3
Effects on inter-species dependency, species extinction and marine ecosystems.	2

Prepared by the authors based on the P51 database.

In these communities, the impacts to biodiversity reported are closely tied to the coastal marine ecosystem, which plays a fundamental role in the region's environmental and economic sustainability. Climate impacts, particularly storms and floods, have resulted in significant loss of biodiversity, evidenced by two reports of storm damage and seven reports related to flooding.

The loss of biodiversity also implies a deterioration of the ecosystem's resilience to future climate events. A healthy and diverse coastal marine ecosystem has a greater capacity to recover from disasters and maintain its functionality. However, the decline of critical species and habitats can lead to a collapse in food webs and a decrease in ecosystem productivity.

Taken together, these impacts highlight the interconnectedness of climate change, coastal marine ecosystem health and the well-being of local communities. The loss of biodiversity not only affects the environment, but also undermines the economic and cultural bases of these communities, creating a cycle of vulnerability that feeds on environmental degradation. It is crucial to implement conservation and sustainable management strategies that strengthen the resilience of ecosystems and, in turn, that of the communities that depend on them.

7.3.3 Health

For the communities in Honduras, we received a total of 13 reports related to health: ten on impacts in both categories (physical and psychosocial) and three on physical health only.

Physical health

In terms of physical health, we identified 13 cases mainly related to storms and floods. The main impacts reported include lack of food, which exacerbates food insecurity, especially in vulnerable communities. Extreme weather conditions, such as storms and floods, destroy crops and cut off access to essential resources, resulting in severe food shortages that impact both nutrition and overall health.

Additionally, we received reports of health problems associated with the increase of vectors, such as dengue fever, and sanitation, like diarrhea and respiratory diseases. These diseases not only increase the burden on local healthcare systems, which are often already weakened, but also worsen the living conditions of those affected, who face difficulties in accessing medical care or medicines.

On an emotional level, reports describe feelings of worry and sadness among those affected, reflecting the profound impact these physical health problems have on mental well-being. People expressed a strong sense of injustice, feeling that it was unfair to have to face these circumstances without the resources or adequate support to mitigate them.

Psychosocial health

In the area of psychosocial impacts, ten people reported having experienced significant emotional impacts linked to climate phenomena like floods and storms. The most common impacts include loss of sleep, nightmares, anxiety, deep sadness and stress. This feeling of vulnerability and lack of protection further aggravates the emotional and social stress of communities, who not only struggle with the physical effects of disasters, but also with the psychological and emotional deterioration caused by these events. Storms and floods not only wreak physical havoc, but also erode the emotional and mental health of communities, hindering their resilience and increasing health inequalities.

7.3.4 Infrastructure

We received 13 reports related to infrastructure, which list infrastructure damage observed by the community. In the case of the communities in Honduras, five people reported infrastructure losses due to flooding and eight due to storms. The following is a list of the infrastructure reported as lost or damaged by the communities in Honduras:

Table 18. Number of reports on Loss and Damage related to Infrastructure in Honduras

Infrastructure	Number of reports mentioning infrastructure
Housing	13
Streets and roads	9
Sewers	10
Bridges	5
Telecommunications	4
Electricity	8
Commercial activities	3
Health services	3

Prepared by the authors based on the P51 database.

Analysis of the reports and timelines from Central American communities

An analysis of the climate impact reports from the communities in Honduras, Guatemala and El Salvador reveals significant patterns in the way these events affect populations and their livelihoods. By examining the timelines collected in these territories, it is possible to observe the interaction between emergency and slow-onset events, as well as the differences in the perception and awareness of these events.

There are a greater number of responses related to floods and storms, which are emergency events with immediate and noticeable impacts. On the other hand, awareness of slow-onset events, such as droughts, has grown due to their cumulative consequences that affect food security and water resources in the long term. Although droughts may not generate an urgent response like floods, their prolonged impact has begun to be recognized by the communities.

Community of Palenque, Honduras

2020	Hurricanes Eta and Iota cause significant flooding, resulting in the loss of crops and property.
2023	The overflowing of the river due to the rains in Tegucigalpa shows how storms continue to be a recurrent threat in the region.
2024	Changes in rainfall patterns are observed, with a general fall in precipitation. This change may aggravate the already critical situation in agriculture and other climate-dependent sectors..

Community of Pino Solo, Guatemala

2014	The community experiences unpredictable rainfall patterns, making it difficult for farmers to properly plan their crops.
Current	The perception of more frequent droughts and the decrease in crop diversity reflect a drastic change in environmental conditions. Dry land and crops that no longer grow are indicative of severe water shortages, which have been growing over the past four to five years.

Communities in El Salvador

Prior to 2022	Extreme events like storm surges and hurricanes remain in the memory of the communities.
Since 2022	Droughts and storms are reported in the same year, creating a scenario of uncertainty and vulnerability. The implications of these events not only affect agriculture, but also fishing and health, highlighting the interconnection between the different economic and social sectors.

An analysis of compensation and reparations for the impacts of climate change highlights the need for justice and support for the most vulnerable communities, who often bear minimal responsibility for the greenhouse gas emissions that cause these events.

Paragraph 51 of the Paris Agreement limits the ability of these communities to claim compensation, which, together with the lack of clear mechanisms to address loss and damage, puts them in a situation of vulnerability.

In Central America, the records of emergency events like floods and storms, and of slow-onset phenomena like droughts show the complexity of these impacts. Floods generate immediate responses, while droughts and changes in rainfall patterns produce cumulative effects that harm food security, public health and general welfare. Therefore, addressing compensation becomes a moral and legal imperative, acknowledging the human right to live in a healthy and sustainable environment.

The recognition of climate damage must consider not only the loss of tangible assets like homes and livelihoods, but also the psychological, social and cultural impacts. Communities, whose traditions and social cohesion are affected, need a legal framework that ensures their right to reparations and clear mechanisms that allow for the effective implementation of remedies without increasing the debt of the countries of the Global South.

Finally, community participation in managing these resources is essential to ensure that communities can decide on the destination of the funds earmarked for their recovery. The international community must recognize the importance of climate reparations as a human right, especially for developing nations facing the most severe consequences of climate change, urging countries responsible for historical emissions to take an active role in compensating for these damages.

Conclusions

The methodology used in this pilot project not only adapts to the technical needs of monitoring, but also responds to the social realities of each community, integrating risk management in a context of multidimensional poverty where priorities tend to focus on daily survival and immediate response to emergencies. In this process, people actively participated and recognized the value of documenting loss and damage in their communities. This participation has been essential, as it allows communities to make their needs visible to external actors and strengthen their tools for demanding action and resources to help reduce the adverse effects of climate change.

Accompaniment in using the tool has been key in helping the communities to name both the direct and indirect impacts of these events, promoting a more inclusive and effective process. Moreover, the importance of building capacities at the local level has become evident so that communities can identify the specific effects they face as a result of climate change. In this way, the monitoring of data and evidence collected becomes a fundamental basis for informed decision-making and resilient planning in the face of future climate challenges.

An analysis of the reports, impact chains and timelines from the Central American communities reveals that identifying and monitoring climate loss and damage is not only crucial for responding to emergency events like storms and floods, but also for dealing with the cumulative effects of slow-onset events like droughts. These climate phenomena seriously affect food security, water availability and overall well-being, highlighting the importance of constant monitoring that will allow the communities to anticipate their impacts and better manage their resources.

Finally, establishing a framework for reparations and compensation for the impacts of climate change is essential in this context. The communities pointed out the importance of having clear mechanisms that not only cover material losses, but also the psychological, cultural and social impacts. Recognizing these damages and establishing a legal framework that guarantees the right to reparations are crucial steps in addressing climate vulnerability and ensuring that communities do not bear the costs of a climate crisis to which they contributed little. Community participation in managing these resources is essential to ensure a fair recovery that promotes long-term resilience.

This holistic approach enables communities to adapt to current climate challenges as well as to build a more resilient future in which local knowledge and the evidence collected can be translated into concrete and sustainable actions to address climate impacts in a fair and equitable manner. Additionally, it is essential for communities to have access to funding and redress mechanisms that recognize the principle of common but differentiated responsibilities.

Such access would not only strengthen local adaptive and coping capacities, but would also ensure that the countries and actors responsible for the largest portion of greenhouse gas emissions bear a fair share of the costs of addressing and mitigating the effects of climate change on the most affected communities. Effective access to these resources would allow for the implementation of more robust and fairer measures focused on livelihood protection, cultural preservation and human security in the face of growing climate challenges.

Appendix

Appendix 1. Pre- and post-workshop evaluation tool

Community training workshops on how to use the mobile Loss and Damage monitoring application

Name:	**Date:**

Below are some questions on concepts related to climate change and Loss and Damages, we ask you to answer with your opinions and the knowledge acquired in the previous workshop:

Climate change has causes:

- ☐ Only natural
- ☐ Natural and human-generated
- ☐ Only human-generated

"Measures to reduce or prevent greenhouse gas emissions"
This definition corresponds to:

- ☐ Mitigation
- ☐ Adaptation
- ☐ Loss and Damages
- ☐ Climate Justice

Loss and damages caused by climate change are categorized into:

- ☐ Essential and non-essential
- ☐ Physical and economic
- ☐ Economic and non-economic

Which of the following is NOT a climate event?

- ☐ Heavy rainfall
- ☐ Hurricane
- ☐ Sea level rise
- ☐ Loss of biodiversity
- ☐ Temperature increase

Loss and damages related to cultural factors fall into the category of:

- ☐ Loss and damages in Health
- ☐ Loss and damages in Communities
- ☐ Loss and damages in Infrastructure
- ☐ Loss and damages in Environment

LaRutadelClima

Sweden
Sverige

OXFAM

ASEDE
Por un Desarrollo Integral

ASONOG

unes