

FROM THE FIELD

accounts and evidence
of damage and losses



LaRutadelClima

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Acronyms

App: Mobile Application

ECLAC: Economic Commission for Latin America and the Caribbean

IDH: Human Development Index

INEC: National Institute of Statistics and Census

IMN: National Meteorological Institute

LRC: Climate Route

MAG: Ministry of Agriculture and Livestock

MIDEPLAN: Ministry of National Planning and Economic Policy

MINAE: Ministry of Environment and Energy

OIM: International Organization for Migration

Introduction

Climate change is not a future threat, but a present reality that is transforming living conditions in many communities in Costa Rica. Despite the international recognition the country has earned for its environmental leadership, renewable energy matrix, and rich biodiversity, climate impacts are intensifying, affecting historically vulnerable territories disproportionately.

Recurring floods, prolonged droughts, rising temperatures, intense storms, and extreme events have disrupted livelihoods, public health, infrastructure, and food security in various populations, particularly in the Global South.

Costa Rica is no exception: it faces increasing exposure to hydrometeorological phenomena such as tropical waves, troughs, intertropical convergence zones, convective storms, and extreme rainfall, which have been recorded with greater frequency and intensity since the 1980s.

This publication offers a localized and participatory view of the damage and losses associated with climate change in eight Costa Rican communities where La Ruta del Clima has worked: Los Chiles, Puerto Jiménez, Linda Vista, Cahuita, Puerto Viejo de Talamanca, Caldera de Esparza, Costa de Pájaros, and Manzanillo de Puntarenas. Each of these localities faces specific climate challenges, but they share the same urgency: to repair what has already been lost and defend the territory.

This publication seeks to recognize the value of local action and knowledge, not only as a complement to institutional technical data, but also as a critical source that enriches

the understanding of climate impacts from a territorial and human perspective.

Reporting the damage and losses—both economic and non-economic—caused by climate change, addressing the climatic and sociodemographic dimensions and the experiences of those who inhabit these Costa Rican territories, is imperative in a context of climate debt and structural injustice.

In doing so, we also seek to contribute to a more complex understanding of the climate crisis, one that goes beyond the numbers to focus on what is often invisible: the loss of identities, collective memories, ancestral knowledge, and community ties.

Damage and loss can be addressed from two complementary dimensions of climate impact. Damage refers to tangible and repairable impacts, such as the destruction of homes, crops, infrastructure, or ecosystems, which, although costly, can be rebuilt or compensated for. In contrast, loss refers to irreversible and intangible impacts, such as the loss of human lives, territories submerged by sea level rise, extinct biodiversity, or destroyed cultural heritage, which cannot be recovered.

This distinction is key, as it guides discussions on climate justice, financing, and the need for differentiated responses to the effects of climate change. In this context, the approach of repairing damage and losses (D&L) takes on special relevance.

This publication not only seeks to document these impacts, but also to generate a call to action to strengthen climate justice and promote more comprehensive, inclusive, and territory-centered responses.

Community outlooks: climate, society, and action

La Ruta del Clima has carried out processes in eight communities in Costa Rica, located in the provinces of Alajuela, San José, Limón, and Puntarenas.

This territorial journey has made it possible to connect diverse realities, from urban to coastal areas, where initiatives aimed at building capacities in the face of the climate crisis have been promoted.

In each community, projects with complementary approaches have been launched that respond to local needs and strengthen the social fabric. Issues such as human mobility in the context of climate change, damage and loss analysis, climate governance, citizen participation, youth action, and the incorporation of a gender perspective have been central.

These approaches have not been worked on in isolation, but as part of a network of experiences that dialogue with each other and, by intertwining, have opened up spaces for the exchange of knowledge and practices.

This path has allowed communities not only to appropriate tools to better understand the impacts of climate change, but also to strengthen their voices in advocacy and decision-making processes.

Thus, the efforts made have contributed to the creation of local learning and action networks that recognize the value of community knowledge as a fundamental piece in advancing toward climate justice with a human and territorial face.

Below, each of these communities is presented from a sociodemographic and climatic perspective, along with the actions and identifications that have been made visible over the years.



Photographs taken by members of the LRC team

Alajuela

In the province of Alajuela, La Ruta del Clima developed a community work process in the community of Los Chiles, located in the northern part of the country.¹

This process focused on developing a diagnosis of mobility and climate change, which identified the main issues related to transportation, connectivity, and exposure to extreme weather events.

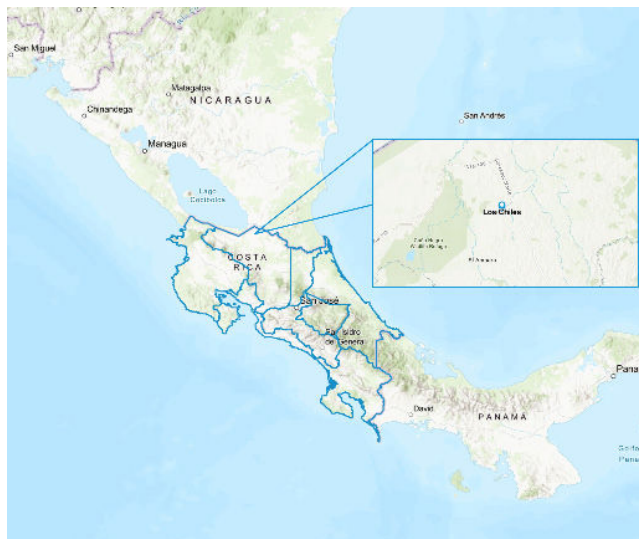
Based on this assessment, a local adaptation plan and a prioritization of community actions were developed in a participatory manner, strengthening the capacity to respond to floods, road deterioration, and impacts on production.

This work enabled a direct approach to new rural realities in which climate change interacts with socioeconomic and infrastructure conditions, providing key information for the design of adaptation strategies focused on people and their territories.

¹ International Organization for Migration (IOM), Needs assessment to strengthen capacities in Los Chiles (IOM Costa Rica, March 2024) 26-27

Los Chiles

Figure1 . Map of Alajuela. Los Chiles working community



Own elaboration. La Ruta del Clima

La Ruta del Clima worked for three years in the community of Los Chiles in the province of Alajuela. In this community, a climate change mobility assessment was carried out, along with an adaptation plan and prioritization of actions in the communities of Nueva Esperanza and Cuatro Esquinas, in collaboration with the IOM in Costa Rica.

This process consisted of three phases that allowed for the characterization, prioritization, and implementation of actions in collaboration with the community to adapt and improve adaptability in the face of the climate crisis.

Overall, this process not only provided valuable technical input, but also represented an exercise in community

empowerment, in which the people of the communities of Nueva Esperanza and Cuatro Esquinas in Los Chiles became protagonists of their own adaptability strategy in the face of the challenges of climate change.

Climate data

In Costa Rica, the canton of Los Chiles is located in the Northern Zone, one of the rainiest regions in the country. According to the National Meteorological Institute (IMN), this area is under the Caribbean climate regime, characterized by rainfall during most of the year and a relative decrease between February and April.

The rainy season lasts from May to December or even January, with annual averages exceeding 3,200 mm.² According to the Climate Action Plan of the canton of Los Chiles (2022), the average annual rainfall is 2,878.9 mm, with average maximum temperatures of 30.3°C and minimum temperatures of 21.9°C.³

The climate is hot and very humid, highly sensitive to climate variability phenomena such as the El Niño-Southern Oscillation (ENSO), which has historically caused seasonal droughts (1965, 1982, 1997, 2019), while events such as La Niña (2008) have intensified rainfall.⁴

Significant changes in climate patterns have been detected in the regions where work has been carried out. Among the most relevant are the sustained increase

² International Organization for Migration (IOM). (2024, March). Needs assessment to strengthen the capacities of local governments and communities to address the factors driving environmental migration in Los Chiles. 26; IMN. (2010). Climate in the Northern Zone.

³ International Organization for Migration (IOM), Climate Change Adaptation Plan for the Canton of Los Chiles (IOM Costa Rica, May 2024) 15-16; International Organization for Migration (IOM), Needs Assessment to Strengthen Capacities in Los Chiles (IOM Costa Rica, March 2024) 25-27

⁴ International Organization for Migration (IOM), Climate Change Adaptation Plan for the Canton of Los Chiles (IOM Costa Rica, May 2024) 16; International Organization for Migration (IOM), Needs Assessment for Capacity Building in Los Chiles (IOM Costa Rica, March 2024) 25-27

in temperatures, alterations in precipitation patterns, and a higher frequency of extreme events.

According to sources such as the National Meteorological Institute (IMN), the Ministry of Environment and Energy (MINAE), and the Economic Commission for Latin America and the Caribbean (ECLAC), the average annual temperature has increased between 0.6°C and 1.1°C in recent decades, especially in the north of the country and the areas bordering Nicaragua⁵.

This warming has led to a redistribution of rainfall: droughts have intensified in the North Pacific, while heavy rains have increased in the Caribbean, causing flooding.

Extreme events such as hurricanes, tropical storms, prolonged droughts, and flash floods are now more frequent.

These impacts not only affect local infrastructure but also seriously harm agriculture, with losses in crops such as cassava, beans, and corn, and threaten terrestrial and marine biodiversity⁶.

Sociodemographic data

The canton of Los Chiles, located in the northern region of Costa Rica, borders Nicaragua to the north, the cantons of Upala and Guatuso to the west, and the canton of San Carlos to the south and east.

With an area of 1,332.72 km² and a projected population of 37,384 inhabitants in 2025, it is

made up of four districts: Los Chiles, Caño Negro, El Amparo, and San Jorge.

These districts have an uneven territorial distribution, with population densities ranging from 41.9 inhabitants per km² in the cantonal capital to only 7.7 inhabitants per km² in rural areas such as Caño Negro.

This territorial configuration directly influences access to services and opportunities, deepening structural gaps between urban and rural areas.⁷

Los Chiles faces high levels of poverty and inequality, with a poverty incidence of 30.5% and extreme poverty of 9.5%, reflecting the difficult economic conditions faced by many families in the canton.

The Gini coefficient is 0.500, a value comparable to the national average (0.504), but equally revealing of a significant concentration of wealth.

This structural inequality is reflected in limited access to basic services such as health and education, especially in rural areas, as the Huetar Norte region has the lowest health insurance coverage in the country⁸.

The population of Los Chiles is diverse and presents multiple factors of vulnerability. Approximately 45.8% of its inhabitants are women, 1.5% belong to indigenous peoples, 10.8% live with a disability, and nearly 30% of the total population is migrant, which adds

⁵ International Organization for Migration (IOM), Needs assessment to strengthen capacities in Los Chiles (IOM Costa Rica, March 2024)

⁶ International Organization for Migration (IOM), Needs assessment to strengthen capacities in Los Chiles (IOM Costa Rica, March 2024) 26-27

⁷ International Organization for Migration (IOM). (2024, March). Needs assessment to strengthen the capacities of local governments and communities to address the factors driving environmental migration in Los Chiles. 23-24

⁸ International Organization for Migration (IOM), Needs assessment to strengthen capacities in Los Chiles (IOM Costa Rica, March 2024) 24-25.

complexity to the social and economic challenges of the territory⁹.

The canton's economy is heavily dependent on the primary sector: more than 55% of the economically active population is engaged in agricultural activities, mainly farming, livestock, and fishing. In 2011, there were an estimated 7,395 economically active people, of whom 4,035 worked in this sector.

However, this economic structure presents a marked gender gap, as only 21% of this population were women. In addition, this concentration in the primary sector entails high exposure to precarious working conditions and informal employment. Furthermore, agricultural activities have significant environmental impacts.

For example, it has been identified that extensive livestock farming on forest land contributes to the silting and sedimentation of the Frío River basin, which negatively affects the canton's aquatic ecosystems, including wetlands of high ecological value such as the Caño Negro Mixed Wildlife Refuge¹⁰.

Table1 . Community characterization sheet: Los Chiles

Name	Los Chiles
Territorial locatio	10°51'28 north latitude and 84°40'37 west longitude, 1,332.72 km²
Population	37,384 inhabitants ¹¹ (2025, INEC)
Rural/urban	rural/urban
IDH	0,658 (2022)
Climate vulnerabilities	Floods, droughts -> food insecurity, structural and access vulnerability, environmental and socio-economic vulnerability (poverty) ¹²

Own elaboration. The Climate Route

9 International Organization for Migration (IOM), Needs assessment to strengthen capacities in Los Chiles (IOM Costa Rica, March 2024) 24

10 International Organization for Migration, Needs assessment to strengthen the capacities of local governments and communities to address the factors driving environmental migration in Los Chiles (IOM Costa Rica, March 2024) 23-25

11 National Institute of Statistics and Censuses, Total population projections by province, canton, and district (n.d.)

12 International Organization for Migration, Assessment of needs to strengthen the capacities of local governments and communities to address the factors driving environmental migration in Los Chiles (IOM Costa Rica, March 2024)



Photographs taken by members of the LRC team

Vulnerabilities and damage and losses in the community of Los Chiles

The situation in Los Chiles reflects an intersection between socioeconomic factors (migration, precarious employment, gender, education) and environmental factors (monoculture, wetland degradation, climate risks).

The Los Chiles Climate Change Adaptation Plan identified floods, droughts, heat waves, and landslides as significant threats.¹³ The communities of Cuatro Esquinas and Nueva Esperanza mention that the recurrence of floods and droughts is a central element in day-to-day decision-making, affecting community organization, food security, infrastructure, and ecosystems.

These elements generate high levels of structural vulnerability that translate into a lack of opportunities, increased risk, and damage and losses in the face of extreme

weather events. The process carried out in the community by La Ruta del Clima revealed that, although institutional actors are involved in various areas, there is a shortage of personnel and an overload of tasks.

In addition, there are few civil society organizations in the community, and those that do exist focus on migration issues. These factors restrict the management of prevention actions, increasing dependence on external actors and limiting local resilience. With regard to ecosystems, the Northern Zone is rich in wetlands, with Caño Negro being a wetland complex with predominant ecosystems such as shrub-herbaceous and mixed Yolillal.

Protected Wildlife Areas, such as the Northern Border Corridor National Wildlife Refuge and the Caño Negro National Wildlife Refuge, play a crucial role in mitigating extreme weather events, functioning as a "sponge" during heavy rains.¹⁴

¹³ Municipality of Los Chiles and MINAE Climate Change Directorate, Cantonal Action Plan for Adaptation (2023) <https://cambioclimatico.minae.go.cr/wp-content/uploads/2023/06/Los-Chiles-Plan-de-Cantonal-de-Accion-para-la-Adaptacion-.pdf>

¹⁴ SINAC, 'National Wildlife Registry (RNVS - CN)' <https://www.sinac.go.cr/es/ac/acahn/rnvscn/paginas/default.aspx> (accessed September 19, 2025).

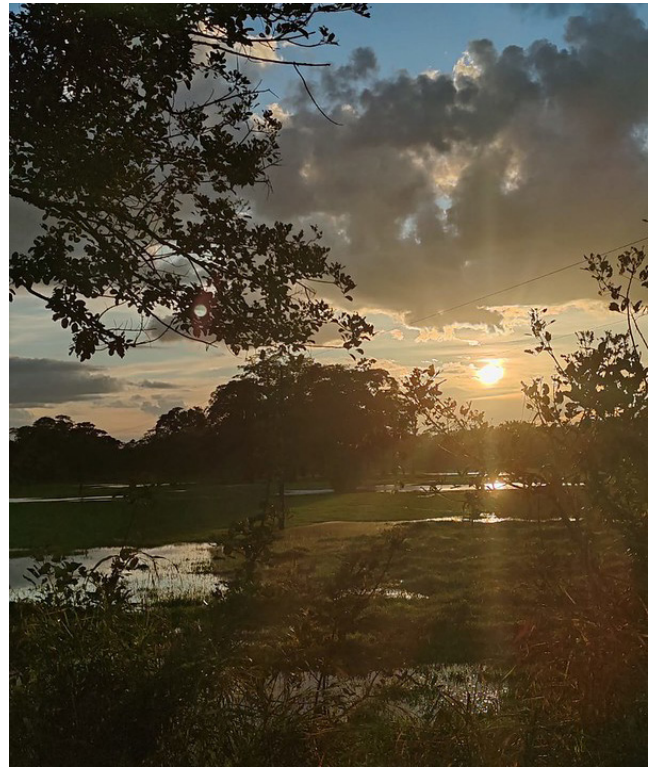


Photographs taken by members of the LRC team

However, these areas face degradation from land use and extensive practices that are exacerbated by drought phenomena, affecting their ability to reduce vulnerability to climate events.

Environmental degradation and pressure on wetlands and watersheds increase climate risks and reduce ecosystem services vital to the community.¹⁵

Most of the population in the community of Los Chiles is engaged in the primary sector of the economy, which is one of the sectors most affected by climate change¹⁶



This increases the vulnerability of the community, as both subsistence farming and monocultures that generate employment are directly impacted.

Faced with constant droughts and floods, the community suffers from recurring agricultural losses and damage.

Establishing sustainable subsistence crops is difficult, creating significant pressure on the young population to migrate.

The loss of agricultural autonomy increases food insecurity and pushes families toward precarious jobs in monoculture farming.

¹⁵ SINAC, Specific Climate Change Plan for the Caño Negro Mixed Wildlife Refuge, 2021–2025 (Caño Negro, Costa Rica, November 2020) eds L Sánchez, LG Ramírez, and J Sánchez. <https://www.sinac.go.cr/ES/docu/Cambio%20Climtico/PECC%20RNVSMCN.pdf>

¹⁶ International Center for Tropical Agriculture (CIAT), State of the Art in Climate Change, Agriculture, and Food Security in Costa Rica (International Center for Tropical Agriculture with the Ministry of Agriculture and Livestock of Costa Rica, CGIAR-CCAFS, and Central American Agricultural Council, 2014) https://www.cac.int/sites/default/files/Estado_arte._Costa_Rica_.pdf



Photographs taken by members of the LRC team

Current risk analysis indicates that farms face medium-high to high risk from floods and droughts, which, combined with climate projections, creates uncertainty for the community.¹⁷

The presence of large pineapple companies is not synonymous with sources of employment, much less quality employment.

People working on plantations perform low-skilled and poorly paid jobs, disproportionately affecting the migrant population and women.¹⁸

Women face even fewer opportunities, mainly in domestic work, informal sales, and unpaid care work, with training efforts that are not very sustainable.¹⁹

In addition, planting by pineapple companies has undermined food security, driving small-scale farmers out of production and creating indebted consumers.

The expansion of monocultures, such as pineapple, has led to the displacement of subsistence agriculture and precarious working conditions.

The extractive logic of this activity is evident in the extraction of water, biomass, and labor, without significant investment in infrastructure or economic sustainability²⁰

The experience of Los Chiles shows how the damage and losses associated with climate change go beyond immediate impacts on production.

17 The Climate Route, Operational Plan for Adaptation to Climate Change in Cuatro Esquinas and Nueva Esperanza, Los Chiles (International Organization for Migration IOM Costa Rica 2023)

18 Vinicio Chacón Soto, 'Pineapple workers live in a climate of labor exploitation' *Semanario Universidad* (Costa Rica, March 23, 2016) <https://semanariouniversidad.com/pais/trabajadores-la-pina-viven-clima-explotacion-laboral/>

19 IOM Costa Rica, Los Chiles Adaptation Plan (Costa Rica, May 2024) https://costarica.iom.int/sites/g/files/tmzbd1016/files/documents/2024-05/plan-de-adaptacion_los-chiles.pdf

20 Maglianesi-Sandoz MA, 'Development of pineapple plantations in Costa Rica and their impact on natural and agro-urban ecosystems' *Biocenosis* 27(1-2) (2013) <https://revistas.uned.ac.cr/index.php/biocenosis/article/view/611>

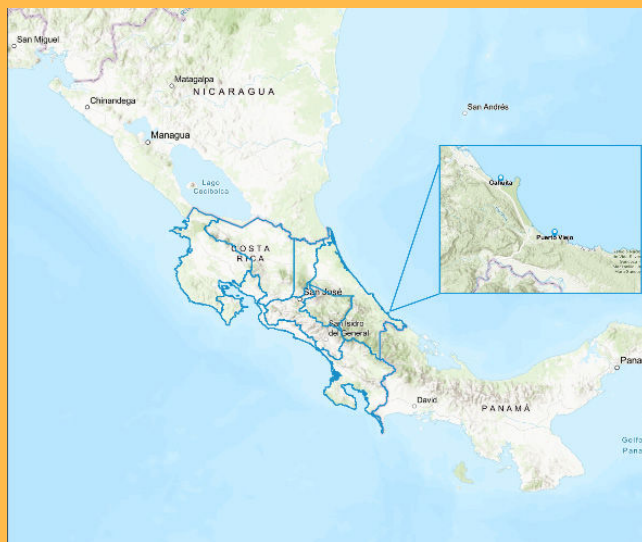
Ecosystem degradation, food insecurity, and the deterioration of community infrastructure generate cumulative impacts that limit the well-being of the population and erode their livelihoods.

These conditions are exacerbated in historically marginalized groups, such as women and migrants, who bear the disproportionate consequences of an extractive economic model and insufficient investment in resilience.

Testimonies and assessments show that the loss of agricultural autonomy and the precariousness of employment constitute irreparable damage to communities, while extreme events such as droughts and floods reinforce cycles of structural vulnerability.

Limón

Figure2 . Map of the communities of Cahuita and Puerto Viejo de Talamanca



Own elaboration. La Ruta del Clima

La Ruta del Clima has been working for five years in the communities of Cahuita and Puerto Viejo in the province of Limón. This process has enabled the exchange of knowledge and networking with community actors for the development of various initiatives and projects, such as:

- Community participation program
- Damage and loss monitoring and reporting project with the Liceo Rural de Cahuita
- Project with young people on mental health and climate change
- Participatory creation of a gender indicators module with the community

In the communities of Puerto Viejo and Cahuita, these projects opened up avenues for participation and strengthened local capacities around climate change.

Through the community participation program, spaces for dialogue were consolidated where neighbors and organizations shared experiences and built greater ownership of environmental knowledge.

With the damage and loss monitoring and reporting project in conjunction with the Liceo Rural de Cahuita, school youth were trained in citizen science, produced their first local reports, and thereby positioned the educational center as a benchmark in community resilience. This process also provided concrete evidence of climate impacts, which was useful for advocacy in other spaces.

Working with young people on mental health and climate change created a safe space for them to express how they experience the climate crisis emotionally, promoting tools for collective care and psychosocial resilience, and highlighting the importance of including mental health in the local climate agenda.

Finally, the participatory creation of a gender indicator module with the community made it possible to highlight inequalities related to care and the distribution of impacts, while strengthening the voice of women and young people in decision-making processes.

This module, validated locally, became a pilot tool for measuring how climate change affects women and men differently, consolidating an inclusive approach in community analysis.



Photographs taken by members of the LRC team

Cahuita

Climate data

Cahuita, a community located on the Caribbean coast of Costa Rica, in the canton of Talamanca, is characterized by a humid tropical climate with high rainfall and marked seasonality.

The province of Limón, where Cahuita is located, recorded the highest number of atmospheric phenomena between 1980 and 2017, mostly concentrated between November and February, when the heaviest rains of the year occur.

Historically, the Huetar Caribbean region has been prone to storms, heavy rains, floods, landslides, and soil saturation.

Although the center of Cahuita is less affected by flooding due to its topography, the surrounding neighborhoods have experienced significant impacts, such as flooded streets and buildings.

Residents also report that rainfall has become more intense in less time, increasing the risk of flash flooding.

Despite being a humid area, drought events have been recorded between 1988 and 2017. These mainly affect the agricultural sector, and the Ministry of Agriculture and Livestock (MAG) has identified droughts as one of the main challenges for the area.

In addition, a change in the seasons has been noted: December is drier, January is rainier, and there is a very marked dry season in April. These irregularities make agricultural planning difficult.

With regard to hurricanes, Cahuita, like the rest of the Costa Rican Caribbean, is within the official tropical cyclone season, which runs from June 1 to November 30.

Although Costa Rica has historically been indirectly affected by hurricanes, Hurricane Otto in 2016 marked the first direct impact on the country. Other hurricanes, such as Nate and Eta, have also left their mark.



Photographs taken by members of the LRC team

Climate change has increased the frequency and intensity of these events due to the warming of the oceans, which acts as a source of energy for these phenomena.

In addition to meteorological impacts, Cahuita also faces non-meteorological threats related to climate change. Studies by the BIOMARCC project show an increase in sea surface temperature, which directly affects coastal marine ecosystems such as coral reefs, mangroves, and seagrass beds.

Moderate thermal stress has been identified in areas of Cahuita National Park, with projections indicating an increase toward the end of the century.

In summary, Cahuita is experiencing increasing vulnerability to climate change. Extreme events, both due to excess and deficit of water, have intensified, affecting both infrastructure and the socio-economic livelihoods of the population.

Added to this is the deterioration of coastal marine ecosystems, highlighting the urgent need to implement local adaptation and mitigation strategies in the face of climate variability and change²¹.

Sociodemographic data

Cahuita is a coastal district in the canton of Talamanca, in the province of Limón, in the Atlantic region of Costa Rica.

Known for its biodiversity and strong Afro-Caribbean cultural identity, Cahuita has an estimated population of around 14,573 inhabitants in 2025 (INEC).

This region is characterized not only by its unique biodiversity, but also by its great cultural and ethnic diversity: it is one of the most diverse territories in the country.

Almost half of the population belongs to an indigenous people, such as the Bribris in the Kéköldi territory or in the town of Patiño.

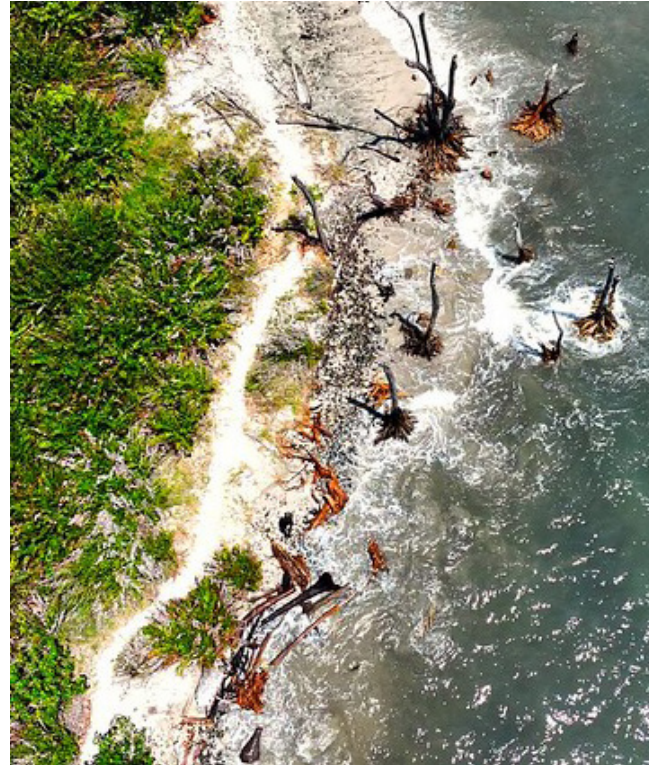
²¹ A Martínez Blanco, L Soto Villalobos, H Gutiérrez, A Vásquez Rodríguez and A Corrales Núñez, Community perspectives: Losses and damage in Cahuita, Costa Rica (1st edn, La Ruta del Clima 2022) 14-23



Photographs taken by members of the LRC team

In addition, people of African descent, mestizos, and migrants coexist in an environment that has historically been multicultural. Cahuita currently faces significant economic challenges due to low productive diversification.

The limited range of economic activities generates few job opportunities, resulting in high rates of unemployment, underemployment, and informal or low-quality jobs. Agriculture in the area continues to depend heavily on banana companies, which limits the economic autonomy of the local community. Tourism, although historically one of the main sources of income, is still recovering from the impact



of the COVID-19 pandemic. In this context, Cahuita National Park remains the district's main economic driver, attracting national and international visitors interested in its marine and terrestrial biodiversity.

However, dependence on a single sector such as tourism exposes the community to economic risks in the event of any crisis or fluctuation in demand.

This highlights the need to promote greater economic diversification, as well as investments that strengthen education, decent employment, and access to basic services, especially for the indigenous, Afro-descendant, and migrant populations that make up the social fabric of Cahuita²².

22 A Martínez Blanco, L Soto Villalobos, H Gutiérrez, A Vásquez Rodríguez and A Corrales Núñez, Community perspectives: Losses and damage in Cahuita, Costa Rica (1st edn, La Ruta del Clima 2022) 7-13

Table 2 . Community profile: Cahuita

Name	Cahuita
Territorial location	Latitude 9° 44 19 N Longitude 82° 50 27 W
Población	14 573 inhabitants ²³
Rural/urban	Rural
IDH	Talamanca 0,681 (2022)
Climate vulnerabilities	Floods, landslides, soil saturation, droughts, hurricanes -> poverty, impacts on health, education, housing, employment, land use planning, drinking water supply, and adaptive capacity ²⁴

Own elaboration. The Climate Route

²³ National Institute of Statistics and Censuses, Total population projections by province, canton, and district (n.d.)

²⁴ Martínez Blanco, L. Soto Villalobos, H. Gutiérrez, A. Vásquez Rodríguez and A. Corrales Núñez, Community perspectives: Losses and damage in Cahuita, Costa Rica (1st edn, La Ruta del Clima 2022)



Photographs taken by members of the LRC team

Puerto Viejo de Talamanca

Climate data

Puerto Viejo is located in the canton of Talamanca in the province of Limón. It is a coastal community known for its rich Afro-Caribbean culture and biodiversity.

The region has a humid tropical climate typical of the Caribbean, with temperatures ranging between 24°C and 32°C throughout the year.

Average annual rainfall is high, approximately 2100 mm, with abundant rainfall throughout most of the year and a slight dry period between January and April.

The region combines coastal areas and tropical rainforests, with great terrestrial and marine biodiversity ().

This climate favors important ecosystems such as Cahuita National Park and Gandoca-Manzanillo Wildlife Refuge, which contain tropical rainforests and living coral reefs (SINAC, 2016).

The community faces a series of climate impacts, including floods, droughts, heat waves, storms, and accelerated coastal erosion due to sea level rise.

These phenomena have caused severe damage to public and private infrastructure, losses in marine biodiversity, particularly in coral reefs, and significant impacts on the physical and psychosocial health of its inhabitants, with children and adolescents being particularly vulnerable. Climate change has also altered social and cultural practices, creating risks for the continuity of traditions and community cohesion.

Sociodemographic data

The canton of Talamanca, which includes Puerto Viejo, has an estimated population of 45,618 inhabitants for 2023, according to official data from the National Institute of Statistics and Censuses (INEC). It has a diverse population comprising Afro-Caribbean and indigenous communities (mainly Bribri) and migrants, giving it a multicultural and multilingual character, with Spanish, English Creole, and indigenous languages spoken.



Photographs taken by members of the LRC team

Its economy depends mainly on tourism, attracted by beaches, protected areas, and activities associated with ecotourism, although there are also small-scale fishing and agriculture activities.

The P51 mobile application was introduced as a community registration tool, which allowed for the systematic documentation of impacts in categories such as health, community, infrastructure, environment, biodiversity, and tourism.

The reports collected in Puerto Viejo showed a wide range of impacts. In health, heatstroke, anxiety, insomnia, and water-related illnesses, such as gastrointestinal problems, were identified. In the community category, job losses were reported, especially in the tourism sector, as well as damage to material goods and difficulties in accessing education during emergencies. In infrastructure, damage was reported to roads, bridges, homes, and basic drinking water and electricity systems.

In the environmental sphere, the community noted the deterioration of marine-coastal

ecosystems, with the loss of corals and the disappearance of species linked to changes in sea temperature .

These processes directly affect both biodiversity and local livelihoods. In tourism, impacts were documented from beach erosion and reduced visitor numbers during climate crises, which directly affect community income.

Table 3. Community characterization sheet: Puerto Viejo de Talamanca

Name	Puerto Viejo de Talamanca
Territorial location	Latitude 9° 38 59 north, longitude 82° 46 30 west
Population	Talamanca: 45,618 inhabitants (2023)
Rural/urban	Rural, Semi-urban
IDH	Talamanca 0,681 (2022)
Climate vulnerabilities	Coastal erosion, sea level rise, flooding, droughts, heat waves.

Own elaboration. The Climate Route



Photographs taken by members of the LRC team

Vulnerabilities and damage and losses in the communities of Cahuita and Puerto Viejo

The various processes led by LRC in these communities have highlighted how climate change events, combined with the vulnerability of the area, have an impact on historically marginalized groups such as youth, Afro-descendant communities, and indigenous peoples in the area.

The Adaptation Plan for the area mentions four identified threats (floods, landslides, droughts, and heat waves), which are associated with periods of heavy rainfall, rainfall deficits, high temperatures, and coastal erosion.²⁵

Participants from the communities of Cahuita and Puerto Viejo de Limón have mentioned how these events impact health, ecosystems, community and social fabrics, and infrastructure..²⁶

Gradual phenomena, such as sea level rise, water salinization, and extreme temperatures, progressively weaken critical infrastructure such as roads, bridges, drinking water systems, and electrical networks, affecting their long-term functionality.

On the other hand, climate emergencies such as intense storms, floods, and landslides cause immediate and severe damage that paralyzes entire communities, interrupts access to basic services, and generates high repair and reconstruction costs.

By 2021, the CNE Damage and Loss Reports system linked to phenomenon 43131-MP Temporal en la Vertiente del Caribe reported damage amounts of: ₡2,301,954,388.08 for roads, bridges ₡454,804,384.81, sewers ₡448,800,000, among others.

²⁵ Action Plan for Climate Adaptation in the Canton of Talamanca 2023-2030 (Ministry of Environment and Energy, Costa Rica, June 2023) <https://cambioclimatico.minae.go.cr/wp-content/uploads/2023/06/Talamanca-Plan-de-Cantonal-de-Accion-para-la-Adaptacion-.pdf>

²⁶ Alonso Martínez Sequeira, 'Climate change threatens customs and ways of life in the southern Caribbean region of Costa Rica' (Climate Tracker Latin America, July 22, 2024) <https://climatetrackerlatam.org/historias/cambio-climatico-amenaza-costumbres-y-modos-de-vida-del-caribe-sur-costarricense/>



Photographs taken by members of the LRC team

These economic impacts not only compromise people's safety and well-being, but also represent an obstacle to sustainable development, especially in vulnerable regions with limited capacities to address these challenges.

They also involve non-economic phenomena such as impacts on health mental health, social cohesion, the transmission of cultural knowledge, and a sense of community belonging, which are fundamental elements for resilience and the continuity of local ways of life.

Some reports from communities highlight both physical and psychosocial effects related to health²⁷

It is important to note that most of these reports come from minors, which highlights the vulnerability of this population to climate impacts, mainly in terms of climate anxiety.



During focus groups conducted by LRC as part of the "Youth and Climate Change" project, young people identified that the impacts of climate change on the community also affect daily life, reflected in decreased income due to reduced tourism or the inability to perform jobs such as construction due to droughts or excessive rainfall. In addition, daily activities are disrupted by drinking water shortages, such as the suspension of classes in educational centers, limited mobility, and damage to homes due to river flooding. In the community of El Carbón, houses are flooded by heavy rains and the population must organize themselves to deal with this, which has a direct effect on their state of mind.

Although the participants do not express it spontaneously, when asked directly, they acknowledge that climate change can affect their future and that of their communities, pointing out in particular the worsening shortage of drinking water.

²⁷ María Angélica Cordero, María Paula Calvo, and Adrián Martínez, Local Monitoring of Climate Impacts: A Community Approach in Costa Rica (La Ruta del Clima Association, 1st ed., December 2024) https://larutadelclima.org/wp-content/uploads/2025/02/Monitoreo-Local-de-Impactos-Climaticos.ES_.pdf



Photographs taken by members of the LRC team

Among the problems reported in the community from a social perspective, unemployment appears to be the most prevalent consequence, followed by loss and damage to property and, to a lesser extent, difficulties related to mobility.²⁸

In addition, significant impacts on access to education are mentioned, which limits long-term development opportunities, as well as manifestations of racism and discrimination, which exacerbate pre-existing inequalities and disproportionately affect certain social groups.

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

This situation not only threatens the continuity of traditions, but also the collective identity of these communities, underscoring the importance of integrating the safeguarding of cultural heritage into climate adaptation strategies in coastal areas.

²⁸ ibid 26



Photographs taken by members of the LRC team

Puntarenas

Within the province of Puntarenas, La Ruta del Clima has been working in four communities for five years, generating analysis and community reflection on climate change.

The process with the communities of Puntarenas has been built not only on theory, but also on the daily experiences of women leaders from Costa de Pájaros, Coyolito, and Manzanillo, and community members focused on human mobility in Puerto Jiménez and Caldera.

These processes included capacity building on damage and loss and climate change, and participation in the process of monitoring and reporting damage and loss through the P51 app.

A diagnosis of human mobility and climate change was also carried out in Caldera and Puerto Jiménez.

In the community of Puerto Jiménez, an adaptation plan and prioritization of adaptation activities were developed based on the diagnosis. These tools open up new possibilities for advocacy and preparedness in increasingly complex scenarios.

The extensive process in the communities of Puntarenas has made it possible to move forward with issues of climate justice and reparations and the need for specific responses, because their lives and territories deserve it.



Photographs taken by members of the LRC team

Manzanillo de Puntarenas

Figure3 . Map of the district of Manzanillo de Puntarenas



Own elaboration. The Climate Route

Climate data

The district of Manzanillo, located in the canton of Puntarenas, is situated in the Gulf of Nicoya region and has a dry tropical climate typical of the Central Pacific. According to the classification of

the National Meteorological Institute (IMN), this area has well-defined dry and rainy seasons, influenced by its proximity to the Gulf and regional marine dynamics. This region experiences an average annual temperature ranging between 26°C and 28°C, with highs that can exceed 33°C during the dry season (December-April) and lows that rarely drop below 22°C. Annual precipitation varies between 1,800 and 2,400 mm, concentrated mainly between May and November, with September and October being the rainiest months.

The dry season can have prolonged periods without rain, which increases the risk of seasonal droughts (IMN, 2022). These risks are amplified by the El Niño-Southern Oscillation (ENSO) phenomenon, which is reflected by its location in the country's dry corridor.

In recent years, Manzanillo has faced phenomena such as storms, floods, storm surges, indirect hurricanes, droughts, and sea level rise, which have directly affected livelihoods.



Photographs taken by members of the LRC team

These changes have reduced fishing productivity, caused coastal erosion, salinization of wells, and loss of marine habitats, impacting both food security and economic opportunities for the population.

Sociodemographic data

Manzanillo has a population of approximately 3,497 inhabitants in 2024, according to INEC projections (2024), with an almost equal distribution between women (48.9%) and men (51.1%).

Manzanillo, like other coastal and fishing communities, has a low population density. In addition to fishing, its economy has begun to diversify in recent years with community ecotourism initiatives and projects linked to the sustainable use of marine resources.

However, this economic dependence on fishing and tourism places the community in a highly vulnerable position to the effects of climate change.

Rising sea surface temperatures, sea level rise, coastal erosion, and well salinization have deteriorated both fishing productivity and the natural resources that attract tourism. Added to this is increasing exposure to storms, floods, and droughts, phenomena that impact basic infrastructure and the living conditions of the population.

In socioeconomic terms, this community faces a context of high poverty, with more than 40% of the population living in extreme poverty and the unemployment rate stands at around 12.5% in the canton of Puntarenas, with significant difficulties in generating formal and decent employment, which directly impacts economic security and community resilience in the face of climatic and social challenges (Summa Magazine, 2025).

At the same time, support has been provided to local organizations such as MUDECOOP, Mariposas del Golfo, and Grupo organizado de Mujeres La Montañita-El Coyolito, which work to diversify livelihoods and promote responsible fishing practices and sustainable ecotourism.

These initiatives seek not only to generate additional income for families, but also to reduce their heavy dependence on artisanal fishing, a sector increasingly affected by overexploitation and climate change.

Support has consisted of raising the profile of these efforts, facilitating spaces for dialogue, and strengthening the advocacy capacity of organizations so that their work can be recognized as part of the community response to the climate crisis.

Table 4. Community characterization sheet: Manzanillo de Puntarenas

Name	Manzanillo de Puntarenas
Ubicación territorial	Latitude: 10° 7 54 north, longitude: 85° 1 5 west
Población	3,497 inhabitants ²⁹
Rural/urban	Rural
IDH	Puntarenas 0,734 (2022)
Climate vulnerabilities	Prolonged droughts, tropical storms, floods, and sea level rise.

Own elaboration. The Climate Route

²⁹ National Institute of Statistics and Censuses, Total population projections by province, canton, and district (n.d.)

Costa de Pájaros

Figure4 . Map of the Costa de Pájaros community



Own elaboration. The Climate Route

Climate data

Costa de Pájaros is a coastal community located in the district of Manzanillo, canton of Puntarenas, on the shores of the Gulf of Nicoya, in the Central Pacific region of Costa Rica. The IMN reports that the Pacific region, where Costa de Pájaros is located, experiences a significant reduction in precipitation during the dry season (December to May) and a tendency toward more irregular and extreme rainfall during the rainy season.

IMN climate models indicate that by 2040-2069, a temperature increase of between 1.5°C and 2°C is expected, along with a possible reduction in rainfall during the dry season of up to 10-15%, affecting water availability in the community (IMN, 2022).

The IMN also warns of the intensification of extreme events, such as droughts and floods, which affect water availability and

food security. As Quesada-Román et al. (2024) point out, the area is vulnerable to extreme weather events, such as tropical cyclones, which have caused significant damage to infrastructure, agriculture, housing, and health in several municipalities on the Costa Rican Pacific coast.

Among the climatic phenomena affecting this community are storms, floods, storm surges, and the progressive rise in sea level. These events cause significant damage to community infrastructure, including housing, roads, and basic services, as well as generating economic and social losses in the community.

Pollution in the Gulf of Nicoya also contributes to the degradation of ecosystems, reducing environmental quality and affecting visitors' perception of the destination, which limits the development of local tourism.

The proximity to protected areas and the importance of mangrove and marine ecosystems, such as the Isla de los Pájaros Biological Reserve, highlight the need for careful environmental management that preserves these resources in the face of human pressure and the effects of climate change (SINAC, 2014).

Sociodemographic data

Costa de Pájaros is a traditional fishing community, with a population that has depended over the years on artisanal fishing and, to a lesser extent, agriculture and informal activities.

The population density is low and most households are large, with a high participation of women in productive and household activities. Women in the community, in particular, have sought

alternatives to improve their living conditions, including participation in reproductive health programs and community projects (Fernández, 2014).

Access to basic services such as drinking water, health, and education is limited, which increases the social and economic vulnerability of the community (Municipality of Puntarenas, 2021).

Despite climatic adversities, there are several organized groups in the community, as in Manzanillo, such as MUDECOOP and Mariposas del Golfo, which actively work to promote sustainable practices and adaptation to climate impacts, strengthening the resilience and adaptive capacity of their members.

The community benefits from participatory methodologies for monitoring damage and losses, which generate valuable evidence for political advocacy and access to climate reparations, a crucial step in defending their rights and protecting their livelihoods in the context of the climate crisis.

Table 5. Community characterization sheet: Costa de Pájaros

Name	Costa de Pájaros
Territorial location	Latitude: 10° 6 17 north, longitude: 84° 59 56 west
Population	Approximately 1,500
Rural/urban	Rural
IDH	Puntarenas 0,734 (2022)
Climate vulnerabilities	Tropical cyclones, rising temperatures,

Own elaboration. The Climate Route

Vulnerabilities, Damage, and Losses in Costa de Pájaros and Manzanillo

The communities of Costa de Pájaros and Manzanillo have faced a confluence of structural and climatic factors that deepen their vulnerability.

In this context, the community science approach promoted by local women-led groups in conjunction with LRC has been essential in highlighting the impacts on the territory and supporting repair processes³⁰.

The local monitoring exercise led by the communities of Costa de Pájaros and Manzanillo made it possible to document multiple dimensions of the damage and losses caused by climate change.

The results reflect not only material impacts, but also profound transformations in daily life and coastal ecosystems.

Both communities depend mainly on artisanal fishing and the extraction of shellfish and shrimp, activities that not only constitute the economic base of the territory, but also a central element of their cultural identity.

However, the climate crisis has directly affected these practices, reducing catches and altering the natural cycles of species. Women fishers and gatherers have pointed out that changes in water temperature, pollution, and the loss of mangroves have reduced the availability of resources, increasing food and economic insecurity during workshops and focus groups conducted by LRC.

30 La Ruta del Clima, Local monitoring of climate impacts: A community-based approach in Costa Rica

On the environmental front, communities have reported severe ecological losses, including mangrove degradation, coastal erosion, and the reduction of marine species essential for fishing. Waste pollution, illegal dumping, and agricultural expansion in sensitive areas have damaged coastal ecosystems and reduced their capacity for regeneration.

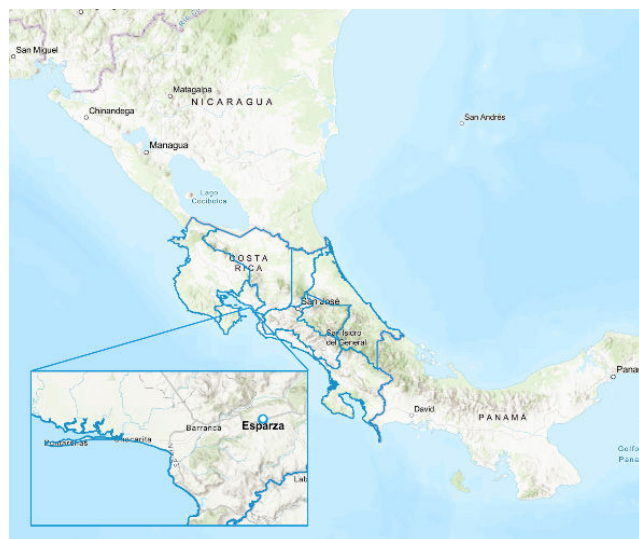
The loss of these natural spaces not only affects livelihoods, but also the ecological stability that protects communities from storms, storm surges, and other extreme events.

The community monitoring process developed by La Ruta del Clima has been fundamental in making these impacts visible through local voices, especially those of women's groups that lead conservation, environmental education, and mangrove restoration actions.

Their participation has strengthened organizational capacity and positioned climatic reparation as a collective process that unites ecological restoration, gender equity, and the right to a healthy environment.

Caldera de Esparza

Figure5 . Map of the Caldera de Esparza community



Prepared by the author. The Climate Route

Climate data

The canton of Esparza, located in the province of Puntarenas, belongs administratively to the Central Pacific region, although climatically it is located within the North Pacific region according to the classification of the National Meteorological Institute (IMN).

This region is characterized by a tropical climate with well-defined dry and rainy seasons. Caldera is specifically located in subregion 4, with a monsoon climate and tropical dry forest vegetation.

In this region, and especially in Caldera, which is located at sea level, average annual temperatures range between 27°C and 30°C, reflecting a consistently warm climate throughout the year. Historically, Esparza has been impacted by multiple hydrometeorological events, such as hurricanes, tropical storms, heavy rains, and prolonged droughts. Using the Ministry

of National Planning and Economic Policy (MIDEPLAN) tool “Losses Caused by Natural Phenomena,” significant economic damage has been identified in sectors such as road infrastructure, housing, education, and especially agriculture, which has reported losses exceeding ₡1.5 billion.

The IMN's climate projections under the RCP8.5 scenario indicate that the North Pacific, where Caldera is located, will experience a temperature increase of between 1.0°C and 4.8°C by the end of the 21st century, making it the region with the highest projected warming in the country. In terms of precipitation, variations in patterns are anticipated, with possible decreases of up to 25% in the long term, which could intensify the occurrence of droughts.

Three main climate threats have been identified in Caldera: flooding, droughts, and coastal erosion. Flooding has been recurrent, caused by intense rainfall and heavy rainfall, the occupation of flood-prone areas, and poor solid waste management, affecting homes, educational and commercial infrastructure, and the sewerage system. On the other hand, droughts have impacted water supply, agricultural production, and institutional activities, causing problems in the provision of basic services.

However, the threat considered most serious by the community is sea level rise and coastal erosion. IPCC projections indicate sea level rises of between 0.4 m and 0.8 m, which is already evident in Caldera with more intense waves, loss of territory, damage to homes and infrastructure, and serious economic consequences for tourism and port operations. Sand accumulations have prevented boats from entering the port, requiring costly dredging work.



Photographs taken by members of the LRC team

In response to these threats, risk management mechanisms have been activated.

The Esparza Municipal Emergency Committee is in the process of finalizing its Cantonal Emergency Plan, while in Caldera a Community Emergency Committee has been formed, with an organizational structure and lines of action in surveillance, logistics, and planning, with the aim of developing a local response and adaptation plan³¹.

Sociodemographic data

Caldera is a coastal district in the canton of Esparza, created in 2014, so it does not have disaggregated data in the 2011 National Census. According to the Municipality of Esparza (2021), the population is estimated at approximately 3,958 people, distributed among some 1,000 homes, with a density of 63.8 inhabitants per km².

Socioeconomically, Caldera is part of the Central Pacific region, where 31% of the population lives in poverty or extreme poverty.

In the canton of Esparza, the Human Development Index (HDI) in 2020 was 0.718, considered "high," while the Multidimensional Poverty Index (MPI) was 0.50, considered low.

However, internal gaps between urban and coastal communities such as Caldera remain notable. In terms of access to basic services, it is estimated that 1% of the population lacks them entirely and 6% receives them in poor conditions. In terms of education, 2% of the canton's population was illiterate in 2011.

By 2015, there were 6 preschools, 7 public schools, and 3 public high schools, with an enrollment of 1,207 students in primary school and 1,864 in secondary school.

³¹ International Organization for Migration, Diagnostic study of climate change mobility in the community of Caldera, Esparza, Puntarenas (IOM Costa Rica, 2024) 23-28



Photographs taken by members of the LRC team

In terms of employment, 49% of the canton's population is employed, while 51% is not part of the labor force. Within the group that does work, 87% do so within the province of Puntarenas, and a smaller percentage commute to other provinces such as Alajuela (4.3%) or even several cantons at once (3.8%). This highlights a lack of local job opportunities, as well as a high dependence on informal or precarious employment³².

Table 6. Community profile: Caldera de Esparza

Name	Caldera de Esparza
Territorial location	Latitude 9°56'21.9»N, longitude 84°43'39.2»W
Population	3,958 inhabitants (2021, INEC)
Rural/urban	Rural
IDH	Esparza 0,746 (2022)
Climate vulnerabilities	Floods, forest fires, poor land use conditions ³³

Own elaboration. The Climate Route

Vulnerabilities, damage, and losses in the community of Caldera

Communities face irreparable losses: disruption of basic services, damage to schools and roads, loss of crops and marine species, health impacts, and, above all, the loss of mangroves.

During the various visits, the dialogues reveal everyday adaptation practices (drinking more water, bathing more frequently, changing fishing or farming techniques) and also recognize the limits of adaptation, such as

This last point was central. Both communities agreed that mangrove restoration is a priority, as their disappearance leads to coastal erosion, loss of biodiversity, reduced fishing income, and a profound emotional impact.

³² International Organization for Migration, Diagnostic study of mobility due to climate change in the community of Caldera, Esparza, Puntarenas (IOM Costa Rica, 2024) 20-22

³³ International Organization for Migration, Diagnostic study of mobility due to climate change in the community of Caldera, Esparza, Puntarenas (IOM Costa Rica, 2024)



Photographs taken by members of the LRC team

At the same time, adaptation projects focused on marine farms and economic alternatives were identified as a way to respond to changes in the sea and strengthen employment options.

Reports compiled in Manzanillo have revealed multiple impacts: physical and psychosocial illnesses linked to extreme heat and lack of drinking water; loss of jobs and material goods associated with flooding and storms; and environmental damage related to coastal erosion and declining fishing productivity.

In this regard, the community points out how rising temperatures directly impact their health: "People suffer greatly because their blood pressure rises due to the excessive heat" and "People tend to become dehydrated due to the excessive heat."

Puerto Jiménez

Figure 6. Map of the canton of Puerto Jiménez



Own elaboration. The Climate Route

Climate data

Puerto Jiménez, located on the Osa Peninsula in the South Pacific region of Costa Rica, is one of the rainiest areas in the country.

According to the IMN, this region has an average annual rainfall of around 3,700 mm, making it one of the areas with the highest rainfall in the country. Temperatures range from a high of 27.9 °C to a low of 20.5 °C, which creates a warm, humid climate with tropical characteristics³⁴.

The annual rainfall pattern is distributed over two wet seasons and a short dry season. The dry season runs from January

to March, accounting for just 11% of annual rainfall. April represents a transition to the rainy season, which is divided into two main phases: May to August (43% of annual rainfall) and September to November (46%). During July and August, there is usually a temporary decrease in rainfall known as Indian summer, a phenomenon typical of peninsular areas³⁵.

Climate variability in this region is strongly influenced by the El Niño–Southern Oscillation (ENSO) phenomenon. There is a high probability (more than 80%) that both extreme dry periods and heavy rainfall are related to this phenomenon. October, in particular, is the month most sensitive to these variations, recording both rainfall deficits and excesses depending on the ENSO phase.

In addition, it has been observed that during dry events, maximum temperatures tend to increase, especially between June and October, with increases that can exceed +1 °C³⁶. In terms of climate projections, IMN models under the high emissions scenario (RCP 8.5) anticipate a progressive increase in temperature in the peninsular area.

For the period 2010–2039, an increase of between 1.3 °C and 1.4 °C is expected. This increase would intensify between 2040–2069, reaching between 2.5 °C and 2.6 °C, and could exceed 4.2 °C by the end of the century (2070–2099), which would imply significant climate change for the region³⁷.

34 International Organization for Migration (IOM). (2024, March). Needs assessment to strengthen the capacities of local governments and communities to address the factors driving environmental migration in Los Chiles. 24

35 International Organization for Migration (IOM). (March 2024). Needs assessment to strengthen the capacities of local governments and communities to address the factors driving environmental migration in Los Chiles. 24

36 International Organization for Migration (IOM). (2024, March). Needs assessment to strengthen the capacities of local governments and communities to address the factors driving environmental migration in Los Chiles. 24-25

37 International Organization for Migration (IOM). (2024, March). Needs assessment to strengthen the capacities of local governments and communities to address the factors driving environmental migration in Los Chiles. 25-26



Photographs taken by members of the LRC team

In terms of precipitation, projections show a percentage decrease during the first two time horizons (up to 15% less in certain seasons), especially during the prolonged dry season.

However, towards the end of the century, a possible increase of between 20% and 30% in annual precipitation is anticipated, albeit with high interannual variability.

A uniform rainfall deficit has also been identified between December and August (10%–15%), which is more pronounced during the hottest months and could pose greater risks to water security and agricultural production.

In summary, Puerto Jiménez already faces high climate exposure due to its geographical location and natural rainfall patterns. However, the effects of climate change—in particular, rising temperatures and changing rainfall patterns—could intensify the environmental, social, and productive challenges facing the territory in

the coming decades. Local planning should incorporate these projections to strengthen community resilience and promote effective, sustainable, and inclusive climate adaptation strategies³⁸.

Sociodemographic Data

Puerto Jiménez is a district located on the Osa Peninsula, belonging to the canton of Golfito, in the province of Puntarenas. Projections from the National Institute of Statistics and Censuses (INEC) estimate that by 2025 the population will reach 13,768 inhabitants, reflecting sustained growth in the area.

Although it currently belongs to the canton of Golfito, it is important to consider its close relationship with other surrounding areas, such as the Ngöbe-Buglé indigenous territory of Alto Laguna, located near Corcovado National Park, with which shares geographical, cultural, and economic ties.

³⁸ International Organization for Migration, Diagnostic study of needs for adaptation to climate change in Puerto Jiménez (IOM Costa Rica, March 2024) 24-26



Photographs taken by members of the LRC team

Land use and economic activities in Puerto Jiménez are marked by a history of intensive extraction. Between 1938 and 1985, the region was the scene of an extractive model based on banana monocultures for export.

After the departure of the United Fruit Company, the local economy shifted to small-scale agriculture and livestock farming, accompanied by an increase in artisanal gold mining, a practice that still persists, despite its illegal nature, both inside and outside Corcovado National Park.



Currently, the main crops are rice, beans, cocoa, bananas, and African palm. However, national free trade policies have affected the profitability of traditional products, weakening local economic security.

Although ecotourism has generated new opportunities, its uneven development has accentuated the concentration of benefits, leaving many communities in a vulnerable situation³⁹.

³⁹ International Organization for Migration, Diagnostic study of needs for adaptation to climate change in Puerto Jiménez (IOM Costa Rica, March 2024) 22-24

Table 7 .Community characterization sheet: Puerto Jiménez

Name	Puerto Jiménez
Territorial location	Latitude: 8° 32' 8" north, longitude: 83° 18' 22" west
Población	13 768 inhabitants ⁴⁰
Rural/urban	Rural
IDH	0,740 (2022)
Climate vulnerabilities	Rising temperatures, changes in rainfall patterns, and sea level rise -> environmental disturbances in the region, impact on water resources and coastal communities (which depend on activities such as tourism and agriculture), poverty, food insecurity, spread of disease, forced migration ⁴¹

Own elaboration. The Climate Route

Vulnerabilities, damage, and losses

Puerto Jiménez, as a recently created canton, faces a scenario of high climate vulnerability.

Extreme events associated with heavy rainfall have had the greatest impact in terms of damage and losses. Among these, the 2007 Tropical Wave in the Central, North, and South Pacific and the Guanacaste Mountain Range stands out as the event with the greatest consequences in the area, followed by Hurricane Eta in 2020, which also caused significant damage.

Both events demonstrate how exposure to extreme weather events continues to be a critical factor for communities in the canton.⁴²

The sector most affected in economic terms has been road infrastructure, which accounts for most of the losses and damage associated with roads, bridges, and culverts.

This situation coincides with the testimonies collected in community interviews, where it was pointed out that during episodes of heavy rain *"it's not just that the river rises and reaches the houses, it's that there is no road"* (Academic researcher, personal communication, 07/06/2023).

The interruption of land connectivity causes isolation, limits access to basic services, and has a direct impact on the local economy.

The second most affected sector is rivers and streams, where damage is reflected in the erosion of riverbeds, dams, and riparian areas.

As another interviewee recounted:

"Even last year in the community, they had not previously had any climate-related problems, but last year many families were affected, losing material possessions, cut off from communication, their homes almost washed away by the river..." (Academic researcher, personal communication, 06/07/2023).

These testimonies show how climate impacts are becoming more frequent and severe in some communities, while others are just beginning to experience the effects.

⁴⁰ National Institute of Statistics and Census, Total population projections by province, canton, and district (n.d.)

⁴¹ International Organization for Migration, Diagnostic study of needs for adaptation to climate change in Puerto Jiménez (IOM Costa Rica, March 2024) 22-24

⁴² IOM Costa Rica, Puerto Jiménez Adaptation Plan (May 2024) https://costarica.iom.int/sites/g/files/tmzbd11016/files/documents/2024-05/plan-de-adaptacion_puerto-jimenez.pdf



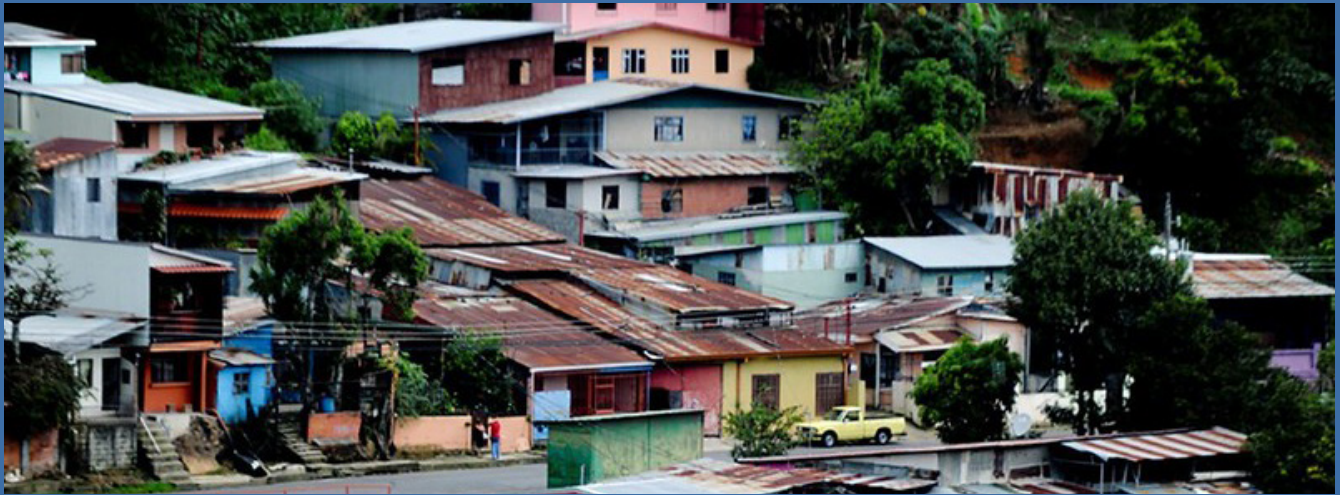
Photographs taken by members of the LRC team

Beyond extreme events that occur immediately, it is essential to recognize that the effects of climate change and change also manifest themselves gradually.

Processes such as sea level rise, ocean acidification, land and forest degradation, biodiversity loss, and salinization are silent threats that develop over months or years. In the case of Puerto Jiménez, these slow impacts are particularly relevant, as they have a cumulative effect on livelihoods and generate losses and damage that are difficult to quantify, especially in the sphere of non-economic impacts such as cultural, social, and ecological deterioration.

For this reason, it is essential to implement constant monitoring mechanisms that capture both the immediate effects of disasters and the processes of gradual environmental transformation.

Only then will it be possible to obtain a more accurate assessment of the canton's vulnerabilities and the strategies needed to reduce future risks.



Photographs taken by members of the LRC team

San José

In the province of San José, La Ruta del Clima has worked with the community of Linda Vista, located in the Greater Metropolitan Area, through a participatory process focused on identifying climate damage and losses and their impact on daily life. Through workshops, interviews, and focus groups, testimonies were collected on the social, economic, and environmental impacts of climate events in an urban context characterized by inequality and high vulnerability. In addition, a report on health and climate change was produced, analyzing the effects of climate change in this context.⁴³

This process has contributed to strengthening the understanding of urban vulnerabilities and generating community evidence to support the need for local climate adaptation and remediation policies in urban environments.

Climate data

Linda Vista, located in the canton of La Unión in the Central Region of Costa Rica, has a warm and humid climate with well-defined seasons.

The dry season runs from December to May, while the rainy season lasts from May to December, with an average annual rainfall of approximately 1,764 mm, which is within the typical range for the Central Valley.

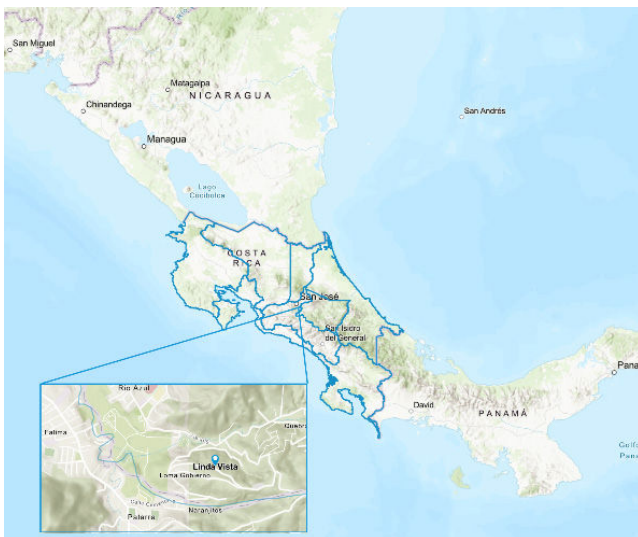
Temperatures range from 17°C to 26°C, contributing to a temperate, humid climate throughout the year.

⁴³ La Ruta del Clima, Exploring the impacts of climate change on public health: a study in Linda Vista https://larutadelclima.org/sdm_downloads/explorando-los-impactos-del-cambio-climatico-en-la-salud-publica-un-estudio-en-linda-vista



Photographs taken by members of the LRC team

Figure7 .Map of the Linda Vista district



Own elaboration. The Climate Route

The community is part of the Quebradas stream micro-watershed and is located within the Cerros de La Carpintera Protected Area, an area rich in biodiversity and integrated into the Tiribí Bicentennial Interurban Biological Corridor.

This location, together with the presence of multiple rivers and streams—such as the Azul, Damas, and Tiribí rivers—

and its irregular geography with steep slopes, exposes Linda Vista to frequent hydrometeorological threats such as landslides and floods.

Since the 1990s, the National Emergency Commission (CNE) has classified Linda Vista as a highly vulnerable area to extreme weather events.

This vulnerability is due to both the natural conditions of the terrain and social, urban, and land-use planning factors. According to the Municipality of La Unión, the areas most prone to risk are located on the slopes of La Carpintera.

The effects of climate change have intensified these risks. The IMN projects an increase of between 1.1°C and 1.3°C in the average annual temperature for the Central Region, as well as a decrease in rainfall in the short and medium term.

These changes could exacerbate phenomena such as urban heat islands, particularly affecting densely populated communities such as Linda Vista.

Local residents report a noticeable increase in temperatures: “The heat has been unbearable since December; we’ve never felt anything like it,” they say. Heavy rains, meanwhile, pose constant challenges, as they disrupt transportation and make it difficult to access employment and public services. Many people must commute daily to other areas such as Desamparados or Cartago for work, which becomes risky during extreme events.

In addition, the community lacks recreational infrastructure and green spaces, which has an impact on the quality of life in . According to the local Environmental Management Unit, this limits the physical and mental well-being of the population. There are also difficulties in coordinating health services, as this area is under the jurisdiction of another canton, weakening the institutional response capacity in emergencies.

In this context, although the Municipal Emergency Committee of La Unión is the official body responsible, the initial response to disasters usually falls to the community itself, particularly the Development Association, which provides spaces such as the community hall to care for those affected. This capacity for local organization and solidarity is key, especially in the face of limited immediate state presence.

From a socioeconomic perspective, the available data—corresponding to neighboring cantons—reflect a Human Development Index adjusted for inequality (HDIc) of 0.67, which is considered high. However, the lack of specific information on Linda Vista limits a detailed analysis of its

particular social and economic conditions.

In summary, Linda Vista is a community highly exposed to climate threats, with vulnerable infrastructure and significant social challenges. The combination of environmental, structural, and territorial factors requires urgent climate change adaptation strategies, in which the local community plays a central role in risk management and resilience building⁴⁴.

Sociodemographic data

Linda Vista is a community located in the canton of La Unión, in the province of Cartago, with an estimated population of 6,000 inhabitants spread over an area of approximately 41 hectares.

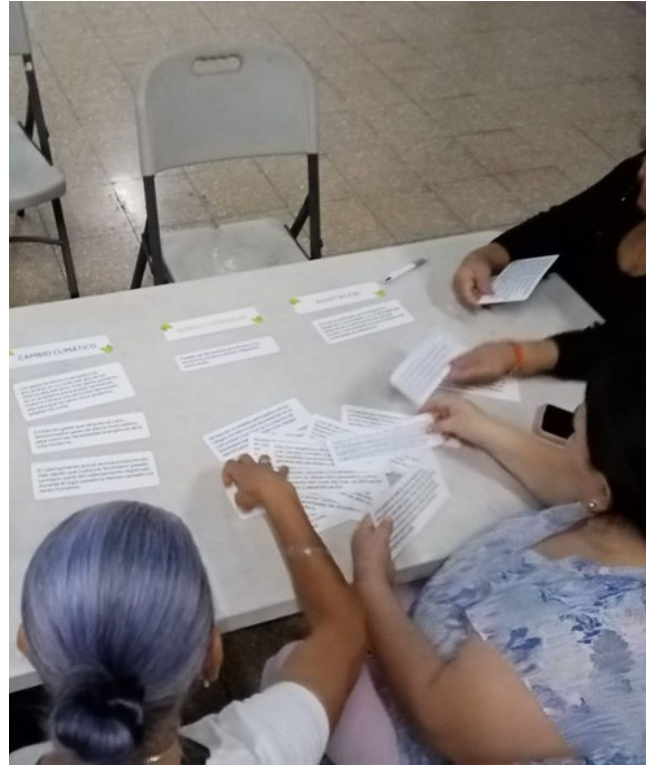
It was established in 1979 as a settlement project to provide social housing for vulnerable people from different regions of the country.

Although the community has a Cantonal Human Development Index (IDHc) adjusted for inequality of 0.67, placing it in the high to very high development categories, it faces significant limitations in access to public services due to its geographical location.

This condition has led, for example, to health services being managed from the neighboring canton of Desamparados, given its greater accessibility to the territory.

The indicators available for the surrounding cantons point to low gender inequality and a medium to low poverty rate. However, the lack of specific data at the community level limits a detailed characterization of the local socioeconomic situation.

44 E Murillo-Rodríguez, D Hernández-Parra, AA Martínez-Blanco, A Robles-Jirón, MP Calvo-Barboza and MF Muñoz-Tubito, 'Perspective on damage and losses due to climate change in public health: the case of the community of Linda Vista, La Unión, Costa Rica' (2024) 4(1) SciComm Report 1



Photographs taken by members of the LRC team

In terms of health, Linda Vista has a Basic Comprehensive Health Care Team (EBAIS) located in the facilities of the Municipality of La Unión.

The staff consists of a doctor, a nursing assistant, two technical assistants (one in networks and one in primary care), a general services worker, a guard, a dentist, and a dental assistant.

However, the ratios of professionals are insufficient when compared to international standards, which generates dissatisfaction among the population due to long waiting lists and low efficiency in medical care.

From a climate risk perspective, the community has experienced significant economic losses as a result of extreme

events, particularly landslides and floods, whose frequency and intensity have increased due to climate change.

These problems are exacerbated by the presence of homes built on unstable land, which in many cases is due to the economic impossibility of accessing better locations or safer construction materials.

This reality forces many families to go into debt in order to rebuild their homes after suffering damage.

According to the Ministry of National Planning and Economic Policy (MIDEPLAN), in the district of Río Azul, where Linda Vista is located, there have been multiple economic losses associated with events such as tropical waves, storms, and hurricanes.

The most severe event occurred in 2002, when heavy rains caused substantial damage to housing infrastructure, highlighting the high geological exposure of the territory.

With regard to risk management, emergency response in the community is the responsibility of the Municipal Emergency Committee of La Unión.

However, it is common for the Community Development Association to be the first to respond, activating spaces such as the community hall to provide initial care to those affected.

This coordination between institutional and community actors is essential to address climate-related threats (), but it also highlights the need to strengthen local capacities and improve preventive infrastructure.

Overall, Linda Vista represents an emblematic case of an urban community vulnerable to climate change, where advances in human development coexist with structural inequalities that require urgent attention from public policies⁴⁵.

Table 8. Ficha de caracterización comunitaria: Linda Vista

Name	Linda Vista
Territorial location	Latitude 9° 53' 7" north Longitude 84° 1' 48" west
Población	6000 inhabitants
Rural/urban	Rural
IDH	La Unión 0,838 (2022)
Climate vulnerabilities	Floods, tropical storms, and heat waves → increase the risk of diseases caused by high temperatures, vector-borne diseases, waterborne diseases, respiratory health, nutrition, mental health, and increased morbidity and mortality from chronic diseases due to weak health infrastructure and poverty ⁴⁶

Own elaboration. The Climate Route

45 E Murillo-Rodríguez, D Hernández-Parra, AA Martínez-Blanco, A Robles-Jirón, MP Calvo-Barboza and MF Muñoz-Tubito, 'Perspective on damage and losses due to climate change in public health: the case of the community of Linda Vista, La Unión, Costa Rica' (2024) 4(1) SciComm Report 1

46 E Murillo-Rodríguez, D Hernández-Parra, AA Martínez-Blanco, A Robles-Jirón, MP Calvo-Barboza and MF Muñoz-Tubito, 'Perspective on damage and losses due to climate change in public health: the case of the Linda Vista community, La Unión, Costa Rica' (2024) 4(1) SciComm Report 1

Vulnerabilities, Damage, and Losses

In the community of Linda Vista, through focus groups and in-depth interviews, four types of impacts were addressed⁴⁷:

- Impacts on livelihoods
- Impacts on social dynamics
- Impacts on health
- Impacts based on gender

Climate change affects people differently depending on their economic status, gender, age, or social class.⁴⁸

In Linda Vista de Río Azul, most homes are precarious.

They are built with low-quality materials and without urban planning. In addition, the community has limited access to basic services such as water and electricity. Many houses are located on steep slopes, near rivers and streams. They lack retaining walls, drainage, and sewage systems.

These factors increase the risk of flooding and landslides. The situation is exacerbated by deforestation, garbage accumulation, and alterations to the micro-watershed.

One example was the 2005 landslide, where many families lost their homes and received only temporary rental assistance.⁴⁹

Economic losses almost always fall on families. Institutional assistance is limited and does not cover all needs.

During the rainy season, flooding in streets and homes is frequent, affecting people's mobility and access to public transportation and limiting income opportunities.

Damage to streets, bridges, and bus terminals increases travel times and generates additional expenses. This situation directly impacts work and education.

The community of Linda Vista reflects high socioeconomic vulnerability. Therefore, it is urgent to address climate impacts considering their livelihoods and social dynamics.

47 La Ruta del Clima, Climate impacts on marginalized urban communities: The case of Linda Vista de Río Azul (San José, November 2023) https://larutadelclima.org/wp-content/uploads/2024/03/ImpactosClimaticosUrbanos_ESP-3.pdf

48 UN Women, 'The correlations between gender inequality and climate change' <https://www.unwomen.org/es/articulos/articulo-explicativo/las-correlaciones-entre-desigualdad-de-genero-y-cambio-climatico>

49 Ibid 43

Conclusions

Deep inequalities, such as poverty, ethnic discrimination, and social inequality, make many communities more vulnerable to the effects of climate change. These structural conditions limit their ability to adapt, especially when there are shortages in basic services such as drinking water, sanitation, or adequate infrastructure.

It is not just a matter of heavier rainfall or longer droughts, but of structural conditions that limit the possibility of adaptation. When basic services such as drinking water, sanitation, or safe infrastructure are lacking, any climatic event becomes a threat to life.

In addition, conflicts related to extractive projects (such as pollution, agricultural expansion, or deforestation) exacerbate the vulnerabilities of communities, directly affecting territories and generating an unfair distribution of environmental impacts.

These problems are not exclusive to rural areas. Cities also experience high levels of poverty, informality, and inequality, which increase urban vulnerability to climate impacts.

In turn, this vulnerability is not isolated, but is determined by systemic socioeconomic, political, institutional, geographic, and environmental factors that vary by territory and reinforce existing inequalities.

This vulnerability is neither an accident nor an isolated event. It is the result of a system that has placed profit above life and left communities in the Global South to bear the consequences of a crisis they did not cause.

That is why talking about climate change also means talking about reparations: acknowledging the damage, restoring what has been lost, and ensuring that it does not happen again. Reparations are not just about compensation, they are about healing the relationship between people, the Earth, and justice.



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