Consequences of El Niño in northern Côte d'Ivoire: Climate risk, community vulnerability, and the rsilience of agro-pastoral dams

This study analyzes the extreme climatic effects of the El Niño phenomenon on agro-pastoral systems in northern Côte d'Ivoire. It presents a rapid climate-risk assessment of the socio-economic and environmental implications of drought for rural communities and local water resources.

The El Niño episode demonstrates that climate risks intensify population vulnerability by driving declines in agricultural yields, pasture degradation, and severe drought affecting agro-pastoral dams. Rapid assessment of climate metrics, combined with pressure analysis, accentuates the dynamics of food insecurity. Community-based adaptation policies are required to limit tensions over access to water and reduce the risk of agro-pastoral conflicts. This study reflects on the impacts of climate metrics, with a focus on integrated water management, population health, and sustainable agriculture.

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Key Messages

To contribute to the evaluation of public policies supporting community-based climate action, local elected officials, development actors, and the government should:

- conduct a rapid assessment of climate risks in northern Côte d'Ivoire, to identify priority climate change mitigation and adaptation measures;
- develop a strategic plan to respond to climate risks and disasters in emergency situations, to meet the needs of rural communities in northern Côte d'Ivoire;
- assess community needs before developing and implementing development or agropastoral projects;
- assess water availability in order to implement joint programs for the development of agro-pastoral dams.

Introduction

The climate assessment conducted in northern Côte d'Ivoire (Folon region) highlights a territory characterized by savannah vegetation and marked by prolonged periods of drought. In 2023, the extreme climate phenomenon known as El Niño contributed to climate variability in northern Côte d'Ivoire. The metric-based climate assessment shows that the region is subject to higher temperature intensity, more pronounced drought conditions, and fewer rainy days. The impacts of the El Niño phenomenon on agricultural practices, rural communities, water availability, agricultural production, health, and rural economic benefits raise the following question: What are the climatic impacts of the El Niño phenomenon on agropastoral activities in northern Côte d'Ivoire (Folon region)? The analysis draws on data from AGNES Africa's Adaptation Atlas (adaptationatlas.cgiar.org), complemented by field observations and interviews with local communities. These data were analyzed, and presented through figures and maps. This approach enabled a detailed analysis of climate metrics and their correlation with specific agricultural, health, labor, and water-stress parameters.

Overall objective

The overall objective of this study is to assess the impact of the El Niño phenomenon on variations in climate parameters and agropastoral practices.

Specific objectives

- Evaluate the climatic parameters affecting the Folon region.
- Measure the influence of drought on agricultural activities and livestock farming.
- Measure the impact of water and ▶▶

climate stress on rural communities' health.

Hypotheses

- Assessing climate parameters in the northern region could lead to a community adaptation plan for extreme climate risks.
- Measuring climate metrics could reveal the climate parameter causing water stress.
- In addition to climate assessment, direct observation of the northern region of Côte d'Ivoire could reveal the impact of gold mining pollution on water resources.

Methodological approach

The methodology centers on field-based observations of the impacts of El Niño on human activities, water resources and the biological environment in northern Côte d'Ivoire. The assessment relies on climate data obtained from the World Bank Climate Data Portal and is conducted under the SSP5–8.5 scenario. This information is correlated with demographic and agricultural data from Côte d'Ivoire. In addition, interviews and direct field observations were conducted with communities in rural areas (traditional leaders, women and youth).

- The CVCA analysis method

The Climate Vulnerability and Capacity Analysis (CVCA) method will be applied in northern Côte d'Ivoire to assess the impacts of El Niño. This approach also enables the integration of a rapid climate assessment component.

- The non-directive (open-ended) interview method

This type of interview does not involve pre-written questions or a structured format. Instead, it proposes a broad theme, and the interviewer intervenes only to relaunch the discussion and encourage the interviewee to explain their thoughts in more detail. In this study, the interviews focused on issues of climate risk, vulnerability, community adaptation, and gender mainstreaming in adaptation and mitigation projects.

Box 1: Climate observation data

The World Bank has an open-source platform (https://climateknowledgeportal.worldbank.org/) which provides access to climate data (historical, extreme and projected). This portal contains data from across the globe. It includes raw data, analyzed using different climate models.

Box 2: The evaluation framework applied to the analysis of El Niño in northern Côte d'Ivoire

This framework presents a technical approach to our study, which enables the integration of in situ observations (SODEXAM station data) and satellite-derived datasets linked to the World Bank portal. It is based on a combination of three complementary models:

- the IPCC Climate Vulnerability Analysis framework;
- the Disaster Risk Management (DRM) framework; and
- a socio-ecosystem approach.

This evaluation framework will support the prioritization of adaptation options to address climate risks.

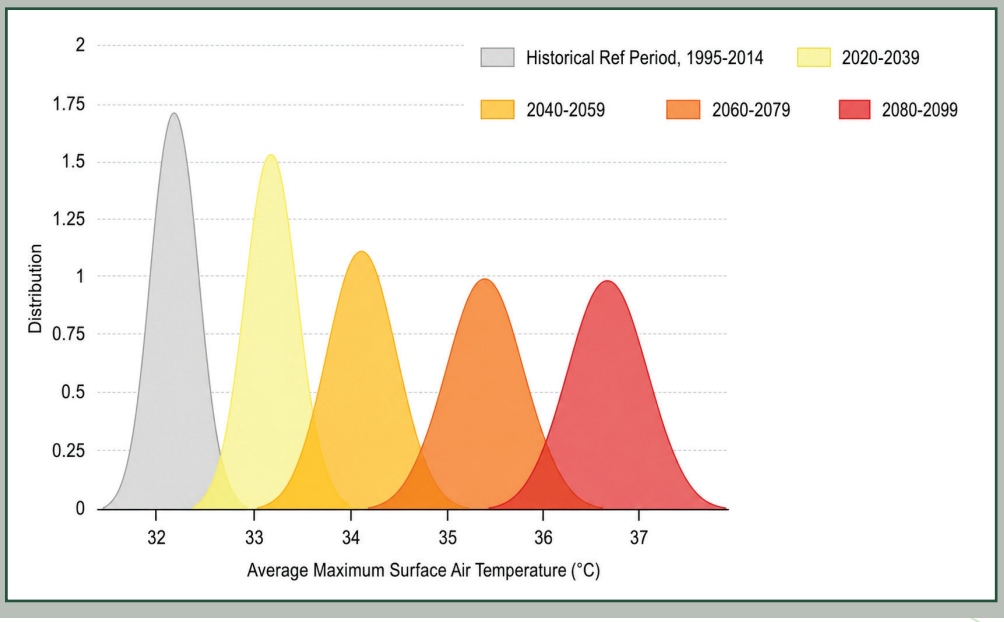
Outcomes and discussion

Assessment of climate risks in northern Côte d'Ivoire (Folon region)

Climate projections for 2020–2039 in northern Côte d'Ivoire indicate an upward shift in maximum temperatures, with mean values frequently around 33–34°C, consistent with a trend toward intensifying drought. Observational analyzes confirm that temperature is the dominant climatic driver in the study area. The high temperature metrics clearly show an El Niño-related contribution to warming. Current impacts include more frequent and longer episodes of severe heatwaves (Figue 1).

In Côte d'Ivoire, the El Niño episode that began in 2023 resulted in intense heatwaves, with peak temperatures reaching 36°C, and

Figure 1: Projected changes in maximum temperature distribution, 2020–2079_SSP 8.5 (northern Ivory Coast)



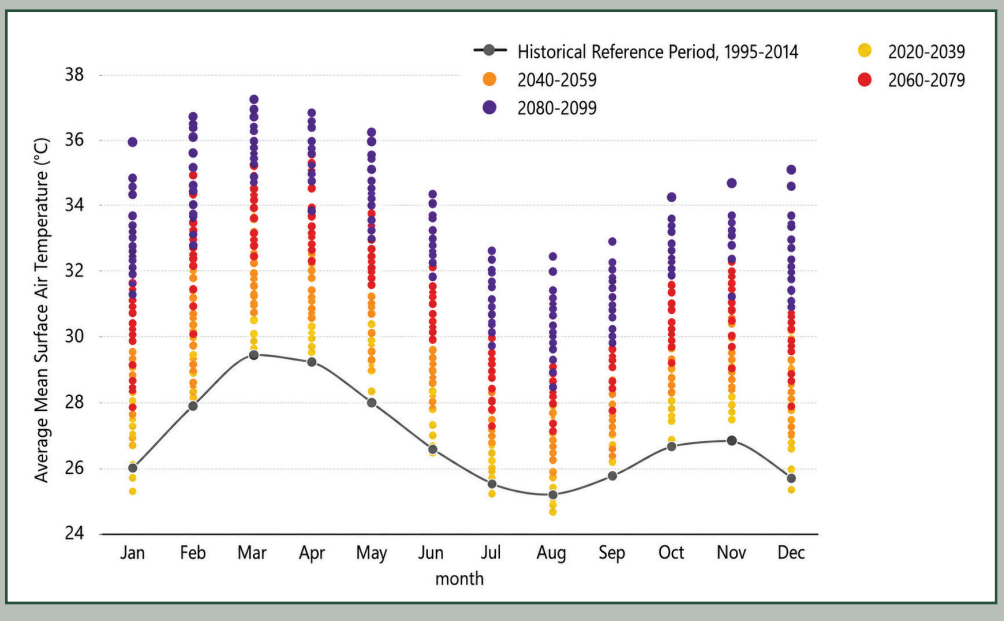
rainfall deficits in early 2024, according to SODEXAM (Figue 2).

The climate assessment indicates a marked rise in temperatures, with 2020 ranking among the hottest years on record. Figure 2 confirms an increase in mean temperature, with maximum values frequently exceeding 30°C, consistent with an upward trend in local climatic conditions.

Community vulnerability in northern Côte d'Ivoire to climate risks

Northern Côte d'Ivoire is among the most affected geographical areas. Communities ▶▶

Figure 2: Projected changes in average temperature distribution, 2020–2100_SSP 8.5 (northern Ivory Coast)



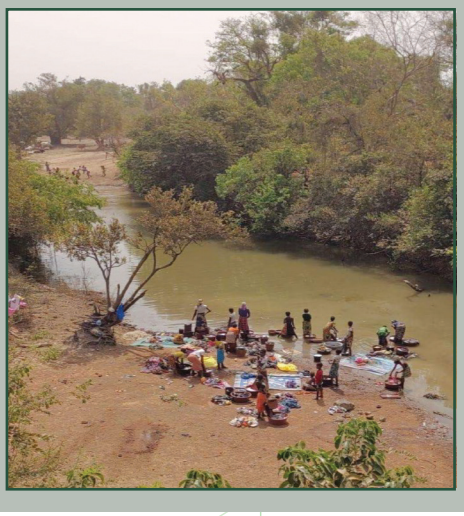
in this part of the country face greater constraints in adapting to climate variability, and water scarcity is particularly acute.

Agropastoral dams are increasingly exposed to extreme drought.

Extreme drought is placing agropastoral dams under severe pressure, while agriculture-based human activities are becoming increasingly difficult for village communities.

The drying up of rivers, boreholes and wells, exacerbated by droughts and overexploitation, is severely constraining domestic water provision. Interview data highlight numerous climate-driven effects on women's activities. Due to water stress, water availability and quality have become a major crisis.

Figure 3: Photo taken at the Folon

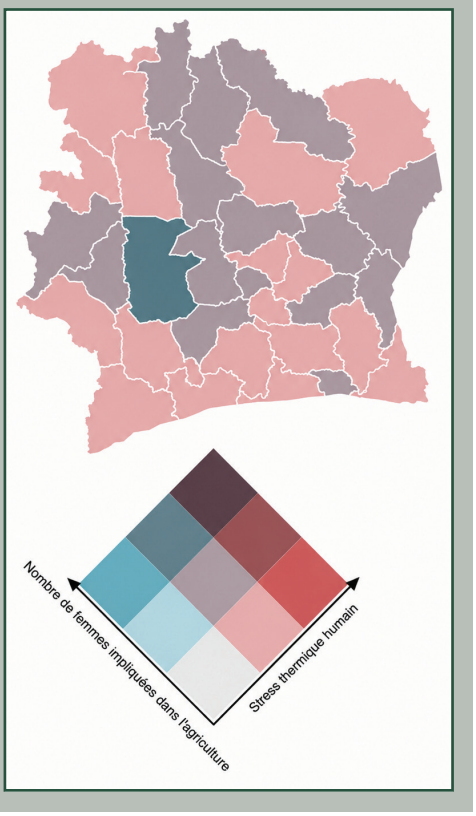


Community interviews in Folon show high levels of exposure to climate risks. Moderate heat stress, intensified by climate change, disproportionately affects rural women in agricultural sectors. Shifts in heat stress affect health and agricultural productivity, partly through their interaction with water availability. Similarly, severe heatwaves reduce working hours by increasing the incidence of sun-related illness.

Analysis of human and agropastoral risks

A risk analysis was conducted to inform the implementation of public policies targeting

Figure 4: Climate impact on women's activities



climate risks affecting women. The proportion of women engaged in agriculture and the variables associated with women's empowerment and well-being were classified based on their distribution through the superimposition of the datasets. This classification was made to highlight regions combining elevated heat stress, substantial involvement of women in agriculture, and low empowerment and well-being outcomes among women. The assessment points to severe climate impacts on livestock, with values exceeding 90 (Table 1).

Resilience of agro-pastoral reservoirs under extreme climate conditions

The integrated assessment of El Niño's impacts on agro-pastoral systems in northern Côte d'Ivoire reveals agricultural losses of approximately 30%, accelerated pasture degradation, and a 45% decline in water levels in agro-pastoral dams. These outcomes, combined with spatial and socio-economic analyzes, provide plausible evidence to inform public policies. It is necessary to mainstream

Table 1: Climate risk analysis for livestock, crops, and the population

Category	Low threshold %	Moderate threshold %	High threshold %
Human	<27	27-41	>41
Culture	<9	9-25	>25
Livestock	<72	72-90	>90

adaptive water management into municipal development plans, encourage green investment in sustainable water infrastructure, and strengthen local climate-economy monitoring mechanisms. The assessment thereby serves as evidence to support local policy dialogue and climate adaptation planning.

In northern Côte d'Ivoire, market gardening is a female-dominated activity that contributes to income diversification within village communities.

Market gardening activities are now becoming increasingly rare in some villages, due to severe drought. Villages in the departments of Kouto, Tienko, Odienné and Tengrela are not immune to this climatic hazard. Increasing water needs, declining incomes, and the spread of diseases associated with drought conditions and water pollution (caused by artisanal mining activity) are among the negative impacts on village communities.

Agricultural production and agropastoralism are the sectors most exposed to climate stressors, including drought, flooding, and severe heatwaves. The populations in this area of northern Côte d'Ivoire are subject to heatwaves, which constrain agricultural activities.

Gold Panning as a contributing factor to the effects of El Niño in Northern Côte d'Ivoire

In northern Côte d'Ivoire, El Niño alone does not account for the scale of the impacts observed. Illegal gold mining is one of the human-induced stressors affecting communities. This activity adversely affects water resources, fish biodiversity, the biological environment, livestock farming, fisheries, and ▶▶

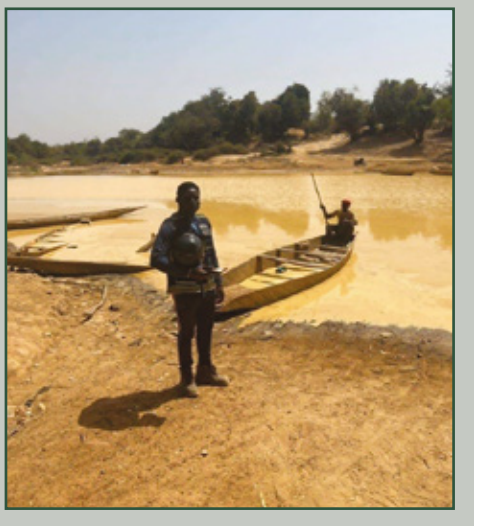


Women's agropastoral practices under extreme climate risk conditions (northern Côte d'Ivoire)

human health, and contributes to increased greenhouse gas emissions.

In these areas, some children suffer from diarrheal diseases, infections and dehydration. Gold mining, combined with heatwaves, heightens the likelihood of life-threatening consequences for farmers.

Figure 5: Gold-related pollution of waterways (northern Ivory) Coast)



Agro-pastoralism, a key resilience strategy to climate change, is also affected

Figure 6: The impact of El Niño on agro-pastoral dams (northern Ivory Coast)



After agriculture, livestock farming is the priority option for village communities. However, under severe heatwave conditions, livestock face water scarcity due to reduced availability in agro-pastoral reservoirs. Community accounts indicate that these dams offer a glimmer of hope for strengthening community resilience in the face of climate variability. Interview evidence suggests that, compared with the decade preceding 2023, drought-related risks to these dams were previously very low.

Leveraging assessment outcomes to inform climate decision-making

Classification of climate risk levels in relation to El Niño (Table 2).

The vulnerability analysis provides a concise appraisal of climate events and offers insights for public policy decision-making. Côte d'Ivoire's NDC 3.0 establishes local objectives aligned with the climate risks specific to each region of the country. These outcomes inform the design of local adaptation plans, help determine appropriate financing options, and identify priority infrastructure for local communities. Community adaptation options for climate risk (El Niño) (Table 3).

Adaptation options are identified at a cross-cutting level involving all relevant parties. To address these climate risks, Nationally Determined Contributions (NDCs) and National Development Plans (NDPs) must leverage green-economy sectors to deliver large-scale projects. The agro-pastoral sector is positioning itself as a pillar of climate change adaptation through sustainable practices. Strategic decisions are coupled with a gender analysis to assess women's participation across priority sectors. At COP 30, Côte d'Ivoire presented its NDC 3.0, a framework that demonstrates the country's long-term commitment to climate action. This document describes national and sectoral strategies, structures mitigation and adaptation actions, and assesses budgetary requirements. Gender and climate policy (Table 4).

Table 2: Climate vulnerability analysis

Climate events	Frequency of El Niño-induced events	Severity of consequences on systems and communities					
		Late rains (long periods of drought	Pockets of drought during the rainy season	Poor distribution of rainfall	Early end to the rainy season	Excessive heat	Floods
		Very severe	Severe	Low	Low	Very severe	Severe
Late rains (longs period of drought)	Very severe	Extreme	Very high	Moderate	Moderate	Extreme	Very High
Pockets of drought during the rainy season	Very severe	Extreme	High	Moderate	Moderate	Extreme	Very high
Poor rainfall distribution	Severe	Extreme	High	Moderate	Moderate	Very high	High
Early end to the rainy season	Severe	Very high	High	Moderate	Moderate	Very High	High
Excessive heat	Very severe	Extreme	Very High	Moderate	Moderate	Extreme	Very High
Floods	Very severe	Extreme	Very High	Moderate	Moderate	Extreme	Very High

Table 3: Evaluation of climate adaptation options

Priority adaptation option	Level of priority
Cross-cutting option	
• Establishing a climate risk observation, information management and warning system	Top priority
• Raising awareness and building capacity among local populations and other stakeholders on the effects of climate change and the measures to be taken to improve resilience • Promotion of IGAs • Training on climate change-resilient agricultural practices	Secondary
Sector 1 - Agriculture and food security	
• Promoting new crop varieties adapted to drought, high temperatures and heat stress	Top priority
• Ensuring water availability during prolonged periods of drought to make cropping systems resilient to climate change • Improving soil conservation and restoration techniques	Secondary
Sector 1 - Agriculture and food security	
• Supporting the creation of livestock feed banks and storage of crop residues • Supporting efforts against wildfires to prevent the destruction of fodder reserves during the dry season • Creating and promoting fishponds or concrete tanks	Top priority
• Supporting the restoration of degraded and vulnerable riverbanks	Secondary

Table 4: Gender analysis of climate policies in Côte d'Ivoire: Responses from northern Côte d'Ivoire

Analysis	Evidence	Rating grid	Outcomes and assessments
Can programs or projects demonstrate that they consider the diverse situations, needs and aspirations of women and men?	Reference to studies, gender-disaggregated data, contributions from local groups specializing in gender equality	2	Moderate
Do the specific objectives take into account the needs of women and men as expressed in the analysis?	At least one specific objective focused on equal opportunities for women and men	3	Good
Do the specific objectives take sufficient account of the inequalities identified and promote equality?		2	Moderate
Do the programs or projects explain how they will implement equal opportunities in their outcomes?	Existence of a clear equal opportunities strategy as a guiding principle for all activities of the development partnership	3	Good

The gender assessment grid indicates women's level of involvement. While women are disproportionately affected by and concerned about climate issues, adaptation projects and programs are integrating their priorities into planned action. Côte d'Ivoire's climate policies emphasize gender considerations and recognize women as direct beneficiaries of climate-related projects.

Conclusion

The hypothesis formulated at the beginning of the study is validated. By triangulating observational evidence, community interviews, and metrics drawn from an open-source climate platform, the study produced climate risk assessments and an impact profile for agro-pastoral activities. This evidence base underpins the design of community adaptation and mitigation strategies aimed at addressing climate change. In 2023, the El Niño phenomenon contributed to climatic disruptions in Côte d'Ivoire.

Based on the outcomes of this study, which proposes a rapid climate risk assessment approach, it is essential to implement policies aimed at strengthening community adaptation strategies to extreme weather events. Such a policy orientation would require mobilising green investors and climate finance to support the implementation of adaptation and mitigation programs and projects. The gender analysis of climate action must take into account the country's national policies (NDC, NAP, NDP). eVALU

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Author's Profile



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