CLIMATE PROFILES AND POLICY FRAMEWORKS IN AGRICULTURE AND ENERGY SECTORS IN BENIN AND BURKINA FASO

Technical Report

Sévérin Ekpé, Madou Sougué, Kwame Oppong Hackman, Kisito Gandji, Ramata Ouedraogo, Alcade C. Segnon, Seyni Salack, Robert B. Zougmoré

November 2025

To cite this report
Ekpé, S., Sougué, M., Hackman, K. O., Gandji, K., Ouedraogo, R., Segnon, A.C., Salack, S., Zougmoré, R.B. 2025. Climate profiles and policy frameworks in agriculture and energy sectors in Benin and Burkina Faso. Centro Internacional de Agricultura Tropical - CIAT.

Acknowledgement

This study was funded by the Alliance of Bioversity International and CIAT through the Accelerating Impacts of CGIAR Climate Research for Africa (AICCRA) project. AICCRA helps deliver a climate-smart African future driven by science and innovation in agriculture. It is led by the Alliance of Bioversity International and CIAT and supported by a grant from the International Development Association (IDA) of the World Bank. We also take this opportunity to acknowledge the continued support of the ClimateWorks Foundation (CWF), which provided financial and technical support for the establishment and operationalization of the Independent Global Stocktake West Africa Regional Hub (iGST WA Hub). We extend our sincere gratitude to key informants from Benin and Burkina Faso who provided additional sources of information to complement the analyses in this report. In particular, we extend our gratitude to:

- The representatives from the DGEC of the Ministere du Cadre de Vie et du Transport en charge du Developpement Durable (MCVT), the National Designated Authority (NDA) of Benin, and the Ministry of Agriculture, Livestock and Fisheries (Ministère de l'Agriculture, de l'Élevage et de la Pêche - MAEP) of Benin.
- The representatives of the GCF's NDA, and the Ministry of Agriculture, Animal and Fisheries Resources (Ministère de l'Agriculture, des Ressources Animales et Halieutiques - MARAH) of Burkina Faso.

About AICCRA Reports

Titles in this series aim to disseminate interim research on the scaling of climate services and climate-smart agriculture in Africa, in order to stimulate feedback from the scientific community.

Photos
Cover photo: © CIAT/Neil Palmer

Disclaimer
This report has not been peer reviewed. Any opinions stated herein are those of the author(s) and do not necessarily reflect the policies or opinions of AICCRA, donor, or partners.

Partners

ABOUT AICCRA

Accelerating Impacts of CGIAR Climate Research for Africa (AICCRA) is a project that helps deliver a climate-smart African future driven by science and innovation in agriculture. It is led by the Alliance of Bioversity International and CIAT and supported by a grant from the International Development Association (IDA) of the World Bank. Explore our work at aiccra.cgiar.org

aiccra.cgiar.org

CGIARAfrica

ABSTRACT

Climate change is exacerbating vulnerabilities in Benin and Burkina Faso, where livelihoods and economic development depend heavily on agriculture and energy, two climate-sensitive sectors. Both countries are already experiencing rising temperatures, variable rainfall, and more frequent extreme weather events, which threaten food security and energy infrastructure development and efficiency. Both countries have ambitious climate commitments with well-aligned climate policy frameworks that are consistent with their national development goals and priorities, regional (AU and ECOWAS) agendas, and global climate policies such as the Paris Agreement. These frameworks prioritize sustainable land management and renewable energy toward low-carbon and climate-resilient development. Effective implementation of these frameworks is hindered by systemic barriers, mainly financial barriers: both sectors face critical funding shortfalls and heavy reliance on unpredictable external financing tied to donor priorities. Future climate projections indicate continued warming, increased droughts, and more intense rainfall events, leading to heightened risks for rural populations who depend on rain-fed agriculture and biomass energy. Bridging these gaps is essential to moving from ambition to measurable impact. Targeted GCF interventions could play a catalytic role by scaling up financing, strengthening institutional and technical capacities, and fostering regional coherence in line with ECOWAS and global climate priorities.

Keywords

Climate change; Global Stocktake (GST); West Africa; Climate mitigation; Climate adaptation; Climate finance; Technology transfer; Climate governance

ABOUT THE AUTHORS

Sévérin Ekpé is an iGST Young Fellow at WASCAL

Madou Sougué is an iGST Young Fellow at WASCAL

Kwame O. Hackman is Senior Scientist and Coordinator, Land Use Systems and Nature-based Solutions at WASCAL

Kisito Gandji is a Scientist at WASCAL

Ramata Ouedraogo is a Junior Scientist at WASCAL

Seyni Salack is Acting Director of WASCAL Competence Centre

Alcade C. Segnon is Science Officer for AICCRA in West Africa and Scientist at the Alliance of Bioversity and CIAT.

Robert B. Zougmoré is AICCRA Director and Principal Scientist at the Alliance of Bioversity and CIAT.

CONTENTS

ACRONYMS

AFOLU	Agriculture, Forestry and Other Land Use
ECOWAPs	ECOWAS Regional Agricultural Policy
EIS	Energy Information System
GCF	Green Climate Fund
GHG	Greenhouse Gas
LT-LEDS	Long-Term Low Emission Development Strategy
MRV	Measurement, Reporting, and Verification
NAP	National Adaptation Plan
NDC	Nationally Determined Contribution
PANEE	National Energy Efficiency Action Plan
PANER	National Renewable Energy Action Plan
PNGCC	National Policy on Governance and Management of Climate Change
PNDD	National Sustainable Development Policy
PNDES	National Economic and Social Development Plan
PNIASP	National Agro-Sylvo-Pastoral Investment Strategic Plan
PNSFMR	National Rural Land Tenure Security Policy
PONADER	National Renewable Energy Development Policy
PONEME	National Energy Management Policy
PPPs	Public-Private Partnerships
PS-PASP	Agro-Sylvo-Pastoral Production Sectoral Policy
RMF	Results Management Framework
SND-AC	National Strategy for Contractual Agriculture
SND-AE	National Agroecology Development Strategy

SNER	National Rural Electrification Strategy
SNADDT	National Spatial Planning and Sustainable Development Scheme
SOC	Soil Organic Carbon
UNFCCC	United nations Framework Convention of Climate Change

INTRODUCTION

Background

West Africa countries, including Benin (a coastal country) and Burkina Faso (a landlocked Sahelian country), experience several climate-related disasters with severe consequences for agricultural productivity and infrastructures, leading to important disturbances in food systems. All future climate scenarios indicate that global warming will intensify and exceed 1.5°C and possibly even 2°C by 2050, unless substantial reductions in greenhouse gas emissions are achieved in the coming decades (IPCC, 2021). This situation underscores the need for developing countries, which are the most vulnerable, to develop and implement more robust adaptation and mitigation strategies.

While efforts are being made to mitigate the adverse effect and build resilience for the vulnerable communities, the persistent gap between ambitious national climate targets and actual implementation remains a major challenge in the region. Despite developing comprehensive policy frameworks, such as Nationally Determined Contributions (NDCs), Long-Term Low Emission Development Strategies (LEDS), and National Adaptation Plans (NAPs) and other climate related policies and strategies, countries continue to face difficulties mobilizing adequate climate finance.

In this context, the West Africa Regional Hub of the Independent Global Stocktake (iGST WA Hub) serves as a regional platform uniting climate-focused civil society actors - including youth organizations, women's groups, and researchers - to strengthen climate action across the region. The Hub promotes collaboration, research, advocacy, and capacity building to ensure non-state actors actively contribute to the Global Stocktake process.

To enhance climate finance mobilization, the Hub launched a Youth Fellowship Program, now in its second phase, which engages young professionals to analyze the climate profiles and policy frameworks of selected West African countries. The program's findings informed a regional workshop on "Resource Mobilization through Green Climate Fund (GCF) Proposals" for civil society organizations. Supported by the Alliance of Bioversity International and CIAT through the Accelerating Impacts of CGIAR Climate Research for Africa (AICCRA) project, it provided participants with the practical skills necessary to design bankable GCF concept note and train their organizational peers. This initiative directly supports AICCRA's mission to bridge science and policy by promoting partnerships that establish a solid technical and financial foundation for local climate action.

This report presents the climate profiles and policy frameworks of the agriculture and energy sectors in Benin and Burkina Faso, aiming to build the climate rationale that supports the Hub's resource mobilization efforts and helps address the region's persistent funding gaps in climate action.

Objectives

This study assesses the climate policy framework focusing on (i) identifying national climate policy documents, (ii) assessing policy objectives and priorities, including key mitigation and adaptation targets, (iii) establishing connections with regional continental, and global climate priorities, and (iv) mapping policy gaps, challenges, and financing need to identify where GCF support can add value and ensure additionality. Furthermore, it develops the climate profiles of the targets countries in the specified sectors by (v) analyzing the historical trends of identified variables including temperature, precipitation, and relative humidity, (vi) projecting future regional climates under various emission scenarios, and (vii) identifying climate impacts and vulnerabilities in the specified sectors. To achieve these objectives, the following methodology is developed.

METHODOLOGY

To analyze the policy framework, an analytical framework was developed (Figure 1). The research used a secondary data-based approach, by identifying relevant official policy documents. NDCs, NAPs, and LEDS documents were obtained directly from the UNFCCC website. Additional country-specific policies, strategies, and plans related to the energy and agriculture sectors were collected from government websites using French-translated keywords, such as "Nation climate policy," "Agriculture Policy," and "Renewable Energy Policy" as well as from key informants from the technical directorate of the concerned ministers in both countries. To conduct a comprehensive assessment of national climate policy in the targeted sectors, a thematic coding framework was developed using the outcomes of the first Global Stocktake (GST 1) of the PA as a reference (UNFCCC, 2023). The coding framework translates the key mitigation and adaptation priorities of GST 1—especially those found in paragraphs 28 (energy) and 63(b) (agriculture and food systems)—into a set of thematic codes. The objective of this choice is not to directly assess alignment with GST 1, but rather to use it as a reference to ensure a comprehensive review and help identify where GCF support may be needed.

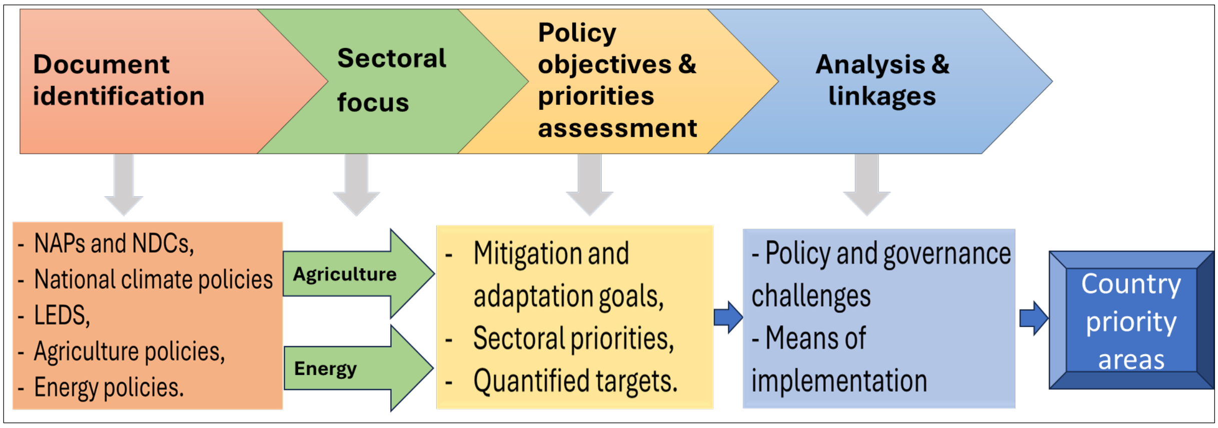

Figure 1. *Analytical framework for the national climate change policy analysis*

With regard to the climate profile, we focused on analysing the historical and future trends of commonly used climatic variables, including precipitation, temperature, and relative humidity, as well as assessing the impacts and vulnerabilities of both the agriculture and energy sectors. To achieve this, the methodology involved reviewing the latest NAP documents for the two countries. When the required climate data were not available in the NAPs, we complemented them with primary data analysis and information from research papers. For the data analysis, trends in climate variables were assessed using rainfall data from CHIRPS and temperature and relative humidity data from ERA5. For future trends of climate variables analysis, ISIMIP climate model data was used. As the slopes per year of the climate variables were relatively small, they were converted into percentage per decade.

Both climate profile and climate policy framework analysis contribute to rational for the development of a regional concept note. The findings are presented in the following sections.

CLIMATE POLICY FRAMEWORK AND CLIMATE PROFILE OF BENIN

Benin's climate policy framework

Climate policies in the agriculture sector

The climate policy framework in the agriculture sector of Benin is summarized in Table 1, including policy documents, their goals and targets, and their focus namely adaptation, mitigation, or integrated cross-cutting dimension.

Table 1. *Benin's agriculture climate policies with objectives and targets*

Policy document	Objectives / Targets	Focus
Benin NAP (2022)	Improve the performance of Benin's agriculture, by reducing its vulnerability to enable it to sustainably ensure food and nutritional sovereignty, to contribute to the economic and social development of the men and women of Benin, and to achieve the SDGs, particularly SDGs 1, 2, 12, and 13 (With the NDC)	Adaptation
Updated NDC 2.0 (2021)	Improve agricultural performance for food and nutritional sovereignty and SDGs 1, 2, 12, 13.	Adaptation
	Achieve 29.9 Mt CO_2eq reduction (51.4% vs BAU) 99.4% of reductions projected to come from improved farming techniques and soil fertility management	Mitigation
National Climate Change Management Policy (2020)	Strengthen adaptation in agriculture, forestry, water resources, health, energy, tourism, coastline, and infrastructure	Adaptation (with cross-cutting)
Low-Emission and Climate-Resilient Development Strategy (2016)	Ensure food security by improving productivity and access to clean drinking water, preventing production losses in key agricultural sub-sectors, and building the capacity of local communities to manage climate-resilient decentralized development.	Adaptation

Climate Change Law (2018)	- Ensure conservation and climate-smart agriculture by creating conditions for access to cultivable land and other resources (Article 34). - Implement policies for ecologically sustainable management and conservation of all types of forests (Article 35). - Establish and strengthen systems for early warning and natural disaster management in agricultural production areas (Article 36).	Adaptation
	- Promote climate-smart agriculture through incentive measures (Article 58). - Conserve and strengthen greenhouse gas sinks by restoring and enriching forests (Article 59). - Require agricultural producers to avoid harmful practices such as deforestation and the use of non-approved inputs (Article 60). - Support agronomic research for improved techniques that enhance mitigation and promote the use of approved inputs for soil fertility (Article 61).	Mitigation
National Strategy for Ecological and Organic Agriculture (SNDAEB 2022)	- Develop sustainable ecological and organic farms. - Improve the quality and competitiveness of processed or unprocessed Ecological and Organic Agriculture (EOA) products. - Improve the framework conditions of the EOA sub-sector.	Cross-cutting (sustainability and resilience)
National e-Agriculture Strategy (2020)	- Strengthen the availability of and access to quality seeds and seedlings (plant, animal, and fishery production). - Strengthen access to other types of agricultural inputs. - Mechanize the agricultural activities that is adapted and accessible for both men and women.	Cross-cutting (technology and innovation)

	- Improve access to professional knowledge and technological innovations for both men and women.	
Strategic Plan for Agricultural Sector Development (PSDSA 2017)	Improve the performance of Beninese agriculture, to make it capable of sustainably ensuring food sovereignty, food and nutritional security, and contributing to the economic and social development of the men and women of Benin in order to achieve the Sustainable Development Goals (SDGs).	Adaptation and cross-cutting

These policies outline a comprehensive strategy to promote low-emission, climate-resilient farming systems, integrating sustainable land management, climate-smart agriculture practices, technological innovation, and inclusive practices to achieve both mitigation and adaptation objectives. The following table presents the directions and the promoted approaches.

Table 2. *Benin's climate agriculture specific direction and approaches*

Direction/Approaches	Description
Transition to low-emission, regenerative systems, and integration of technology and mechanization.	Priority to sustainable, climate-smart agriculture to restore ecosystem health and reduce emissions. Adapted agricultural mechanization, and ICT solutions adopted, strengthening productivity, reducing fossil fuel use, and improving system efficiency.
Soil fertility and sustainable farming practices.	Promotion of soil fertility management, conservation agriculture, ecological and organic farming, and agroforestry which enhances productivity while mitigating greenhouse gas emissions, including methane from livestock.
Climate-resilient production systems.	Strategies focus on building resilience to climate shocks through climate-resistant seeds, large-scale farming initiatives, and support for women farmers.
Water-energy-agriculture synergies.	Investments in multi-purpose dams, reservoirs, and boreholes enhance water security and link agricultural adaptation with energy resilience.
Early warning and monitoring systems.	Strengthening agro-meteorological networks and EWS supports proactive disaster management and informed decision-making.

Legal and institutional foundations.	Mandate to promote conservation and climate-smart agriculture and supports agronomic research, ensuring a formal basis for implementation
Gender and inclusivity.	Emphasizes gender inclusion in training and capacity-building initiatives to enhance equitable participation in climate-smart agricultural practices.

Together, these policies provide a robust foundation for enhancing productivity, ecosystem health, and resilience to climate shocks, while ensuring legal, institutional, and social support for the country's long-term agricultural climate goals.

Climate policy framework for the energy sector

Table 2 presents Benin climate policies in the energy sector with the objectives and targets. In addition, the framework sets some energy efficiency and national renewable energy specific targets (Annex 1 and 2).

Table 3. *Benin's climate policy framework with objectives and targets in the energy sector*

Document	Objectives / Targets	Focus
National Energy Efficiency Action Plan (2015)	- Eliminate inefficient lamps by 2020; - Reduce distribution losses from 15%/22% to <10% by 2020; - Universal access to clean cooking by 2030 - Energy efficiency standards & labeling Create financing instruments for sustainable energy, including carbon finance.	Mitigation
Climate Change Law (2018)	**Renewable Energy Promotion and Integration** - Increase the share of new and renewable energies in the energy balance to achieve energy security (Article 37). - Promote public and private investments in renewable energy technologies, such as solar, wind, and thermal (Article 65). **Governance and Regulation** - Integrate the promotion of renewable energies into the state's energy policy (Article 37).	Mitigation

	- Establish instruments and mechanisms to promote new and renewable energies and energy efficiency (Article 39). - Ensure the production, transport, storage, and distribution of renewable energy-based electricity comply with safety and security standards (Article 38). - Open the renewable energy sector to the private sector for facility construction, operation, and modification (Article 40). **Sustainability and Environmental Protection** - Develop renewable energy sources in compliance with public health, environmental standards, and national economic competitiveness (Article 39). - Ensure that biofuel development does not jeopardize equitable access to land, food security, and environmental protection (Article 41). - Encourage forest plantations to strengthen greenhouse gas sinks and reservoirs (Article 64).	
Low-Carbon and Climate-Resilient Development Strategy (2016)	- Reduce anthropogenic GHG emissions - Enhance carbon sequestration potential.	Mitigation and adaptation
National Policy on Climate Change Management (PNGCC)	- Ensure low-carbon and climate-resilient development across all sectors of the economy	Mitigation and adaptation
National Energy Efficiency Policy (2020)	- Diversify supply sources to achieve national energy autonomy of 51% by 2025 and 79% by 2030. - Develop an electricity transmission network with projects integrated into the regional ECOWAS grid. - Develop a distribution network to reach an electricity access rate of 77.6% by 2030 and 100% by 2035.	Mitigation and adaptation

	- Reduce losses in the electricity distribution network to at least 15% by 2025 and 10% by 2030.	
National Policy on Renewable Energy Development (PONADER, 2020)	- Harness renewable energy potential - Promote renewable energy technologies - Foster favorable institutional & regulatory environment for renewables	Mitigation
Updated Nationally Determined Contribution (NDC 2021)	- Reduce energy sector GHG emissions 12.15% by 2030 (8.4% unconditional, 3.75% conditional) - Develop electricity from gas & renewables - Extend household access to electricity & efficient energy use - Promote low-wood-fuel technologies & energy efficiency in transport	Mitigation
National Adaptation Plan (NAP 2022)	- Increase resilience & adaptive capacity to climate change - Reduce vulnerability of communities & livelihoods - Integrate adaptation into policies & programs - Strengthen stakeholder capacity & adopt preventive strategies	Adaptation
Electricity Code (2020)	- Law establishes obligations: five-year indicative program for RE proportion - Promotes valorization of local energy resources - Requires institutional and regulatory governance enabling RE deployment.	Mitigation

The policies contribute to sustainable renewable energy and climate action through a strategic commitment to decarbonization, energy efficiency, and modernizing infrastructure to achieve energy autonomy and resilience. The following table describes the promoted approaches.

Table 4. *Benin's climate energy specific direction and approaches*

Approaches/Practices	Description
Decarbonization and renewable energy transition	Strategic commitment to decarbonization through a large-scale shift from fossil fuels to renewable energy sources. For instance, development of hydroelectric (Dogo Bis, Vossa, Bétérou) and solar power (PV solar farms of 112 MWp) infrastructure; promotion of decentralized solar systems for public lighting and administrative buildings, and integrating hybrid renewable energy models.
Legal and fiscal enablers	Strong legal foundation promoting renewable energy, supported by fiscal incentives such as tax exemptions on solar equipment and provisions to attract private investment in solar, wind, and thermal technologies.
Energy efficiency enhancement	Major focus on reducing energy consumption and transmission losses through national efficiency standards for domestic and industrial appliances, subsidized access to efficient technologies, and modernization of electricity infrastructure. For instance, a 7,221 LED lamps initiative will be undertaken for public use, 3 million for households, and 300,000 efficient refrigerators.
Cleaner biomass and fossil fuel alternatives	Promotion of efficient biomass use through improved cooking technologies and sustainable charcoal production, alongside efforts to introduce cleaner fossil fuel options, including LNG regasification terminal (500 MW) as a transitional energy source.
Just and inclusive energy transition	Subsidies to encourage households' adoption of cleaner domestic energy, reducing dependence on traditional biomass fuels, while ensuring social equity in access to modern energy services.
Transport decarbonization and infrastructure modernization	Development of sustainable transport infrastructure. For instance, the Cotonou bypass and waterway transport systems, to reduce emissions and enhance mobility efficiency.

Together, the policies reflect Benin's commitment to a low-carbon, inclusive, and sustainable energy future, positioning the country to balance development goals with its climate ambitions. However, several systemic barriers continue to limit their full implementation and impact.

Policy gaps, governance and means of implementation challenges

The analysis of Benin's framework in the agriculture and energy sector reveals several systemic gaps and needs across finance, capacity building, technology transfer, and data systems, which collectively determine the effectiveness of implementation. The following table presents these challenges for the two sectors.

Table 4. *Policy gaps, governance and means of implementation challenges*

Sectors	**Agriculture**	**Energy**
Policy gaps and governance issues	- Insufficient integration and tracking of Soil Organic Carbon (SOC) metrics in the NDC limit measurable outcomes for climate-smart agriculture. - Weak inter-ministerial coordination and fragmented governance hinder effective implementation. - Multi-stakeholder engagement, including public, private, and civil society actors, remains underdeveloped, reducing policy ownership and collaboration.	- Policy incoherence and weak coordination. Overlapping and inconsistent targets.[1] This reflects fragmented planning and poor coordination among institutions. - Governance and coordination weaknesses. The multiplicity of actors without a strong coordination mechanism leads to fragmented execution and monitoring, undermining the coherence of national climate and energy strategies
Means of implementation	- Significant funding needs (~$1.48 billion) are constrained by reliance on unpredictable external financing. There is also an absence of a centralized climate financing monitoring system - Limited human and institutional capacity restrict the preparation and submission of donor-compliant project proposals. - Building is needed at all levels, from executives to local producers, focusing on agro-climatic modeling and	- There are severe financial constraints. The sector faces an estimated US$5.4 billion financing gap (Updated NDC 2021), with heavy reliance on unpredictable external funding tied to donor priorities rather than domestic needs. - Capacity and skills shortages. A lack of technical and managerial expertise limits renewable energy expansion. - Technology and R&D deficits. Dependence on imported technologies, with little local innovation in biomass energy or solar PV manufacturing.

[1] For instance, there is notice of the same electricity loss reduction goal appearing in both the PANEE (2015) and PONEME (2020) with different timelines.

	sustainable land management techniques - Need for agro-ecology-specific adaptation and mitigation technologies (e.g., mulching, integrated agropastoral management, manure utilization) is unmet due to gaps in legal frameworks and technology transfer systems - Climate data systems are weak, necessitating modernization of observation stations and development of robust Early Warning Systems (EWS) for proactive risk management.	- Weak data and monitoring systems. The Energy Information System (EIS) is insufficiently developed, lacking updated data on rural electricity access, infrastructure mapping, and renewable resource potential, despite legal obligations for systematic observation.

Addressing these interlinked challenges through coherent planning, diversified financing innovation, and stronger institutional coordination will be essential for Benin to transform its policy ambitions into effective, sustainable outcomes.

Alignment of Benin's climate policy framework

- **Alignment with national framework:** Benin's climate framework is anchored in the Vision Alafia 2025, which envisions a well-governed, prosperous, and sustainable nation. The National Development Plan (PND 2018–2025) and the Sustainable Development Growth Program (PC2D) operationalize this vision through sustainable management of natural resources and balanced territorial development. The Government Action Program (PAG) translates these priorities into concrete government actions.

- **Alignment with regional and continental frameworks:** the policy framework is in alignment with the African Union's Agenda 2063, promoting sustainable and climate-resilient development. Furthermore, it is consistent with ECOWAS policies, including the ECOWAS Renewable Energy Policy (2015), the ECOWAS Energy Efficiency Policy (2015), and the ECOWAS Agricultural Policy, through the PSDSA. Benin also actively participates in the West African Power Pool (WAPP) supports regional energy integration.

- **Alignment with international and global frameworks:** the framework is aligned with UNFCCC and the Paris Agreement. It is also coherent with the Kyoto Protocol, the Convention on Biological Diversity, the Basel, and Bamako Conventions. Finaly, it is aligned with the 2030 Agenda for Sustainable Development, particularly SDG 1 (No Poverty), SDG 2 (Zero Hunger), SDG 7 (Clean Energy), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action).

Benin's climate policy framework demonstrates robust alignment across all governance levels, successfully anchoring its objectives in national development blueprints, adhering to key continental and regional strategies and fulfilling commitments under major global accords.

Climate profile of Benin

Precipitations

Total annual rainfall (PRCPTOT) in the country ranged from 1,000 to 1,300 mm between 1970 and 2019 (MCVDD, 2022). In terms of trends, we complemented primary data analysis. The results showed that the trends PRCPTOT ranged between 0.75% and 5.14%, with a national average trend of 2.92% across Benin. The high values were observed in the northern part of the country. The Simple Daily Intensity Index (SDII) ranged from 0.00% to 4.28%, with a national average trend of 1.83%. Regarding the intensity of extreme rainfall (RX1day and RX5days), the results indicated mixed upward and downward trends, ranging from −7.52% to 4.54%. In contrast, the frequency of extreme rainfall (R10mm and R95p) events showed positive trends across the country, with slopes ranging between 0.00% and 13.25% (Fig. **2**). These findings are consistent with those of Bodjrènou et al. (2025).

Projections under the scenarios indicate that PRCPTOT could range from 645 to 1369 mm by 2050, with an average value of 1,215 mm under RCP 4.5 (Fig. **2**). Under RCP 8.5, PRCPTOT could exceed 658 mm reaching up to 1400 mm by 2050, with an average value of 1,244 mm. According to the RCP 8.5 scenario for 2050, precipitation in the northern part of the country is projected to range between 649.0 mm and 882.0 mm, while in the southern part, projections range from 919.6 mm to 936.6 mm. Concerning precipitation extremes, climate projections for the period 2020–2050 indicate an increase in extreme rainfall compared to the reference period 1970–2019 at the six synoptic stations in Benin (MCVDD, 2022).

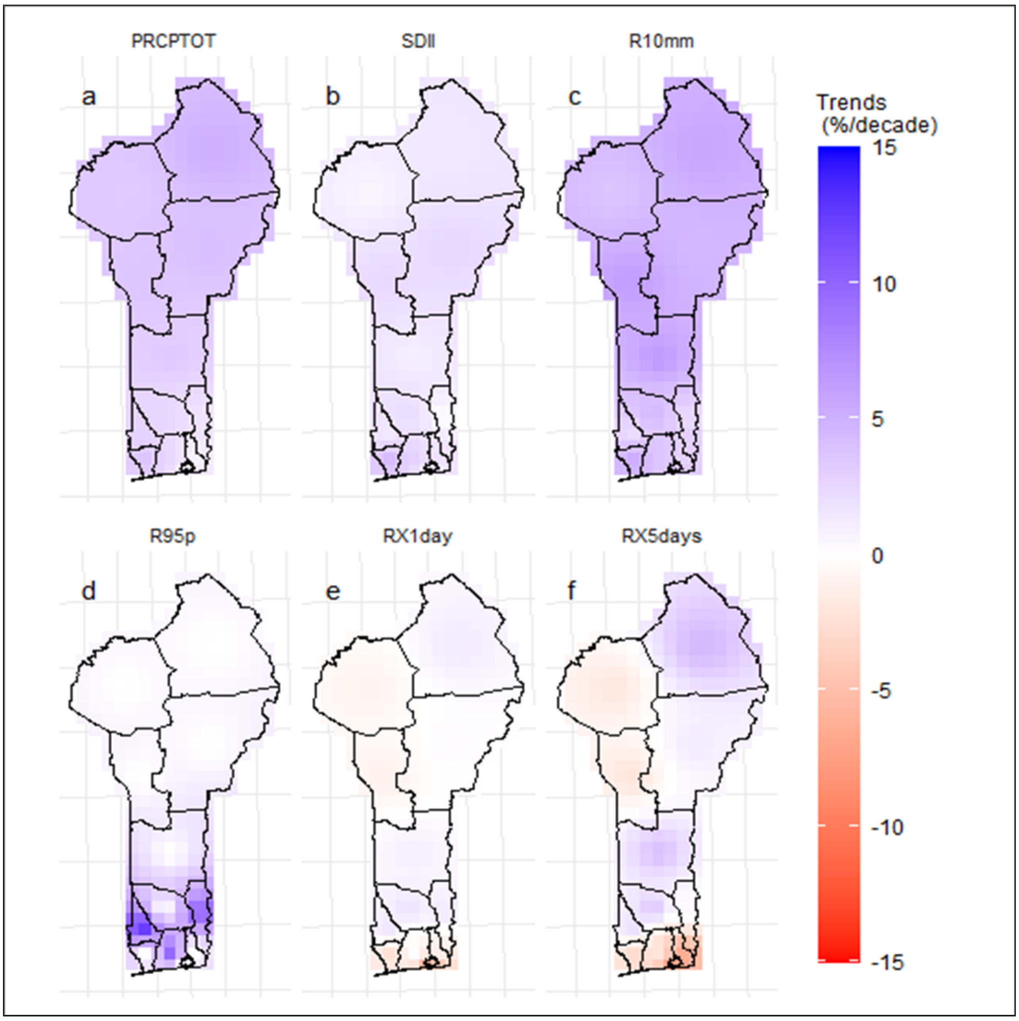

***Figure 2**. Trends in rainfall indices given as change per decade in % for the different rainfall index representing average rainfall indices (PRCPTOT, SDII), rainfall frequency indices (R10mm and R95p) and represent rainfall intensity indices (RX1day and RX5days).*

Temperature

Temperature has exhibited a general upward trend over the period 1980–2014. The spatial distribution shows a clear north–south gradient, with the northern regions consistently recording higher temperatures, averaging around 28.8 °C during this period. The national average temperature shows an increasing trend, with a slope of 0.18 °C per decade, though this rate varies slightly across the country's climatic zones (Bodjrènou et al., 2025). All zonal temperature trends are positive and statistically significant. The average temperature trends in the northern, central, and southern parts of Benin are 0.20 °C, 0.16 °C, and 0.18 °C per decade, respectively (Bodjrènou et al., 2025). Concerning extreme temperatures, overall, maximum temperatures (Tmax) show a positive trend, with a slope of 0.14 °C per decade, while areas between latitudes 8.5° and 10.5° exhibit slightly negative trends of about −0.011 °C per decade (Bodjrènou et al., 2025). Similarly, minimum temperatures (Tmin) display increasing trends across Benin, with an average rise of approximately 0.24 °C per decade (Bodjrènou et al., 2025).

Climate models used for projections show good agreement, indicating a general upward trend in temperature, or overall warming, from 2030 to 2100. Projections for 2050 suggest an increase in average maximum temperatures across all agroecological zones and under different emission scenarios. Under the RCP 4.5 scenario for 2050, the average maximum temperature (Tmax) in the far North of Benin is projected to range between 38.0°C and 38.1°C in the northern Benin. Under the RCP 8.5 scenario for the same period, Tmax is projected to range between 35.8°C and 36.9°C in the central zone, and between 34.1°C and 35.1°C in the southern zone of Benin (MCVDD, 2022). Overall, climate projections indicate that excessive heat is expected in the future, with average maximum temperature increases ranging between 0.9°C and 1.9°C under the RCP 8.5 scenario from 2020 to 2050. By 2100, a continued global warming trend is projected (MCVDD, 2022).

Relative humidity

Benin is characterized by three climatic zones, each showing seasonal and spatial variability in air humidity. The southern region is characterized by an equatorial climate, with high relative humidity ranging from 69% to 97%. In the central region, relative humidity varies between 31% and 98%. The northern region experiences highly variable humidity, ranging from 18% during the Harmattan (December to February) to 99% in August during the rainy season (MCVDD, 2022). In terms of trends, our results indicated that the average relative humidity (RHMean) increased from 0.45% to 0.73% per decade, with an average value of 0.58% per decade across Burkina Faso. As for extreme relative humidity (RH80p and RHmax), the trends ranged from −0.35% to 13.53% per decade.

Impacts of climate change on agriculture and energy sectors

The following table presents the projected climate change impact on crop yields in Benin.

Table 5. *Projections of climate change impact on crop yields in Benin*

Crop (Variety)	**Projected variation rate in 2030**	**Projected variation rate in 2050**
Maize **(SYN – 75 days)**	The yield of this variety of maize is expected to decrease by 21.6%.	The yield of this variety of maize is expected to decrease further, by up to 28.8%.
Maize **(EVDT – 90 days)**	The yield of this variety of maize is expected to decrease by 16.7%.	The yield of this variety of maize is expected to decrease by 8.9% but will remain lower than impacts in 2030.
Cowpea **(IT 82 E 32 – 60 days)**	The yield of this variety of cowpea is expected to decrease by 26.7%.	The yields of cowpea are expected to decrease by 26.1%
Groundnut **(55-437 – 90 days)**	The yield of this variety of ground nuts is expected to decrease by 2.5%	In 2050, groundnut yields are expected to increase by about 6.4%.

The agricultural is a crucial economic sector in Benin, employing more than half of the population, contributing 75% of export earnings, and accounting for 32% of gross domestic product (GDP). As it is primarily rain-fed, the sector is highly vulnerable to changing climate. The impacts of climate change on the agricultural sector are multifaceted and severe. They include disruptions to the agricultural calendar and delays in sowing periods, declines in crop yields (Table **1**) and increased crop losses, scarcity of pastureland, and intensified transhumance due to prolonged dry spells. Climate change also accelerates soil degradation, reducing crop productivity, and causes the early and prolonged drying of water resources used for agriculture as a result of excessive heat and extended dry seasons. These changes heighten the risks of food and nutritional insecurity, as variations in water balance can compromise crop cycles (MCVDD, 2022).

Regarding the energy sector, climate change has several significant impacts. These include reduced flow rates in rivers feeding hydroelectric dams, such as the Nangbéto Dam on the Mono River, due to increased droughts and greater interannual variability in river discharge. Climate change also disrupts the operation of electrical grids and transmission lines, leading to line losses caused by overheating of transmission and distribution networks. The efficiency of photovoltaic solar panels decreases under excessive heat, while biomass resources become increasingly scarce due to disrupted forest regeneration, compounded by continued harvesting for domestic energy needs. Moreover, extreme weather events can cause severe damage to energy infrastructure (MCVDD, 2022).

Vulnerability of agriculture and energy sectors to climate change

The agricultural sector in Benin is particularly exposed to climate hazards, including delayed and intense rainfall events, flooding, dry spells, heatwaves, and strong winds. It is highly sensitive to disruptions in the agricultural calendar, particularly delays in sowing periods, reduced agricultural yields and significant crop losses, accelerated soil degradation that lowers crop productivity, scarcity of grazing land leading to more intensive transhumance, early and prolonged drying of water resources used for agriculture, and heightened risks of food and nutritional insecurity. Despite ongoing adaptation efforts, smallholder farmers, emerging farmers, and market gardeners remain the most vulnerable to agroclimatic risks. The adaptive capacity of agriculture in Benin is currently being strengthened through a strategic and structured process under the NAP. This process aims to reduce the vulnerability of the rain-fed agricultural sector by investing in technology, integrated resource management, and institutional and social capacity building, with an estimated implementation cost for the sector.

Concerning the energy sector, it is heavily dependent on natural resources, particularly surface water for hydroelectricity and forest ecosystems for wood energy. It is exposed to climate hazards such as floods, high streamflow, droughts, and strong winds. The sector is highly sensitive to reduced flow rates in rivers feeding hydroelectric dams due to increased drought events, line losses caused by overheating of electricity transmission and distribution networks, disruptions in the operation of power grids and potential network failures during extreme weather events is hindered by climate change, and a decline in the efficiency of photovoltaic solar panels. The energy sector of Benin has limited adaptive capacity, but it is one of the eight priority sectors identified in the NAP.

CLIMATE POLICY FRAMEWORK AND PROFILE OF BURKINA FASO

Climate policy framework of Burkina Faso

Burkina Faso agriculture climate policy framework

Burkina Faso's agricultural climate framework presents an integrated strategy focused on promoting low-emission, climate-resilient, and productivity-enhancing practices that balance environmental sustainability with food security objectives (Table 7).

Table 6. *Burkina Faso's Climate agriculture framework with objectives and targets*

Document	Objectives/ Targets	Focus
Nationally Determined Contribution (NDC) (2021)	Reduce emissions from the Agriculture, Forestry, and Other Land Use (AFOLU) sector by 10,096.8 Gg CO2eq in 2025 and 31,153.2 Gg CO2eq in 2050.	Mitigation
National Adaptation Plan (NAP) (2024)	Increase the rate of achieving potential yields for cereal crops from 40.4% to 60% by 2028	Adaptation
National Climate Security Strategy	Promote sustainable soil management, strengthen producer capacities, develop water-controlled agriculture, and use climate information.	Adaptation
2050 Low-Carbon & Resilient Vision (2024)	Achieve carbon neutrality for the agriculture sub-sector by 2032 (high ambition) and reduce emissions by 209% by 2050.	Adaptation and mitigation
National Strategic Plan for Agro-Sylvo-Pastoral Investment (PNIASP) 2021-2025	Sustainably increase the productivity of the Agro-Sylvo-Pastoral (PASP) sector; Strengthen land tenure security for Agro-Sylvo Pastoral, and Fisheries (ASPHF) production areas; Srengthen the resilience of households and ASPHF production systems.	Adaptation and cross-cutting
National Agroecology Strategy (2023)	Sustainably increase productivity and production through agroecological intensification.	Adaptation and mitigation
National strategy for soil restoration, conservation, and recovery in	Integrate Water and Soil Conservation / Soil Defense and Restoration (WSC/SDR) actions into local development plans; and To implement WSC/SDR actions at the national level.	Adaptation

Burkina Faso 2020 - 2024		
National Agricultural Advisory Strategy (2017)	Disseminate technologies for soil reclamation, improved varieties, and sustainable resource management.	Adaptation and mitigation
Sectoral Policy (Agro-Sylvo-Pastoral) (2018)	Develop 59,146 hectares of new irrigated land to double the share of irrigated production to 30% of total output.	Adaptation
National Contract Farming Strategy (2024)	Develop contract farming to ensure producer market access and secure supply for agri-food companies.	Adaptation

Table 8 presents the agriculture specific direction and approaches. These approaches demonstrate Burkina Faso's commitment to building a climate-smart agricultural system that strengthens resilience, fosters innovation, and accelerates the transition toward sustainable land and resource management.

Table 8. *Climate agriculture specific direction and approaches*

Direction/Approaches	Description
Low-emission and ecosystem-focused agriculture.	The framework prioritizes non-CO_2 mitigation through reforestation, afforestation, and conservation agriculture, aiming to strengthen carbon sinks while improving ecosystem services and soil health.
Integration of agroecology and innovation.	Agroecology is mainstreamed into all agricultural policies and programs, supported by the development and dissemination of innovative technologies (50 new technologies) and methods in environmental and agricultural sciences.
Climate-resilient production systems.	The strategy promotes irrigation expansion, hydro-agricultural infrastructure maintenance, and the development of resilient production and supply systems to reduce vulnerability to climate shocks.
Enhanced climate information and early warning systems (EWS)	Modernization of meteorological infrastructure and the establishment of effective EWS support proactive adaptation and disaster preparedness.

Food security and productivity improvement.	Strengthening food supply chains and reducing production losses underpin the drive toward national food self-sufficiency and agricultural resilience
Financial and policy support for agroecology.	Subsidies and incentives are designed to encourage the adoption of agroecological practices and technologies, ensuring that financial mechanisms reinforce climate-resilient and low-emission farming.

Burkina Faso's climate energy policy framework

Table 9 presents Burkina Faso's climate energy framework with objectives and targets with their focus area (mitigation or adaptation, or both).

Table 7. *Burkina Faso's climate energy framework with objectives and targets*

Document	Objectives / Targets (Energy)	Focus
Nationally Determined Contribution (NDC) (2021)	- Reduce emissions from the energy sector by 3,192.71 Gg CO2eq by 2025, 6,385.45 Gg CO2eq by 2030, and 19,156.29 Gg CO2eq by 2050.	Mitigation
National Adaptation Plan (NAP) (2024)	- Increase the share of renewable energies in total energy production from 31.39% to 45% and increase energy savings from 56.94 GWh to 65 GWh by 2028.	Mitigation and adaptation
2050 Low-Carbon & Resilient Vision (2024)	- Increase the share of renewables in electricity generation to between 41% and 53% by 2050 (from a baseline of 8% in 2020).	Mitigation
National Rural Electrification Strategy (SNER) (2024)	- Increase the national rural electrification rate to 50% (from 5.49%) and the national coverage rate to 80.9% (from 50%) by 2028.	Adaptation
General Regulation Law for the Energy Sector (2017)	- To ensure an effective, efficient, reliable, sustainable, sufficient, and perennial energy supply to promote sustainable socio-economic development.	Mitigation and adaptation
National Renewable Energy Action Plan (PANER) (2015)	- On-Grid: Increase renewable capacity to 318 MW (36% of mix) by 2030. - Off-Grid: Serve 26.9% of rural population with mini-grids/standalone systems by 2030.	Mitigation

	- Cooking: 79% of population using improved cookstoves by 2030.	
National Energy Efficiency Action Plan (PANEE) (2015)	- Lighting: 100% use of low-consumption lamps by 2030. - Distribution: Reduce electricity losses to 10% by 2030. - Buildings/Industry: 90% of new buildings and 50% of industries to adopt efficiency measures by 2030.	Mitigation
Sustainable Energy for All (SE4ALL) Action Plan (2015)	- Achieve the three global SE4ALL objectives by 2030: 1) Universal access to modern energy, 2) Double the global rate of energy efficiency improvement, 3) Double the share of renewables in the global energy mix.	Mitigation and Adaptation

Guided by its national energy transition agenda, Burkina Faso's climate–energy policy framework promotes a shift toward cleaner, more efficient, and resilient energy systems through coordinated legal, institutional, and technological approaches. Table 10 presents directions and approaches.

Table 10. *Climate energy specific direction and approaches*

Direction/Approaches	Description
Energy transition	The national framework prioritizes a large-scale shift toward renewable energy and reduced fossil fuel dependence, guided by the *Energy Transition* pillar. Efforts center on electrifying key sectors and decentralizing energy production to improve rural access.
Renewable Energy Expansion	Policies promote the development of grid-connected and off-grid renewable systems, including regional solar power plants and community-based mini-grids. A strong decentralization approach supports off-grid electrification in rural areas. The legal framework (Law No. 014-2017/AN) provides investment incentives and buy-back mechanisms to encourage private participation.
Energy efficiency enhancement.	The framework emphasizes energy-saving technologies across all sectors—residential, public, and industrial—through the adoption of efficient lighting, appliances, and building

	standards. It promotes system-wide efficiency improvements and reduction of transmission losses.
Sustainable biomass and bioenergy transition.	Recognizing biomass as a dominant energy source, policies focus on cleaner cooking technologies, efficient charcoal production, and the gradual replacement of traditional fuels. Biofuels are also promoted in transport to diversify the energy mix and cut emissions.
Legal and Incentive Framework.	The country is strengthening its legal and regulatory environment to stimulate investment, with fiscal incentives, standardized efficiency measures, and performance requirements for appliances, buildings, and industries.

This framework strategically combines renewable expansion, energy efficiency, sustainable biomass use, and enables legal reforms to drive a just and inclusive low-carbon transition.

Despite Burkina Faso's strong policy commitments, key gaps persist in data systems and governance structures, undermining the effective monitoring, coordination, and long-term sustainability of climate–agriculture actions.

Policy gaps, governance and means of implementation challenges

The analysis of Burkina Faso's climate and energy policy framework reveals persistent gaps and needs across governance, finance, capacity, and data systems that must be addressed to ensure the success of the national energy transition.

Addressing these policies, financial, and institutional weaknesses will be essential to strengthen implementation capacity, enhance private sector confidence, and accelerate progress toward Burkina Faso's agriculture and climate objectives.

Table 11. *Policy gaps, governance and means of implementation challenges*

Sectors	Agriculture	Energy
Policy gaps and governance issues	- Data and Measurement Fragmentation. NDC (2021) integrated agriculture into the broader Agriculture, Forestry, and Other Land Use (AFOLU) sector. This aggregation makes it difficult to measure the specific impacts of agricultural policies on emission reductions, carbon sequestration, and adaptation co-benefits. - Limited stakeholder ownership. Insufficient engagement from farmers, the private sector, and local governments may compromise policy implementation.	- Policy incoherence. The energy efficiency targets across key policy documents. For example, the Sustainable Energy for All (SE4ALL, 2015) plan set an ambitious annual energy savings target of 200 GWh/year for 2021–2030, contrasting sharply with the NAP's target of only 65 GWh total savings for the entire 2024–2028 period. This reveals poor alignment and lack of integrated planning.
Means of implementation	- Financial constraints. The agriculture sector alone requires approximately 7,638.68 billion FCFA (65% of the total supplementary investment) to achieve carbon neutrality (LT-LEDS). The country is characterized by a critical shortfall, with 76% of total climate funding sourced externally and only 4% from national public sources. - Technology needs and transfer. Support is needed to equip the nation with both low-carbon and resilient technologies and achieve the commitment to research and development (R&D) to create tailored solutions, specifically for bio-inputs to reach 50% by 2027 and for agroecological equipment to	- Severe financial dependence. Half of required investments, especially for rural electrification, remains unfunded. For instance, 66% of the budget for rural electrification remains unsecured, with the government's contribution standing at only 19%. Heavy reliance on external donors exposes the sector to financial volatility and limits national ownership. - Capacity limitation and coordination, including technical and institutional capacity, affects policy implementation, MRV systems, and resource mobilization. High staff turnover further weakens institutional stability and policy continuity. Frequent ministerial changes and weak coordination among

	reach 25% by 2027 (SND-AE). achieve this target. - Capacity needs. There is an expressed need to strengthen the data and monitoring systems to improve the availability of reliable climate information and EWS, and to strengthen the MRV capacities to ensure compliance with the international transparency framework (e.g., submitting GHG inventories and official reports).	actors undermine institutional stability and policy continuity. A lack of synergy and collaboration among the numerous actors in the energy sector hinders effective coordination. - Technology and data deficiencies. Weak data systems, particularly a lack of data on rural environments (e.g., electricity coverage and subscribers), the absence of a central data management platform for electrical infrastructure, and insufficient technical equipment for controlling imported solar components. The framework explicitly calls for strengthening the Energy Information System (EIS) and ensuring the availability of quality statistical data for effective monitoring and evaluation.

Alignment of Burkina Faso's climate policy framework

- **National alignment:** Burkina Faso's climate framework is strongly aligned with the country's long-term development and foresight vision. This includes the Burkina 2025 National Foresight Study and the National Economic and Social Development Plan II (PNDES II) which are the main reference points for national planning. The policy framework also aligns with national strategies including the Accelerated Growth and Sustainable Development Strategy (SCADD), the National Spatial Planning and Sustainable Development Scheme (SNADDT) which provides a long-term spatial framework linking development and climate priorities. The National Agricultural Advisory Strategy (SNCA) and the National Strategy for Contractual Agriculture (SND-AC) both support PNDES objectives for a resilient agro-sylvo-pastoral sector while the Agro-Sylvo-Pastoral Production Sectoral Policy (PS-PASP) reinforces this by promoting productive and sustainable growth in key value chains.
- **Alignment with regional and continental frameworks:** Burkina Faso's climate framework demonstrates alignment with Agenda 2063 and the Malabo Declaration, reaffirming the country's commitment to continental sustainability goals. At the regional level, policies align closely with ECOWAS and WAEMU frameworks, notably, the ECOWAP+10 for agriculture, the ECOWAS Regional Climate Strategy, ECOWAS

Renewable Energy Policy and Energy Efficiency Policy. The country also participates to the West African Power Pool (WAPP).

- **Alignment with international and global framework: t**he framework is grounded in the UNFCCC, Paris Agreement, and Kyoto Protocol, as reflected in the NAP (2024) and LT-LEDS (2024). There is also a strong alignment with the 2030 Agenda for Sustainable Development, especially SDG 2 (Zero Hunger), SDG 7 (Clean Energy), SDG 9 (Industry, Innovation, Infrastructure), SDG 12 (Sustainable Consumption and Production), SDG 13 (Climate Action), SDG 15 (Life on Land). Additional frameworks cited include the Sendai Framework for Disaster Risk Reduction and the Sustainable Energy for All (SE4ALL) Initiative, demonstrating Burkina Faso’s commitment to global resilience and energy transitions.

Overall, the analysis shows that Burkina Faso's climate policy framework is deeply integrated with and supportive of its comprehensive national development strategies, key regional objectives, and foundational global climate agreements.

Climate profile of Burkina Faso

Precipitation

The historical trends analysis was not done in the latest NAP of Burkina Faso. Total annual rainfall (PRCPTOT) in the country ranged from 1,000 to 1,300 mm between 1970 and 2019 (MEEA, 2024). In terms of trends, we complemented primary data analysis. The results showed that the trends PRCPTOT ranged between 1.79% and 11.34%, with a national average trend of 5.98% across Burkina Faso. The high values were observed in the northern part of the country. The Simple Daily Intensity Index (SDII) ranged from 0.88% to 6.42%, with a national average trend of 3.04%. Regarding the intensity of extreme rainfall (RX1day and RX5days), the results indicated mixed upward and downward trends, ranging from −10.56% to 7.16%. In contrast, the frequency of extreme rainfall (R10mm and R95p) events showed positive trends across the country, with slopes ranging between 0.00% and 23.57% (Fig. **2**). These findings are consistent with those of Sawadogo et al. (2024) and Sougué et al. (2023).

Future climate projections from climate models consistently indicate a general increase in annual precipitation across Burkina Faso, regardless of the emission scenarios employed. Approximately 80% of models project an increase in precipitation, consistent across different emissions scenarios. Under the SSP5-8.5 scenario, precipitation is projected to increase by 20-30% in the northern part of the country during the period 2051-2080 (Sawadogo et al., 2024). Even under the more moderate SSP1-2.6 scenario, a minimum increase of 5% is projected. The rainy season is expected to lengthen by 10 to 15 days, particularly in northern regions. While the season start date is projected to occur earlier and the end date later, uncertainty remains regarding the timing of onset due to model discrepancies. Extreme precipitation indices, including the number of days with more than 20 mm of rain (R20mm) and maximum daily precipitation (RX1day), show significant projected increases reaching up to 40% under the SSP5-8.5 scenario. These projections suggest increased risks of flooding and water erosion (MEEA, 2024; Sawadogo et al., 2024).

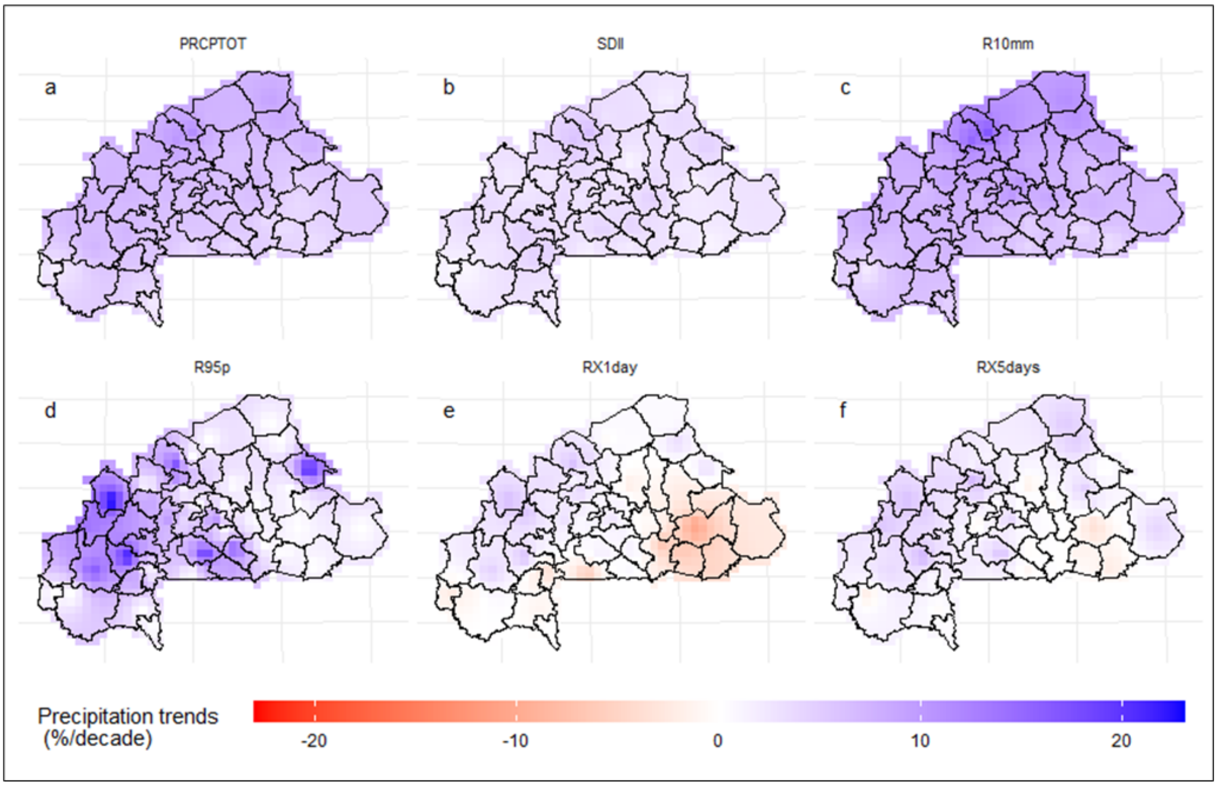

Figure 3. *Trends in rainfall indices given as change per decade in % for the different rainfall index representing average rainfall indices (PRCPTOT, SDII), rainfall frequency indices (R10mm and R95p) and represent rainfall intensity indices (RX1day and RX5days).*

Temperature

Temperature patterns reveal a distinct warming trend across Burkina Faso. The average annual temperature has shown notable increases: rising by 0.2°C per decade in Dori and by 0.3°C per decade in both Ouagadougou and Bobo-Dioulasso. This warming trend manifests in multiple ways: there has been an increase in the number of hot days and nights, with approximately fifteen additional days per decade. Furthermore, both the frequency and intensity of heat waves have increased, while cold nights have become progressively rarer (MEEA, 2024).

Future climate projections confirm that this warming trend will persist, regardless of the scenario considered. For the near-term period (2021-2060), projected temperature increases vary by scenario: 1.0 °C under SSP1-2.6, 1.7 °C under SSP2-4.5, and 2.8 °C under SSP5-8.5 (Fig. **2**). Looking ahead to the long-term period (2051-2100), more substantial warming is projected, with temperatures could exceed 4.3°C in the northern region under the SSP5-8.5 scenario, reaching up to 7°C locally according to some extreme simulation scenarios. The warming pattern shows distinct geographical variation: more pronounced increases are projected for the Sahelian zones (Nord, Central-Nord, and Ouest), while the southern regions are expected to experience slightly less intense warming. Under the SSP5-8.5 scenario, the Cooling Degree Days (CDD) index, which measures energy demand specifically for air conditioning requirements, reveals a substantial upward trend, potentially exceeding 200 days per year by the end of century (MEEA, 2024; Sawadogo et al., 2024). Rising temperatures will drive higher demands for both water and energy for cooling purposes.

Relative humidity

Relative humidity and evapotranspiration represent crucial components of the water balance, significantly impacting both water availability and thermal comfort. Historically, trends in relative humidity across the Sahelian and Sudano-Sahelian zones, indicating a progressive shift toward a drier atmospheric condition. This reduction in atmospheric moisture leads to increased air dryness and diminished soil moisture retention capacity, ultimately resulting in exacerbated water stress conditions and corresponding agricultural yield losses.

Future climate projections consistently indicate a widespread increase in evapotranspiration across all scenarios. More than 80% of climate models project a significant rise in evapotranspiration rates, reaching up to 20% under SSP5-8.5 scenarios. Consequently, this trend will result in reduced soil moisture levels, leading to chronic water deficits and more severe agricultural drought conditions. Relative humidity exerts a significant influence on human heat stress levels. While projections remain limited, the Heat Index (HI) serves as a valuable metric for estimating the combined effects of temperature and humidity on human health. There is unanimous agreement among climate models regarding an increase in the number of days characterized by dangerous heat stress (HI > 41°C). In the near future (2031-2060), annual dangerous heat stress days are expected to range from 40 to 60 per year. By contrast, projections for the distant future (2071-2100) indicate a substantial increase, potentially reaching an additional 160 days annually, with some areas in the Western part of the country possibly experiencing more than 180 dangerous days per year (Sawadogo et al., 2024).

Impacts of climate change on agriculture and energy sectors.

Climate change has significantly impacted many small-scale agricultural producers who heavily depend on rainfed farming systems in Burkina Faso. Under current climate conditions, crop suitability will shift towards the south of Burkina Faso due to climate change, with more severe shifts under the high emissions scenario (Röhrig et al., 2021). Agricultural yields show significant regional variations, with projected decreases of up to 30% in southern regions and potential increases in northern areas for sorghum.

Table 8. *Climate change impacts on agriculture sector in Burkina Faso*

Crops	**Under SSP1-RCP2.6 scenario**	**Under SSP3-RCP7.0 scenario**
Sorghum yield	Sorghum yields are expected to increase by up to +30 % in the North, while decreasing by up to -30 % in the South, with the national average remaining like current simulated yields by 2090.	Sorghum yield is expected to increase by up to +20 % in the North, while decreasing by up to -20 % in the South, with the national average yield decreasing by -3.8 % by 2090.
Sorghum, millet and maize (areas	The areas suitable for multiple crop production are expected to remain relatively stable by 2090.	

suitable for these crops)		
Cowpea (areas suitable for production)	Cowpea is expected to lose 10.3 % of suitable areas by 2090.	Cowpea is expected to lose 12.6 % of suitable areas by 2090.
Mixed cropping (Optimal suitability for at least 3/4 crops)	Mixed cropping is expected to decrease down to 9.2 % of the country by 2090.	Multiple crop production will become more difficult. A decrease down to 8 % of the country by 2090 is expected.

Additionally, mixed farming practices are becoming increasingly challenging, potentially limiting farmers' ability to diversify their crop cultivation (Röhrig et al., 2021). According to the NAP of Burkina Faso, the main impacts associated with climate change include loss of crops and means of production (MEEA, 2024).

Climate change impacts on the energy sector through several critical mechanisms. Rising air temperatures pose a major risk, as they reduce the efficiency of both thermal and solar power generation. Moreover, global warming significantly increases energy demand for cooling buildings, creating pressure that existing energy supplies struggle to meet. Uncertainty about water resource availability, particularly due to increased evapotranspiration, also negatively affects energy production. Additionally, flooding and heavy rainfall can damage equipment and cause shutdowns of energy facilities (MEEA, 2024).

Vulnerability of agriculture and energy sectors to climate change

Climate change exposes the agriculture and energy sectors in Burkina Faso to significant vulnerabilities, intensifying development challenges. Both sectors are currently, and are projected to remain, highly vulnerable to climate hazards, including extreme rainfall, flooding, heatwaves, dry spells, and extreme winds. They are extremely sensitive to drought, flooding, heavy rainfall, and rising temperatures. The vulnerability of the agricultural sector is further exacerbated by the fact that over 80% of the population depends on it, and approximately 70% rely on rain-fed agriculture for their livelihoods (MEEA, 2024).

Despite the efforts made under the previous NAP (2015–2020), the adaptive capacity of the agricultural sector remains limited due to persistent vulnerabilities. Water management remains weak, a critical issue given the sector’s strong dependence on rainfall, l’imited access to climate-resilient agricultural inputs and agricultural financing continues to pose major challenges. In addition, there is a shortage of food intervention reserves and national security stocks (MEEA, 2024).

In the energy sector, adaptive capacity also remains insufficient to ensure resilience and energy supply in the face of climate change, particularly during heat waves. Energy supply continues to fall short of the ever-increasing demand, a situation exacerbated by rising consumption for cooling (air conditioning) as temperatures increase. Energy production is dominated by thermal generation, which relies heavily on imported hydrocarbons. Low-carbon technologies remain underutilized, and the adoption of energy-efficient practices is still limited. Furthermore, national expertise in solar technology is insufficient, and there is weak control over the quality of imported solar equipment (MEEA, 2024).

CONCLUSION AND PERSPECTIVES

Climate change poses a serious and growing challenge to West African countries, including Burkina Faso and Benin, where livelihoods and national development heavily depend on climate-sensitive sectors like agriculture and energy. This study was undertaken to provide the climate profile and analyze national climate policies in Benin and Burkina Faso in order to analyze targeted sectors vulnerabilities and identify strategic gaps and needs in policies that can inform the development of a competitive regional proposal to the Green Climate Fund (GCF).

The analysis of the policy framework confirms that both countries possess ambitious and globally aligned frameworks in the agriculture and energy sectors, consistent with the Paris Agreement and the SDGs at global level, the Agenda 2063 at the continental level, and the ECOWAS Agricultural Policy, the ECOWAS Energy Efficiency Policy and the ECOWAS renewable energy policy regional goals.

Despite this alignment, the transition from policy intent to measurable implementation remains constrained by persistent and interlinked gaps in finance, institutional capacity, data systems, and technology transfer. Addressing these systemic challenges is critical for translating the existing policy ambition into tangible results.

Both countries experience significant changes in rainfall patterns, rising temperatures, and increasing climate extremes. In Burkina Faso, rainfall variability and rising temperatures threaten agricultural productivity and energy security, while in Benin, the intensification of extreme weather events and prolonged dry spells amplify vulnerability in similar sectors. Future climate projections under different emission scenarios indicate continued warming, more frequent heatwaves, and an increase in extreme rainfall events, leading to greater risks of droughts, floods, and energy disruptions. These impacts exacerbate existing socio-economic vulnerabilities, particularly for rural populations reliant on rain-fed agriculture and an energy dominated by thermal generation.

In this regard, the study identifies a non-exhaustive list of fundable interventions that deliver additionality, scalability, and regional coherence with ECOWAS and global priorities.

In the agriculture sector, the following interventions ideas can be considered:

Scaling climate-smart production systems in critical major crops including cereal, and legumes: Address food security and productivity challenges by expanding climate-smart agriculture (CSA) practices—such as water-efficient irrigation, improved seed varieties, and localized extension services—aligned with the ECOWAS Regional Agricultural

Policy (ECOWAP)[2] objective of sustainable agricultural intensification. The intervention should also include gender-responsive capacity building for women farmers in conservation agriculture and seed utilization.

Scaling sustainable livestock and agroforestry innovations: Contribute to non-CO_2 (CH_4) emission reduction and enhanced carbon sequestration through sedentary livestock systems, fodder production, and integrated agroforestry, complementing ECOWAS regional efforts to promote sustainable land and ecosystem management.

Regional R&D and technology transfer for ecological agriculture: Bridge the research and innovation gap by supporting regional agricultural research institutions to develop, test, and disseminate local, climate-resilient technologies such as bio-fertilizers and improved composting methods, advancing the African Union's Science, Technology, and Innovation Strategy for Africa (STISA 2034) and ECOWAS agricultural innovation agenda.

In the energy sector the following interventions ideas can be considered:

Regional grid integration and renewable autonomy: Support large-scale renewable infrastructure development (e.g., 300 MWp in Burkina Faso and 112 MWp in Benin) and enhance interconnection through the West African Power Pool (WAPP), directly contributing to the ECOWAS Renewable Energy Policy & Energy Efficiency Policy goals of 48% renewable electricity penetration by 2030.

Clean cooking and non-CO_2 mitigation facility: Reduce household GHG emissions by scaling up improved cookstoves and modern fuels (LPG, biogas) adoption, in line with ECOWAS's regional clean cooking initiative. Financial instruments such as consumer subsidies and revolving funds can accelerate equitable access.

Sustainable urban mobility and transport decarbonization initiative: Promote low-emission transport systems, including river and lagoon transport, and urban infrastructure improvements to reduce fuel consumption and congestion, supporting ECOWAS's regional transport and energy efficiency objectives.

[2] ECOWAP is a framework adopted in 2005 to improve agriculture, food security, and rural development across the 15 ECOWAS member states. It serves as a regional framework for national policies, developed in alignment with the broader Comprehensive Africa Agriculture Development Program (CAADP) agenda.

REFERENCES

MCVDD, 2022. Plan national d'adaptation aux changements climatiques du Bénin. Ministère du Cadre de Vie et du Développement Durable (MCVDD, République du Bénin.

MEEA, 2024. Plan National d'Adaptation aux Changements Climatiques (PNA) du Burkina Faso (2024-2028). Ministère de l'Environnement, de l'Eau et de l'Assainissement (MEEA).

Röhrig, F., Gloy, N., von Loeben, S., Arumugam, P., Aschenbrenner, P., Baek, H., Bado, I., Chemura, A., Habtemariam, L., Kaufmann, J., Koch, H., Laudien, R., Liersch, S., Lüttringhaus, S., Murken, L., Neya, O., Noleppa, S., Ostberg, S., Santo, S., Schauberger, B., Shukla, R., Tomalka, J., Wesch, S., Wortmann, M. & Gornott, C., (2021). Climate Risk Analysis for Identifying and Weighing Adaptation Strategies for the Agricultural Sector in Burkina Faso. A report prepared by the Potsdam Institute for Climate Impact Research (PIK) in cooperation with the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ), 147 pp. DOI: 10.48485/pik.2022.001.

Sawadogo, W., Neya, T., Semde, I., Korahiré, J. A., Combasséré, A., Traoré, D. E., et al. (2024). Potential impacts of climate change on the sudan-sahel region in West Africa – Insights from Burkina Faso. *Environmental Challenges* 15, 100860. doi: 10.1016/j.envc.2024.100860

Sougué, M., Merz, B., Sogbedji, J. M., and Zougmoré, F. (2023). Extreme Rainfall in Southern Burkina Faso, West Africa: Trends and Links to Atlantic Sea Surface Temperature. *Atmosphere* 14, 284. doi: 10.3390/atmos14020284.

CGIAR

AICCRA

Accelerating Impacts of CGIAR Climate Research for Africa

aiccra.cgiar.org info@cgiar.org CGIARAfrica