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ENDA ENERGIE

UNLOCKING ADAPTATION POTENTIAL:

Insights into Senegal's climate change policies, initiatives and local actions

Acknowledgements and citation

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Acronyms

AAAP	Africa Adaptation Acceleration Programme
ADB	Asian Development Bank
ADD	Association for the Development of Dionewar
AF	Adaptation Fund
AFD	Agence Française de Développement (French Development Agency
AfDB	African Development Bank
AGMV	Great Green Wall Agency
ANACIM	Agence Nationale de l'Aviation Civile et de la Météorologie (National Agency of Civil Aviation and Meteorology)
ANR	Assisted Natural Regeneration
ARD	Regional Development Agency
ASUFOR	Association of Borehole Users
BOAD	Banque Ouest Africaine de Développement (West African Development Bank)
CCAF	Climate Change Fund for Africa
CDM	Clean Development Mechanism
CDP	Communal Development Plans
CDS	Comité de Développement de la Santé (Health Development Committee)
CERER	Centre d'Etudes et de Recherche sur les Energies Renouvelables (Center for Studies and Research on Renewable Energies)
CGIAR	Consultative Group on International Agricultural Research
CIS	Climate Information Services
CNAAS	Caisse Nationale d'Assurance Agricole du Sénégal (National Agricultural Insurance Fund of Senegal)
CNCAS	Caisse Nationale de Crédit Agricole du Sénégal (National Agricultural Credit Fund of Senegal)
CNCR	Conseil National de Concertation des Ruraux (National Rural Dialogue Framework)
COMNACC	Comité National sur les Changements Climatiques (National Climate Change Committee)
COMRECCs	Regional Climate Change Committees
CORAF	Conseils Ouest et Centre Africain pour la Recherche et le Développement Agricoles (West and Central African Council for Agricultural Research)
CRNS	Senegalese National Red Cross

CSA	Climate-Smart Agriculture
CSD	Conference on Sustainable Development
CSE	Centre de Suivi Ecologique (Ecological Monitoring Centre)
CSV	Climate Smart Village
CTCN	Climate Technology Centre and Network
DEEC	Direction de l'Environnement et des Etablissements Classés
DNA	Designated National Authority
DPC	Directorate of Civil Protection
DPPD	Documents de Programmation Pluriannuelle des Dépenses (Multiannual Expenditure Programming Documents)
FAO	Food and Agriculture Organization
GCA	Global Centre on Adaptation
GCF	Green Climate Fund
GEF	Global Environment Facility
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
ICZM	Integrated Coastal Zone Management
IFAD	International Fund for Agricultural Development
INP	National Pedological Institute
IP	Innovation Platform
IPAR	Initiative Prospective Agricole et Rurale (Agricultural and Rural Prospective Initiative)
IPCC	Intergovernmental Panel on Climate Change
IRD	Development Research Institute
ISRA	Senegalese Institute of Agricultural Research
ITCP	Integrated Territorial Climate Plans
LBA	La Banque Agricole (The Agricultural Bank)
LDA	Local Development Agency
LLA	Locally Led Adaptation
LoCAL	Local Climate Adaptive Living Facility
LPSD	Sectoral Development Policy Letters
Lux-Dev	Luxembourg Agency for Development Cooperation
MEFP	Ministère de l'Economie, des Finances et du Plan (Ministry of Economy, Finance and Planning)
MEDD	Ministère de l'Environnement et du Développement Durable (Ministry of Environment and Sustainable Development)
MEDDTE	Ministry of the Environment, Sustainable Development and Ecological Transition
MRV	Monitoring, Reporting, Verifying
MSAS	Ministry of Health and Social Action
NAP	National Adaptation Plan
NAPA	National Action Plan for Adaptation to Climate Change
NDC	Nationally Determined Contribution

NEA	National Accredited Entity
NGO	Non-Governmental Organisation
NOAA	National Oceanic and Atmospheric Administration
PASA	Projet d'Appui à la Sécurité Alimentaire (Food Security Support Project)
PDC	Communal Development Plans
PDD	Departmental Development Plans
PLACC	Plan Local d'Adaptation au Changement Climatique (Local Climate Change Adaptation Plan)
PNDL	Plan National Développement Local (National Local Development Plan)
PNUD	Programme des Nations Unies pour le Développement (United Nations Development Programme)
PROGEP	Projet de Gestion des Eaux Pluviales et d'Adaptation au Changement Climatique (Rainwater Management and Climate Change Adaptation Project)
PROMO-VILLE	Programme de Modernisation des Villes (Urban Modernization Programme)
PSE	Plan Sénégal Emergent (Emerging Senegal Plan)
PUDC	Programme d'Urgence de Développement Communautaire (Emergency Community Development Programme)
REVARD	Reducing Vulnerability and Improving Resilience of Dionewar's Coastal Communities
SDG	Sustainable Development Goals
UCAD	University of Dakar
UGB	Gaston Berger University
UNFCCC	United Nations Framework Convention on Climate Change
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
WACA	West African Coastal Management Programme
WRI	World Resources Institute

Executive summary

Context

This report presents findings of research on climate change adaptation policies, strategies and local actions in Senegal, West Africa. It highlights locally led adaptation (LLA) strategies, practices and lessons that can inform and guide the implementation of the Nationally Determined Contributions (NDCs) and climate actions at the local and national levels.

African countries such as Senegal are implementing their climate change adaptation strategies as part of the NDCs through various climate actions carried out according to the priority sectors defined. Indeed, each priority adaptation sector in Senegal (agriculture, livestock, fisheries, water resources, flooding, coastal erosion, infrastructure, health, biodiversity) has identified national adaptation options that should be implemented locally. Thus, the question is whether endogenous responses to climate challenges at the local level or community adaptation practices were taken into account in the process of developing and implementing the NDCs. To support Senegal in addressing the challenges of NDC implementation and to integrate the needs of communities in terms of LLA, the Africa Policy Research Institute (APRI), in close collaboration with ENDA Energy, conducted research on climate change adaptation policies, strategies and local actions across the country.

Objectives

To effectively contribute to the implementation of climate action in Senegal, the mainstreaming of community-led adaptation requires the removal of barriers, constraints and challenges in terms of the skills, funding and leadership of local governments. It is in this context that the research project 'Climate adaptation, strategies, practices and initiatives: Issues and pathways in Senegal' was initiated by APRI. Its objectives are to understand and document:

- the status, needs and priorities for climate actions in Senegal;
- the adaptation priorities and needs of local communities;
- the policies, strategies, practices and initiatives available at the national and community levels to address adaptation needs;
- the implementation of commitments according to Senegalese stakeholders' priorities for climate action;

- the challenges, barriers, opportunities and entry points to further locally led climate adaptation;
- the potential opportunities and entry points to support and encourage effective and sustained adaptation action for at-risk and vulnerable communities by national international actors.

Approach and methodology

The research project was implemented in Senegal through the establishment of a framework of collaboration and dialogue between in-country-based scientists, policy makers, practitioners and local communities. This co-creation and collaboration with diverse stakeholders helped to analyse the climate governance context, gaps, challenges and knowledge needs on adaptation for a more just and inclusive climate action. It also helped to interrogate the alignment of local knowledge and endogenous adaptation knowledge with the adaptation options of the NDCs and other climate action policies and strategies, and to draw insights on how the national adaptation policies and strategies can benefit from local knowledge, experiences, practices and strategies to support effective and sustained adaptation at the local, national and global levels.

The project implementation was based on the following methods:

- A review and analysis of relevant documents such as the NDC, National Adaptation Plan (NAP), adaptation policies, national and local development policy planning, climate governance and LLA for mapping national climate action initiatives, with a focus on the design and implementation of NDCs through the lens of LLA.
- Consultation of stakeholders at different scales and categories of actors, including two stakeholder consultation and sharing workshops.
- Deep dives focusing on key priority adaptation sectors with i) food security in the climate-smart village of Daga Birame (agriculture sector); ii) the Dionewar Island REVARD project on coastal erosion control (coastal zones sector); iii) the early warning system initiative of Widou Thiéngoly concerning the mitigation of health impacts of heatwaves (health sector); and iv) a qualitative analysis of data and information collected with all the methods applied.

Key findings and main messages

Mapping climate policies, strategies and actions at the national level

The multidimensional impacts of climate change on production systems, living conditions and social well-being require the identification and implementation of adaptation options and actions according to the priority sectors defined in the NDC.

With a view to providing more integrated, effective, efficient and sustainable responses to climate challenges, the State of Senegal has put in place a harmonised framework of actions between the Emerging Senegal Plan (PSE) 2035, the 2030 Agenda Sustainable Development Goals (SDGs) and the NDC 2030. This framework takes adaptation into account in the planning of economic and social development policies, especially through the development and implementation of NAPs for priority sectors such as agriculture, coastal zones and health.

However, the priority sector adaptation options do not yet sufficiently integrate local community-led adaptation practices and strategies. Behind this weak integration of the needs of community-led adaptation lie huge barriers in financing. That climate governance struggles to be decentralised or domesticated at the territorial level is also a significant constraint.

Indeed, the financing needs for climate change adaptation measures associated with the NDC (USD 14.5 billion by 2030) are beyond the reach of the national budget and depend largely on the contribution of technical and financial partners (USD 12.725 billion).[1] Thus, uncertainties in the mobilisation of climate funds compromise not only Senegal's commitments to combat climate change and access to funding for communities to implement local adaptation strategies and practices, but also the climate governance model. The challenge of climate financing emphasises the need to mobilise domestic resources to sustain climate actions in the long term.

In Senegal, a diverse range of actors are engaged in climate actions, including technical agencies and directorates of the government, non-governmental organisations (NGOs), and private sector, academic and other international organisations. These stakeholders are implementing a range of policies, practices and strategies aimed at addressing climate change challenges. Stakeholders increasingly share the view that on-the-ground implementation of adaptation actions at sub-national levels remains inadequate.

Key findings from case studies

Despite limited support from the central government, LLA is a reality in Senegal. It is well aligned with the priorities of the NDC and with other national policies and strategies designed to deal with the impacts of climate change.

Findings from the three case studies in the Daga Birame, Dionewar and Widou Thiéngoly areas on LLA for the NDC priority sectors of agriculture, coastal zones and health show that the impacts of climate change on production systems, livelihoods and social well-being are the main sources of motivation for communities to engage and mobilise for climate action or governance. This awareness and commitment is the basis for successful, effective and sustained adaptation actions.

Locally led adaptation presents clear co-benefits for climate action and sustainable development at both the community and national levels. However, the adaptation practices and strategies developed by the communities have a generally low level of consideration in the actions of the central government in terms of policy development and implementation and related governance. Such a low level of integration, even into local development plans, has been materialised by the obstacles and constraints related to direct access to climate finance, and the strengthening of technical and organisational capacities in the implementation of climate policies at the local level. Additionally, the design and implementation of policies is siloed, with limited local and community stakeholder involvement – another major obstacle to effective and sustained adaptation actions.

The lack of financing coupled with the increasing cost of adaptation to climate change is a significant obstacle to adaptation action at both the national and local levels. This is compounded by a lack of access to available finance and technical and scientific capacity, which limits the contributions and efficiency of local actors, and hence the country's overall climate action. Access to climate finance and technical capacity in the development of climate projects are inextricably linked in that stakeholders must be able to demonstrate climate additionality and accountability to justify the

relevance and soundness of the project. However, local and community stakeholders are often a long way from having this capacity if they do not have the support of state technical services.

The relevant lessons and best practices learned from our three case studies on LLA initiatives in the areas of agriculture, coastal zones and health demonstrate the real capacity of communities to identify and implement key adaptation strategies that can contribute to improving the effectiveness and efficiency of climate action in the country.

Main message of the report

The main results and conclusions of the research conducted on climate action and the implementation of adaptation policies in Senegal lead to several key messages:

- Senegal promotes a sectoral and territorial approach to implement climate action for connecting interventions from the NDC, the PSE for 2035 and the country's SDGs of the 2030 Agenda.
- The country is making appreciable progress in implementing the adaptation policies defined in the NDC, though there are large inequalities in climate resilience interventions between sectors and territories.
- Lessons learned from the case studies highlight the capacities of local communities to identify and implement adaptation strategies and solutions well aligned with the NDC adaptation options and actions with the support of technical services, civil society and NGOs.
- The climate-smart village model of LLA in Daga Birame relies on levers of community mobilisation and participation. These are based on the need to preserve agricultural production systems and income-generating activities that ensure the community's sustainability and commitment to climate action with support from national structures.
- The Dionewar community's model of reactive adaptation to coastal erosion is based on a flexible, nature-based solution with Maltese groins. It is seen by the people as a means of both limiting the advancing sea and preserving production systems and income-generating activities largely dominated by traditional grazing and local tourism.
- Widou Thiéngoly's model of reactive and spontaneous adaptation, based on the establishment of an early warning system for the adverse effects of heatwaves on human health, is considered by the community and local authorities as one of the most effective ways to adapt to the health impacts of rising temperatures.
- Better synergy and links between NDC adaptation options and local community practices and strategies in climate action implementation processes in Senegal are required to i) increase access to the evidence-based knowledge on LLA which informs climate policies, ii) increase access to the local technical capacity and competence which mobilises climate funds, and iii) integrate endogenous adaptation practices in climate policies.

Overall, given the alignment between the adaptation options of the NDC and LLA, action at the community level could be considered an important and relevant driver of climate action in Senegal. However, enhancing the effectiveness of LLA actions and policies, along with implementation

strategies at the national level, requires a series of actions. These encompass gaining a clear understanding of existing strategies and practices, documenting them and ensuring the visibility of local adaptation strategies and practices. It also involves actively considering local opportunities to tackle climate challenges and making sustained efforts to overcome obstacles related to accessing knowledge and information. This includes addressing issues such as existing policies, financial constraints, technical assistance and implementation support.

Report structure

The rest of the report is organised into four sections.

Section 1: an introduction giving a global overview of climate change according to the country context, the adaptation conceptions and the project approach and objectives.

Section 2: mapping the climate action landscape with a focus on NDC priority areas, adaptation policies, local practices, stakeholder mapping and engagement, and financial aspects.

Section 3: case studies documenting the communities' practices on adaptation in the sectors of agriculture, coastal zones and health.

Section 4: a general analysis and discussion focused on the value added by LLA, the alignment and coherence with the NDC, the importance of the project, as well as the gaps, challenges and opportunities.

SECTION ONE

Introduction

Country background and context

Senegal is a country of 196,722 km² located at the western extremity of the African continent. The country is subject to the Sodano-Sahelian climate, which is tropical in the south and semi-desert in the north, with a dry season from November to June and a hot, humid season from June to October. Average annual rainfall follows a decreasing gradient from the south to the north of the country, from 1,200 mm to 300 mm respectively, with varying climatic zones: a humid zone in the south, a wooded savannah in the centre and a semi-desert zone in the north.[2]

Demographic projections estimate Senegal's population at 17.7 million in 2022, compared with 16.2 million in 2019 and 13.5 million in 2013.[3] The intercensal population growth rate, although still high, has remained mostly stable in recent years at a level of 2.7% between 1976 and 1988, and 2.5% over the periods 1988–2002 and 2002–2013, resulting in a doubling of the population every 25 years.[4] The Senegalese population is characterised by its disproportionate youth (one in two Senegalese is under 20 years old) and its predominance in rural areas (53.1% of the total population in 2019). The urban population was estimated at 46.9% in 2019 (7,606,700 urban against 8,602,426 rural).

In 2018/2019, Senegal's poverty rate was estimated at 37.8%[5] with major disparities between areas of residence (urban/rural) and regions of the country (Dakar and the rest of the country). The rural population is more affected by poverty, with more than half (53.6%) known to live below the poverty line. In urban areas it affects two out of ten people (19.8%). Senegal's Human Development Index (HDI) for 2022 was 0.512, which places the country in the 'low human development' category and ranks it 170th out of 188 countries and territories worldwide.[6]

Senegal's economic growth rate decreased from 6.2% in 2018 to 4.4% in 2019 due to the slowdown of activity in the primary (4.5% against 8.1% in 2018), secondary (3.7% against 6.5% in 2018) and tertiary (4.6% against 5.4% in 2018) sectors.[7] The continued dynamism of the primary sector (7.9%), the secondary sector (7.5%) and the tertiary sector (5.3%) in 2018 favoured economic growth despite recorded deceleration that same year.[8]

Indeed, a large part of the Senegalese economy is based on production systems which, once affected by environmental crises, will weaken a country already facing a fragile socio-economic situation. For example, the loss of biodiversity, the reduction of vegetation cover, deforestation, water and wind erosion, salinisation and acidification have led to soil degradation, reducing its suitability for cultivation.

Climate change trends, status and needs in Senegal

Due to its location in the Sahelian zone and in a wide coastal strip, Senegal is among those African countries considered to be highly vulnerable to the impacts of climate change.[9] Exposure to climate risks depends on the variability of key parameters such as rainfall, temperature, sea level and the occurrence of extreme hydrometeorological events that will determine the characteristics of the current and future climate.[10]

From 1965–2013, minimum and maximum temperatures have increased by an average of +1.1 to 1.7°C depending on the ecogeographical zone.[11] Future forecasts indicate an average increase of between +1.2 and 1.8°C by 2035, with major disparities between the centre-west (0.5°C), the north (1.7°C) and the agro-sylvopastoral zone (2 to 3°C). For rainfall, analysis of the Standardised Precipitation Index

(SPI) over the period 1940–2013 shows a 16 mm decline in rainfall across Senegal, even though the last decade has seen a return to wet conditions and greater interannual rainfall variability. Future trends predict a decline in rainfall to an average of 89 mm by 2035, especially in the north, north-west and central regions. Concerning the state of the sea surface, an increase in water temperature of about 0.04˚C to 0.05˚C per year from 1980 to 2009 and a progressive increase in the salinity of the marine waters of the Senegalese coast have been observed.[12] A major part of the Senegalese coast, from Saint-Louis to the Saloum islands, has been experiencing erosion for the past 70 years, materialised by a retreat of an estimated 146 m in the positions of the coastline between 1946 and 2017, an average rate of 2.06 m per year.[13]

Increasing temperature trends and disrupted rainfall patterns, often punctuated by frequent extreme events, are generating increasing climate risks related to the frequency of hazards, impacts and vulnerabilities. These expose and weaken the foundations of the national economy and natural and human capital. In the context of socio-economic poverty and persistently low human development, the high probability of present and future hazards, impacts and vulnerabilities risks attacking the main factors of production contributing to human and social capital in Senegal – that is, unless climate change adaptation solutions are implemented.[14]

The deterioration of the productive bases of the national economy, in particular agriculture, livestock and fisheries, which employ a significant proportion of the working population, especially in rural areas, illustrates the economic challenges of climate change in Senegal. Projections of the economic impacts of climate change made by the Planning Department of the Ministry of the Economy, Finance and Planning (MEFP) show that with an increase of temperatures between 1˚C and 2˚C by 2050, there could be a drop of around 25% in productivity, with severe consequences for economic growth.[15]

The present and projected climate risks make the country highly vulnerable to the impacts of climate change, generating risks for production systems, social sectors and communities. Indeed, the dynamic nature of vulnerability, often influenced by several factors (environmental, socio-economic, political and institutional), makes any action to adapt to climate change complex. Like all countries committed to climate action, in December 2020 Senegal validated its Nationally Determined Contribution (NDC), which includes priority adaptation options set out in the framework of the National Adaptation Plan (NAP), which should provide more integrated, effective, efficient and sustainable responses to climate challenges.[16]

To address the challenges from climate change governance, the government of Senegal launched a development strategy called the Emerging Senegal Plan (PSE) for the period leading up to 2035, which is well aligned with the Sustainable Development Goals (SDGs). This plan integrates the need to consider adaptation in economic and social development policies in order to increase the resilience of the country's production systems to climate change impacts. Moreover, this policy document draws attention to climate risks and stresses the need to consider unconditional commitments in the NDC regarding both mitigation and adaptation to climate change, whilst integrating them into national medium- to long-term budgetary programming.[17]

Climate adaptation, which is largely inspired by the country's economic and social vulnerability to climate impacts, is seen as an important leverage for transformational change in Senegalese society and economy.[18] This conception of adaptation in the climate action process helps to better articulate

climate change issues within the NDC framework, the SDGs of Agenda 2030 and 2063, and the economic and social policies of the 2035 PSE, and prepares current and future actors for inclusive, coherent and effective management of future environmental and climate challenges.

However, the challenges to the political intention and the aspirations of sustainable and resilient adaptation to climate risks are linked to the integration of the climate change dimension in the sectoral and territorial development plans.[19] The difficulty in effectively and successfully integrating climate change into public policies at the national and local levels means that, for a large part of the Senegalese community vulnerable to this phenomenon, adaptation is more reactive than planned.

The obstacles to better taking climate into account are related to the weakness in the technical capacities and limited access to the climate financing of local authorities. Indeed, many of the actors in climate governance do not have access to scientific evidence to demonstrate climate additionality and accountability in production systems and other social sectors, and cannot therefore integrate this evidence into the planning process of development policies at national and local levels. A more holistic view of adaptation in Senegal would consider local adaptation experiences and initiatives led by local governments and communities in climate policies.

These challenges explain why progress is still slow and the need for adaptation also remains enormous, especially for the urgent areas of adaptation such as agriculture, livestock and fisheries, water resources, coastal areas, health and disaster risk reduction – with the emerging issue of loss and damage, infrastructure, biodiversity, cities, and especially the recurrence of climate extremes such as floods. Despite significant progress in adaptation in sectors such as agricultural resilience, the protection of coastal areas vulnerable to erosion in Saint-Louis, Rufisque, Saly, Mbour and Joal Fadhiou, and substantial investment in flood control, the country's national budget remains far below what is required to meet adaptation expectations and needs.

However, despite the lack of indicators to measure and verify achievements, Senegal is making steady progress in implementing its adaptation policies as defined according to a number of priority sectors under the NDC.[20] The fisheries and livestock sectors have already finalised their respective NAPs and stakeholders are developing climate resilience projects to mobilise funding. The agriculture, infrastructure, flooding and health sectors are supported by the NAP-GEF (Global Environment Facility) programme to carry out vulnerability and adaptation studies in five target regions in Senegal (Ziguinchor, Kédougou, Kaffrine, Matam and Saint-Louis), which should lead to national sectoral adaptation plans and a funding mobilisation strategy. As they develop their sectoral NAPs, other sectors such as coastal zones, water resources and biodiversity are being supported by partners and financiers such as the French Development Agency (AFD), Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and the Luxembourg Agency for Development Cooperation (Lux-Dev).

Moreover, there is a wealth of adaptation initiatives in the country in different geographical areas. The most important of these are the ambitious projects financed by the Green Climate Fund on salt land management in the Fatick region with the International Union for Conservation of Nature (IUCN) and the Centre for Ecological Monitoring (CSE), coastal erosion and flood management in Saint-Louis and Dakar with AFD, and the resilience of agricultural production systems in the Ferlo area and the groundnut basin with the Food and Agriculture Organization (FAO), the World Food Programme (WFP) and the United Nations Development Programme (UNDP). Currently, some priority adaptation sectors in Senegal are developing and submitting numerous climate resilience project proposals to

different climate funds with the support of the Designated National Authority (DNA) at the Directorate of the Environment and Classified Establishments (DEEC) and the National Accredited Entity (NEA). Faced with the recurrence and severity of extreme climatic events, Senegal is currently working on a loss and damage mechanism to support its disaster risk management strategy through an assessment of the costs of action and inaction to better prioritise adaptation actions with high impact potential for the country's economic and social development.

Conceptual narratives on climate action and locally led adaptation

Climate change is emerging as a hot topic in Senegal, increasingly featuring in national discussions and political debates. The analysis of the implementation process of climate action and adaptation policies in the country highlights certain gaps and barriers related to: i) poor integration of climate risks in the planning of sectoral development policies; ii) inequalities in access to climate financing between priority adaptation sectors and vulnerable territories; iii) the weakness of technical and scientific capacity to transfer and take ownership of innovative adaptation strategies with a high impact on communities; iv) the low consideration of communities' and local actors' adaptation needs; and v) the lack of a framework to monitor and evaluate performance in climate policy implementation, such as the MRV (Monitoring, Reporting, Verifying) system.

Moreover, although the relevance and the coherence of adaptation strategies are often very clearly demonstrated in the project development or design phase, their effective integration into local development policies is a major challenge both technically and politically. From a technical point of view, the complexity of integration is linked to the fact that climate consideration is reduced to a qualitative aspect that informs central decision-makers rather than a quantitative assessment of possible effects on development policies at the local level. These gaps highlight the need for a different, bottom-up approach that allows the adaptation needs (climate actions) of the most vulnerable local communities to be adequately integrated into the planning and implementation processes of local development plans, and to align these needs with Decentralisation Act III, which enshrines the territorialisation of public policies. This requires a shift from the status quo of top-down approaches towards a new model where local actors have more power and resources to adapt to climate change impacts.[21]

This approach to climate action implementation requires the integration of locally led adaptation (LLA) which can enable national, regional and local governments to provide climate planning and improved institutional capacity. LLA is the process by which individuals, communities, networks, organisations, private entities and governments set their own agendas. It also enables them to develop solutions to climate change adaptation and provides the capacity, leadership and resources to make these solutions a reality.[22]

Experiences in adaptation with local actors and indigenous communities show that in most cases local stakeholders lack the financial resources and technical capacity to implement the various components of locally driven adaptation activities.[23] These barriers challenge the coherence between top-down adaptation strategies and local adaptation needs and development plans. For example, the process of planning and implementing priority adaptation options contained in the NDC and NAP does not clearly define a framework for integrating a locally led approach to adaptation, even though the guidance recommends considering local and endogenous knowledge and practices developed by communities in adapting to climate change. Indeed, success in planning and implementing adaptation depends on the active participation of local actors.

However, guidelines and frameworks for considering local and endogenous knowledge and best practices in adaptation into national climate change policy development and implementation are not widely available for stakeholders. This further underscores the need for more research in local practices to identify gaps and opportunities in current climate action strategies, initiatives and practices to support and enhance effective and sustainable adaptation efforts. A more holistic view of adaptation in Senegal would help to take into account local adaptation experiences and initiatives led by local governments and communities in climate policies. Thus, it is necessary to analyse the climate action landscape to identify the challenges, progress, needs and opportunities of the key NDC adaptation options priorities, national climate change policies, local climate policies and strategies, stakeholder engagement and financing aspects, among others.

Research is therefore needed to better understand the challenges and opportunities for advancing climate solutions focused on country-specific priorities that are consistent with endogenous adaptation practices and the needs and priorities of local communities. Moreover, research is needed to collect and analyse information that can illustrate the potential for the development and implementation of climate adaptation through LLA. Such knowledge would inform and support the efforts of policy makers in Senegal to balance climate action with the goals of job creation and sustainable economic development. In addition, it would support national, local and international decision-makers and partners in designing and implementing effective, long-term strategies to address the dual challenges of climate change and sustainable development in Senegal, without detriment to the policy space or the ongoing adaptation efforts of local communities.

Aims and objectives of the project

With the support and close collaboration of ENDA Energy, the Africa Policy Research Institute (APRI) implemented the research project 'Climate Adaptation, Strategies, Practices and Initiatives: Issues and Pathways in Senegal', integrating LLA in climate action and adaptation policies. The aim is to examine the progress and gaps in the implementation of strategies (e.g. NDC, SDGs, PSE, Act III of decentralisation), to deepen LLA in Senegal and to better understand the challenges and opportunities advancing climate solutions that are focused on country-specific priorities and needs and are consistent with endogenous adaptation practices.

The specific objectives are:

- explore and identify the key narratives and policy coherence around LLA in Senegal and other country priorities;
- identify enablers and opportunities for successful local adaptation in Senegal;
- examine barriers for successful LLA in climate action governance;
- draw lessons and make recommendations for advancing local adaptation as a key component of Senegal's NDCs.

Project approach and methodology

The research project is designed as a qualitative study focusing on the design and implementation of NDCs through LLA initiatives. It takes stock of the implementation of commitments according to Senegalese stakeholders' priorities for climate action, as well as existing barriers and opportunities related to locally driven adaptation initiatives through four main strategies (Figure 1).

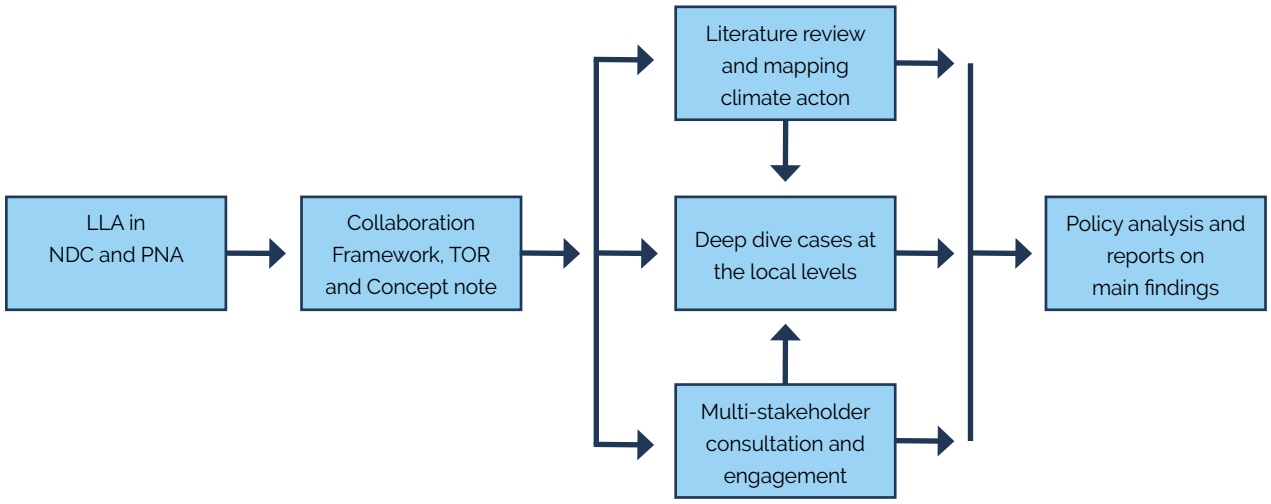
First, an extensive review of the literature and relevant climate change documents on NDCs, NAP, adaptation policies, national and local development policy planning, climate governance and LLA was carried out to understand the state of knowledge on climate change adaptation in the country. The literature review was also conducted to understand the main stakeholders and their responsibilities or mandate concerning climate actions, and to map national initiatives and strategies in Senegal.

Second, Senegal's NDCs were mapped, as were other national policies, strategies and initiatives, including the assessment of adaptation coverage and the consistency of local adaptation policies with the country's needs, priorities and international development goals and commitments. The state of financing and the stakeholders involved in the adaptation action space were also mapped.

Third, stakeholders at different scales and categories of actors (National Climate Change Committee [COMNACC], academic institutions, technical supporting services, non-governmental agencies, civil society and community representatives, private sector) were consulted in order to map policies, strategies and stakeholders. This was achieved by using an interview guide that allowed for the collection of information on the state of climate action, gaps, shortcomings and needs of actors for a better integration of LLA into climate policies at the national and local levels. The first consultation workshop, attended by a range of actors, was an opportunity to share the objectives, approach, activities and expected results and outcomes of the research project. The second stakeholders' workshop presented the main preliminary results and findings from these deep dives. This made it possible to share and obtain participants' feedback and input on the elements, priorities and potential challenges of promoting LLA as a part of Senegal's NDCs.

Finally, according to key priority adaptation sectors, deep dives were conducted into three case studies on local adaptation actions: i) food security in the climate-smart village of Daga Birame (agriculture sector), ii) coastal erosion control in the REVARD project of Dionewar Island (coastal zones sector), and iii) mitigation of the health impacts of heatwaves through the early warning system initiative of Widou Thiéngoly (health sector). These deep dives led to the collection of primary data through field observations, focus groups and interviews with relevant stakeholders. The broader aim of the case studies was to generate lessons on the enablers and barriers to climate change adaptation actions and provide insights into the ways in which the implementation of the NDCs through LLA can influence livelihoods within the host and surrounding communities.

Figure 1: Overview of research approach



Source: Author's construct (2023)

Strengths and limitations of the report

This report presents results on:

- the status of climate action in Senegal, including the main challenges, needs and opportunities in relation to climate governance;
- the degree to which the three case studies demonstrate the capacity and preparedness of communities to carry out adaptation actions themselves if they are well supported;
- the relevance and value of integrating LLA into the implementation of the priority options of the NDC;
- the obstacles to and opportunities presented by locally driven adaptation processes for local, national and global climate action.

The collection of knowledge and information helps to better understand the current status, challenges and opportunities for the development and implementation of LLA strategies. The knowledge generated will inform and support the efforts of countries such as Senegal to balance climate action with the goals of economic development and job creation and sustainable economic development. The knowledge will ultimately improve policy coherence and the mainstreaming of climate action, including adaptation initiatives and livelihood opportunities such as job creation and the creation of value-added goods and services linked to adaptation needs and endogenous strategies. However, the results would have benefited from prior research on best adaptation practices in Senegal. Time limitations and the sole use of qualitative research approaches made it difficult to incorporate some of the findings into this report.

SECTION TWO

Mapping the climate action landscape

Introduction

This section provides the results of mapping key policies, strategies, frameworks and climate actions around climate change adaptation in Senegal. African countries such as Senegal are implementing their climate change adaptation strategies as part of their NDCs through various climate actions carried out according to defined priority sectors. Indeed, each priority adaptation sector in Senegal (agriculture, livestock, fisheries, water resources, flooding, coastal erosion, infrastructure, health, biodiversity) has identified national adaptation options that should be implemented locally. Thus, the question is whether endogenous responses to climate challenges at the local level or community adaptation practices were taken into account in the process of developing and implementing the NDCs. To address this question, an extensive mapping of national policies was carried out with a focus on:

- NDCs, including the provision and implementation of adaptation measures within the NDCs and the consistency or inconsistency of local adaptation policies with the country's needs, priorities and international development goals and commitments.
- National policies, strategies, initiatives and actions on: climate change; local climate actions, strategies and practices; climate finance flows; and various stakeholders involved with climate change adaptation actions. Mapping the climate action landscape proved valuable for several reasons.
- Stakeholders involved in LLA implementation at different levels.
- Climate financing access in implementing LLA strategies.
- The key objective of this exercise included mapping policies, strategies and stakeholders to identify challenges and opportunities for LLA implementation.

Methodology

The methodology for mapping the climate action landscape is built on:

- Reviewing and analysing relevant documents on NDC, NAP-GEF (Global Environment Facility), Green Climate Fund (GCF) country programme, National Action Plan for Adaptation to Climate Change (NAPA), national communications, etc., provided by the Ministry of the Environment, Sustainable Development and Ecological Transition (MEDDTE), national and local development policy planning from the Ministry of Economy and Planning, adaptation policies, climate governance, LLA; and supporting development agencies such as UNDP, United States Agency for International Development (USAID), AFD, GIZ and national institutions (CSE, National Agency for Civil Aviation and Meteorology [ANACIM], universities, Senegalese Institute of Agricultural Research [ISRA], ENDA Energy, Agricultural and Rural Foresight Initiative [IPAR], Directorate of Water Resources Management and Planning [DGPRE]).
- Consulting key informants at different scales and categories of actors of climate governance (COMNACC, DEEC, NDC sectors, civil society, NGOs, local communities) using an interview guide that allowed for the collection of information on the state of climate action, gaps, shortcomings and needs of actors, and thus for a better integration of LLA into climate policies at the national and territorial level.

- Holding consultation and sharing workshops on the project process in Senegal.
- Qualitatively analysing data and information collected, with identification of key messages.

The country adaptation NDC options and actions

The government of Senegal aims to improve the performance and effectiveness of economic and social development policies within the PSE for 2035, the SDGs of the 2030 Agenda and the NDC. To this end, the government has formed a strategic plan which integrates the need to consider adaptation in the planning of economic and social development policies in order to increase the resilience of the country's production systems to the impacts of climate change. As underscored in the NDC, Senegal is progressing towards a sectoral and territorial approach to climate action.

The NDC includes priority adaptation options that are developed within the framework of NAPs. The development and implementation of NAPs for priority vulnerable sectors should provide more integrated, effective, efficient and sustainable responses to climate challenges.[24] The NDC is part of the country's development strategy (the PSE for the period 2014–2035) and presents both unconditional objectives (4% reduction in emissions by 2025 and 5% by 2030, and adaptation policies for eight of the most vulnerable target sectors, including agriculture, livestock, fisheries, health, water resources, social sector and floods, biodiversity and the coastal zone, and conditional objectives (11% reduction in emissions by 2025 and 16% by 2030).

Table 1 summarises the targeted adaptation measures according to the priority sectors defined by Senegal.

Table 1: Targeted adaptation measures according to the defined priority sectors

Sector	Priority adaptation measures
Agriculture	• Sustainable land management • Use of adapted and short-cycle varieties • Building resilience to food and nutrition insecurity/diversification • Water management (promotion of local irrigation) • Promotion and use of climate information • Climate-related risk and disaster management • Agricultural insurance
Livestock	• Sustainable management of pastoral resources • Strengthening the production, dissemination and use of weather information for livestock farmers • Promotion of pastoral and livestock insurance • Improving animal health and productivity • Development of pastoral units • Genetic improvement of animal species
Fishing	• Sustainable management of fisheries resources and restoration of marine habitats • Improving management effectiveness and expanding marine protected areas and marine parks • Promotion of sustainable aquaculture development • Improving the safety of fishing communities and fisheries-related infrastructure

Sector	Priority adaptation measures
Coastal areas	• Integrated coastal zone management • Protection and management of risk areas and restoration of coastal ecosystems
Water resources	• Control of the resource • Seawater desalination • Water transfer • Integrated water resources management
Biodiversity	• Strengthening the knowledge base on biodiversity and climate change • Strengthening ecosystem resilience
Health	• Strengthening integrated epidemiological surveillance • Prevention and control of climate-sensitive diseases in climate-risk areas • Vector control
Social sector/floods	• Spatial planning • Urban restructuring and rehousing • Strengthening sanitation infrastructure and stormwater drainage systems in cities • Urban ecosystem planning integrating watersheds

Source: Author (2023)

The sectors identified as priorities in the NDC framework are currently preparing their NAPs. These will be implemented according to a programme and project approach requiring the mobilisation of skills and funding. The State of Senegal is progressing towards a sectoral and territorial approach to climate action by implementing a process of revision of the main development policy documents, notably the Sectoral Development Policy Letters (LPSD), the Multiannual Expenditure Programming Documents (DPPD), the Sectoral Strategic Development Plans (PSD) and other major state projects to integrate climate change into the planning and implementation of actions to be undertaken.

According to the main target sectors (agriculture and livestock, coastal zones, biodiversity, water resources, health, floods, fisheries, habitat, infrastructures), parts of the adaptation policies in Senegal are often included in the NDC framework. This also includes implementation of interventions concerning territories considered vulnerable to the impacts of climate change. Policies are therefore also implemented at the regional and departmental levels with the support of deconcentrated technical services, regional climate change committees (COMRECCs), local civil society and grassroots community organisations.[25]

Overall, the effective and sustained implementation of the updated NDC published in 2020 will require the government to master:

- The cross-cutting impact of climate change on key sectors of the national economy. This requires the adoption of multi- and intersectoral approaches to strengthen consultation between actors and facilitate the establishment of a harmonised framework for future interventions and actions.

- Adaptation initiatives undertaken and implemented at the national level. These generally provide responses to emergency situations by enabling the NAP to integrate a short-, medium- and long-term planning approach into Senegal's future initiatives. Proper implementation at the

community level requires the strengthening of technical, technological and human resources.

- Raising awareness of the effects of climate change among political actors and vulnerable communities by adopting a 'citizen' and 'decision-maker' oriented communication strategy.

- The reality that climate change and its impacts are a continuous process. This will require the definition of needs and priorities, as well as a long-term strategy that addresses the issue of loss and damage, adaptation, resilience building and mitigation strategies at the local and national levels.

National policies, strategies, initiatives and actions

Climate action is the result of a 40-year-long process of building adaptation policies. Along the way, there have been successes and failures with many lessons learned. Adaptation initiatives follow three main trends that correspond to the three-phase sequence described above: i) the commitment of the Senegalese state to the fight against desertification (1972–1992) and setting up instruments that were later rethought and mobilised to meet the needs of adaptation to climate change; ii) the predominance of environmental preservation issues (1992–2006) for which some adaptation instruments were designed and promoted by international donors;[26] and iii) the multiplication of adaptation initiatives to climate change (2006–2019), facilitated by the provision of technical and scientific support and specific funds for the cause.

At the end of the third period, there is a clearer focus on adaptation action, with projects explicitly naming strategies for adaptation to climate change. Various plans and documents in the process of being drafted were mentioned by the actors during the interviews, notably a NAP which should be published in August 2023. This suggests a fourth phase in the evolution of climate change initiatives in Senegal.[27]

However, long before the scientific and political use of the adaptation notion to climate change, the Sahelian populations had already spontaneously adapted to climate change. Confronted with climate change from 1972 to 1992, their adaptations were informal. Nevertheless, they laid solid foundations in the fight against desertification. The issue of climate change was first tackled in Senegal in the 1970s as part of the fight against desertification in the Sahel.[28]

The establishment of the United Nations Framework Convention on Climate Change (UNFCCC) at the 1992 Rio World Summit put the issue of adaptation on the political agenda in Senegal from 1992 to 2006, but gave little visibility to climate change issues.[29] Adaptation will be indirectly addressed when dealing with environmental issues.

Senegal's adoption of the NAPA in 2006 marked a turning point and an increase in the importance of climate issues. This climate action planning document marks the first national orientation provided exclusively for adaptation.[30] Between 2006 and 2019, there was an acceleration in the consideration of adaptation in the territory by state and development actors through various climate resilience projects and programmes. Currently, climate action is more precisely framed by the NDC and the ongoing development of the NAP, which is broken down according to priority sectors.[31]

This national dynamism is in line with the consideration of climate change issues at the international level: international funds dedicated to the climate cause, recommendations from conferences of the parties and commitment from developed countries and international agencies for technical

support to least developed countries. Senegal's commitment to adaptation thus seems to be mainly motivated by international actors and the recommendations of multilateral organisations.

In addition to the NDC, the government of Senegal has elaborated a development strategy called the PSE for the period up to 2035. This is well articulated with the SDGs of the 2030 Agenda and the NDC.[32] This plan integrates the need to consider adaptation in the planning of economic and social development policies in order to increase the resilience of the country's production systems to climate change impacts. Moreover, this policy document draws attention to climate risks and points out the need to consider the unconditional commitments provided for in the NDC regarding both mitigation and adaptation to climate change, and to integrate them into national medium- and long-term budgetary programming.[33]

Under the direction of the National Policy Studies and Planning Unit within the Ministry of the Economy, Planning and International Cooperation (MEPCI), and with the support of DEEC, the NAP-GEF project is facilitating the revision of key economic and social development planning documents. These include LPSD, DPPD, Communal Development Plans (PDCs) and Departmental Development Plans (PDDs). The objective is to incorporate the climate change dimension effectively, ensuring a coherent and aligned approach to adaptation options and their integration with sustainable development objectives and economic and social development policies.[34]

Thus, by facilitating the integration of climate change into strategic levels of development planning, the development and implementation of NAPs for priority vulnerable sectors should provide more integrated, effective, efficient and sustainable responses to climate challenges in the context of the operationalisation of the PSE by 2035. Indeed, to better take into account the risks linked to climate in the different interventions, the harmonious and successful integration of climate change into sectoral development policies through the NAPs will support the operationalisation of the PSE, which relies on six leverages of growth: i) agriculture, livestock, fisheries and aquaculture, agri-food; ii) social and solidarity economy; iii) social housing and the construction ecosystem; iv) the logistical and industrial hub; v) the multi-services and tourism hub; and vi) mining and fertilisers.

Local actions, strategies and practices

In addition to the adaptation policies implemented at the national level, communities, with the support of technical services, civil society and NGOs have developed several strategies, initiatives and practices to adapt to the impacts of climate change. Since the advent of Act III of decentralisation, which seeks to promote the territorialisation of policies, the State of Senegal has resolutely moved towards a territorial approach to climate change. It has achieved this with the support of the National Spatial Planning Agency (ANAT), the Local Development Agency (LDA) and the National Local Development Plan (PNDL) as well as technical and financial partners such as UNDP, USAID, GIZ and AFD.

The results of the documentary research show that there are a number of LLA strategies in Senegal that concern the production sectors of people's livelihoods, such as agriculture, livestock, fishing, coastal zones and tourism. However, it must be emphasised that these do not necessarily respond to the principles of LLA. These production sectors, which employ a large part of the active population, are the first to be affected by the impacts of climate change. These communities, which invented solutions for adapting to climate risks even before the intervention of state authorities, are therefore mobilised very early on. Indeed, some examples of climate actions at the local level can be placed in the register of LLA strategies:

Integrated Territorial Climate Plans (ITCP) of the Territory Approach to Climate Change (TACC) programme: This initiative was supported by the UNDP, the LDA and the PNDL, as well as other technical and financial partners (Agronomists and Veterinarians without Borders (AVSF), the CSE, the Drylands Pastoral Pole (DPP), the Cheikh Anta Diop University of Dakar (UCAD), the French Committee for International Solidarity (CFSI), and the Rhone-Alpes Region). The TACC programme led to the development of ITCP for Dakar, Fatick and the Ferlo in 2012, with climate change adaptation measures identified with the participation of local stakeholders, deconcentrated technical services, grassroots communities and civil society organisations. However, the adaptation strategy planned at the local level using a top-down approach has not yet been effectively implemented due to the lack of financial resources, skills and capacities of local actors.

Local Climate Change Adaptation Plans (PLACC): Various sustainable development or climate resilience projects and programmes have been supported by agencies such as USAID, the African Development Bank (AfDB), the West African Development Bank (BOAD), FAO, the Adaptation Fund (AF) and GCF. Through these, the CSE has provided technical support to key production sectors such as agriculture, livestock and fisheries to develop local climate change adaptation plans (PLACC) with the participation of technical services, local elected officials, communities of practice and local populations in coastal and agropastoral areas of national interest.[35] However, these top-down adaptation plans are rarely implemented due to a number of barriers, including the insufficient financial resources, skills and capacities of local actors.

Initiatives driven by research institutions and civil society organisations: Research institutions such as the Consultative Group on International Agricultural Research (CGIAR) through the Platform on Climate Change, Agriculture and Food Security (CCAFS) and civil society organisations such as ENDA Energy, IED Africa (Innovation, Development (IED Afrique) and IPAR have also carried out agropastoral adaptation initiatives at the local level. They have focused on capacity building in partnership with local communities, especially in the groundnut basin and Ferlo area.[36] Though adaptation strategies have been identified through a process of consultations with local stakeholders, the planning and implementation of planned activities have not been the work of local actors or communities.

CECI-supported co-production of adaptation strategies: The Centre for International Studies and Cooperation has been implementing a project called 'Women, Agriculture, Resilience' since 2020. A major component of this project is the identification and implementation of technically, socially and economically acceptable and sustainable adaptation measures for agricultural producer organisations in the regions of Tambacounda, Kolda and Sédhiou.[37] With a participatory and inclusive approach carried out with producer actors, this process resulted in the identification, prioritisation and cost-benefit analysis of a number of adaptation measures recommended to ensure the resilience of production systems. However, the concrete implementation of the local adaptation strategies prioritised with the producers' organisations requires a strategy for mobilising funding, which is currently beyond the reach of these local actors.

Disparate initiatives documented by field research: Many technical reports and scientific works have reported on a range of adaptation strategies invented by local populations in the agropastoral area of the Ferlo,[38] the groundnut basin[39] and the Upper Casamance.[40] These spontaneous, locally developed strategies are often considered good responses to the impacts of climate change: they are endogenous and function outside of any financial support or capacity-building processes.

All the local adaptation initiatives identified so far are based on a top-down adaptation design dynamic. This is often imposed on local communities, who then find themselves obliged to domesticate or contextualise the initiative, making it very difficult today to have a clear view of locally driven adaptation actions.

Climate finance flows

The financing needs for climate change adaptation measures associated with Senegal's NDC are USD 13 billion – USD 8.7 billion for mitigation and USD 4.3 billion for adaptation.[41] Of this overall cost, USD 1.4 billion has been included in the national budget and USD 2.9 billion is expected from the contribution of technical and financial partners for the effective implementation of policies to combat the impacts of climate change.

Climate financing in Senegal is provided by several sources including the state budget, and multilateral, bilateral and private sectors. In terms of multilateral funding, the Global Environment Facility (GEF) is the largest provider of grants to Senegal.[42] Out of a total of 94 projects (national and regional) approved for Senegal by the Global Environment Fund since the GEF first phase, USD 473.04 million in grants has been awarded. Several other multilateral actors, including UNDP, World Bank, AfDB, European Union, the International Fund for Agricultural Development (IFAD) and FAO also support the sector.[43] Until recently, bilateral assistance was mainly provided by the Netherlands. As of 2016, the Netherlands withdrew from the environment sector to cover other areas of concentration. However, some countries remain active in the sector, such as Luxembourg, France, Japan, the United States and Germany.

Moreover, as part of the implementation of the Priority Action Plan of the PSE 2014–2018, several sectors' finances take adaptation and climate action into account: the agriculture sector with USD 412.5 million to support family farming, the water and sanitation sector with USD 386.4 million, disaster risk management with USD 61.3 million for the climate resilience project, and the rainwater management and climate change adaptation project (PROGEP) with USD 72.9 million.[44] In addition to this funding for adaptation activities, index-based agricultural insurance developed by the National Agricultural Insurance Fund of Senegal (CNAAS), the National Agricultural Credit Fund of Senegal (CNCAS) and the Universal Health Coverage (CSU) in the health sector (USD 72 million) contribute to the resilience of communities against the negative impacts of climate change. Private finance is still quite marginal compared to the country's needs and potential. Efforts are under way to accredit national private entities to the GCF and accelerate the process of private sector involvement in the mobilisation of climate finance. In addition, there is the emergence of Corporate Social Responsibility (CSR) in the climate space.

In the process of implementing climate change adaptation policies, access to finance faces challenges and barriers that reduce the effectiveness and efficiency of climate governance in Senegal. Although the Senegalese government is committed to adapting to climate change at the national and international levels, it has not made it a priority due to the very limited financial resources available for this cause. Indeed, climate change is the eleventh and final budget of the 2014–2035 PSE, which is intended to be the main orientation and investment framework for all sectors of the national economy. The environment sector, which includes sustainable development and the climate change adaptation mainstreaming project, has the smallest budget with 36.4 billion CFA franc (USD 57 million) in 2018.

Resource constraints are also an issue for Senegal's lead agency, the DEEC. "Over the last ten years, the budget dedicated to the management of environmental issues, including climate change, has been significantly reduced […] Continuous budgetary fluctuations are an obstacle to the smooth implementation of the climate adaptation options in the country."[45]

In view of the low level of resources mobilised by Senegal in relation to the country's climate adaptation needs, a paradigm shift in the mode of mobilisation, allocation and use of resources is necessary in order to bring about in-depth transformations in the financing of the sector. To achieve this, three orientations are recommended: i) strengthening the institutional mechanism and coherence in programming; ii) improving the level of domestic resources dedicated to the environment sector; and iii) mobilising private financing through public funds.

In taking advantage of the funding opportunities that exist around the world, Senegal is advanced in some areas of climate finance preparedness, while others still need work. Senegal has two national entities (Centre de Suivi Écologique and La Banque Agricole) accredited to the GCF, and is involved in 12 approved projects with a total budget of USD 160 million.[46] Work is under way to accredit additional entities, including the Priority Investments Guarantee Fund (FONGIP) and the Strategic Investments Fund (FONSIS). Pilot projects are also in the works to increase access to climate finance by local governments.[47] Greater access should assist Senegal in implementing its climate objectives and achieving its conditional NDC target.

However, it should be noted that local authorities and communities that could develop strategies to adapt to the impacts of climate change do not have access to these sources of climate finance. This is due to a lack of capacity to mobilise funds or organise themselves to propose fundable or grantable projects. The climate financing mechanism in Senegal remains very uncertain. As a result, the achievement of the objectives set for adaptation risks being compromised if the actors involved in climate governance do not manage to mobilise the necessary funds for the implementation of the interventions planned in the NDC framework.[48] To address this issue, the PNDL and the CSE are currently working on capacity building in climate finance and climate risk management for local authorities to support the process of implementing locally driven adaptation with the involvement of vulnerable and marginalised communities. The aim is to help better integrate climate change adaptation issues into the local planning process and to build local institutional capacity for project development that facilitates access to climate finance and the inclusion of community-developed adaptation technologies.

Stakeholder mapping and engagement

The analysis of the adaptation sector in Senegal shows that a diversity of stakeholders with different areas of expertise are involved in climate action. The mapping of these different actors can be divided into seven categories of stakeholders.

National strategic authorities of climate action and adaptation policies implementation. These consist of the DEEC, under the supervision of the Ministry of Environment and Sustainable Development (MEDD), and are a focal point for the UNFCCC and COMNACC, which was created in 2003 as a framework federating all actors involved in climate change issues (administrative, technical services, private sector, NGOs, civil society, research structures, universities, technical and financial partners, local authorities). This category of stakeholders coordinates planning and implementation and monitors the climate change policies and programmes at the highest level.

Priority adaptation sectors leading the sectorial NAP, composed of the sectorial ministries, directorates, technical divisions, agencies, programmes and projects implementing and coordinating climate adaptation policies for priority sectors declined in the NDC and NAP

National technical support organisations composed of ANACIM, CSE and IPAR giving support on knowledge management, climate data and services access, capacity-building training, project development and funds mobilisation.

Academic and research institutions composed of national universities, ISRA, the National Pedological Institute (INP), the Centre for Studies and Research on Renewable Energies (CERER), the West and Central African Council for Agricultural Research (CORAF), Climate Analytics, and the Development Research Institute (IRD) supporting the move from science development to science implementation (i.e. science into action) while addressing impacts of climate change research questions and capacity building for vulnerable communities and priority sectors for climate action.

International agencies and technical and financial partners supporting climate action and adaptation policies. These are composed of multilateral development banks (World Bank Group, AfDB, Islamic Development Bank, BOAD), climate change facilities (GEF, GCF, AF, African Climate Change Fund) and bilateral agencies and partners (United Nations Development Program (PNUD), FAO, USAID, AFD, GIZ, Lux-Dev) supporting resource mobilisation, capacity development and technology development and transfer for current and future adaptation actions.

Civil society organisations and the private sector facilitating climate adaptation implementation. These are composed of ENDA Energy and the National Rural Dialogue Framework (CNCR) developing actions in social mobilisation and the organisation of actors on climate action. These organisations engage people in planning, advocacy, education and awareness raising at the local level. The Agricultural Bank (LBA), CNAAS and the national civil engineering companies contribute from the private sector.

Local governments and actors supporting field climate adaptation implementation. These are composed of councils or assemblies of territory collectivities, COMRECC, the LDA, the Regional Development Agency (ARD) and the PNDL, all of whom are involved in the planning and implementation of several climate change policies, programmes and projects at local and community levels.

Figure 2: National climate action stakeholder mapping and organization in Senegal

Academic and Research Institutions:

Institut Sénégalais de Recherche Agricole (ISRA)

Institut National Pédagogique (INP)

Centre d'Etudes et de Recherches sur les Energies Renouvelables (CERER)

Conseil ouest et centre africain pour la recherche et le développement agricoles (CORAF)

Institut de Recherche pour le Développement (IRD)

National Technical Support Organizations:

Agence Nationale de l'Aviation Civile et de la Météorologie (ANACIM)

Centre de Suivi Ecologique (CSE)

Institut pour la Prospective Agricole et Rurale (IPAR)

Civil Society Organizations and private sectors:

Environnement et Développement du Tiers Monde (ENDA)

Conseil National de Concertation des Ruraux (CNCR)

La Banque Agricole (LBA)

Ciasse Nationale d'Assurance Agricole du Sénégal (CNAAS)

Territories Collectivities, Regional Climate Change Committee

Agence de Développement Local (ADL)

Agence Régionale de Développement (ARD)

Plan National de Développement Local (PNDL)

Technical and financial partners

African Development Bank (AfDB)

World Bank Group (WB)

Banque Ouest Africaine de Développement (BOAD)

Islamic Development Bank (IDB)

Green Climate Fund (GCF)

Adaptation Fund (AF)

Global Climate Fund (GEF)

Programme des Nations Unies pour le Développement (PNUD)

Food and Agriculture Organization (FAO)

United States Agency for International Development (USAID)

Agence Française de Développement (AFD)

Agence Allemande de Coopération Internationale (GIZ)

Source: Author

All actors (state, civil society, development partners, private sector) have mobilised to develop strategies to address climate change from the national to the local level. The national framework for the implementation of climate and adaptation policies is the UNFCCC. This requires the establishment of an institutional framework that allows for synergy with other Multilateral Environmental Agreements (MEAs) that have an impact on climate.[49]

Thus, the institutional framework for monitoring the commitments made under the UNFCCC guidelines is essentially composed of:

- **The DEEC**, under the supervision of the MEDD. This is the focal point for the UNFCCC and GEF. In addition, the DEEC acts as the DNA for the Clean Development Mechanism (CDM), the AF and GCF.

- **COMNACC**, created by ministerial decree No. 1220 of 7 March 2003 and instituted by decree No. 2011-1689 of 3 October 2011. This is a framework federating all actors involved in climate change issues (administrative technical services, private sector, NGOs, civil society, research structures, universities, technical and financial partners, local authorities). The committee plays an essential role in providing scientific and technical advice, training, raising awareness, monitoring and coordinating activities carried out in the framework of the implementation of the convention. At the deconcentrated level, it has set up COMRECCs to better adapt its policies and actions to the regions.

- **The National Commission of Sustainable Development (CNDD)**, coordinated by the DECC, is responsible for developing a national, sustainable development strategy and action plan and reporting to the United Nations Conference on Sustainable Development (CSD) on progress in implementing Agenda 21 of the programme and the Johannesburg Plan of Implementation.

- **ANACIM**, focal point of the Intergovernmental Panel on Climate Change (IPCC). ANACIM has contributed significantly to work on climate projections in Senegal.

- **CSE**, which has been accredited as a National Entity for the Implementation of the AF. As such, the CSE supports the formulation and submission of project and programme documents targeting the resources of this Fund. The CSE is also NEA for the GCF.

- **CERER**, which acts as the designated national authority for the UNFCCC technology transfer mechanism, and plays a key role in the mastery, development and dissemination of clean and climate-adapted technologies.

- **ENDA Energy**, a member of the Consortium and Knowledge Partner in the Climate Technology Centre and Network (CTCN). The CTCN promotes the accelerated transfer of environmentally sound technologies for low-carbon and climate-resilient development. ENDA Energy is also an observer at the GCF and coordinates the preparation programme for civil society access to the GCF.

- **The multidisciplinary technical working groups (MTWGs)**: The planning, implementation and coordination of climate action and adaptation policies in Senegal use a cross-sectoral policy approach to ensure a robust and efficient output. This approach is also anticipated to generate the buy-in needed for effective implementation of climate adaptation policies according to NDC and NAP priority sectors. Each priority sector (agriculture, water resources, livestock, fisheries, health, coastal zones, infrastructure, biodiversity) establishes one technical working group or cross-sectoral planning group (CSPGs) with representatives from government and academia

ensuring the coordination of the development and implementation of climate resilience projects and programmes.[50]

Analysis and summary of key findings

The mapping of the climate action landscape in Senegal has revealed that the country has made suitable progress in formulating various policies, strategies and frameworks to guide climate change actions. Senegal has a range of climate change policies and strategies in place, including the NAP and the NDC which provide a framework for climate action and clarity on the priority sectors, adaptation measures and actions that would enable the country to strengthen the resilience and adaptative capacity of the sections of the population that are most vulnerable to climate change.

The stakeholder mapping further revealed a diverse range of actors engaged in climate actions in Senegal, including government agencies, NGOs, the private sector, academic institutions and international organisations. These stakeholders are implementing a range of policies, practices and strategies aimed at addressing climate change challenges at national and local levels. The national climate governance model is characterised by an ecosystem of diverse actors with different needs, priorities and approaches in the planning, implementation and coordination of adaptation policies.

Furthermore, the review showed that at the local level, communities are developing and implementing several strategies, initiatives and practices to adapt to the impacts of climate change. They are achieving this with the support of technical services, civil society and NGOs. However, key priority adaptation sectors do not yet sufficiently integrate local community-led adaptation needs, practices and strategies due to a lack of access to climate finance and the technical capacity to contribute to strengthening the governance of climate action in the country.

In respect to financing, access to funding for communities to implement local adaptation strategies and practices is not guaranteed by the central government. Most of the climate actions are funded through donor support with limited timeframes. As such, there is a need to mobilise domestic resources to sustain climate actions in the long term. At the same time, finance flows targeting adaptation are small compared to other investments in mitigation activities.

Overall, the insights from stakeholder engagement revealed that the value of LLA is well received and that deepening such an approach is recognised as an essential pathway for the implementation of NDCs. However, challenges remain to ensuring access to evidence-based knowledge on climate change, the integration of endogenous adaptation practices in climate policies and implementation, climate finance and access, and to the governance of climate actions both at the national and local levels. Overall, the magnitude of climate change challenges shows that the vast financial needs for climate change adaptation measures lie beyond the reach of the national budget. Thus, Senegal depends largely on the contribution of technical and financial partners as well as other innovative and strategic means of leveraging local financial support and investments.

SECTION THREE

Case studies

General introduction

In addition to the national adaptation policies, communities have developed several strategies, initiatives and practices according to their level of knowledge, the adaptation option and opportunities available. Needless to say, these depend on the means they have at their disposal. To some extent, some community initiatives are supported by government agencies, civil society organisations (CSOs), academies and NGOs.

However, despite the existence of many community-led adaptation initiatives, these are not yet sufficiently integrated into either climate action or the implementation of the country's priority adaptation sectors. This is due to the absence or lack of relevant scientific evidence on the contribution or added value of local adaptation practices. Hence, the consideration of endogenous adaptation practices requires research on local adaptation strategies to support their integration into climate action in Senegal, with a focus on priority sectors. Local adaptation initiatives constitute the levers of action in areas and sectors most affected and in need of adaptation action, such as the agriculture and aqua sectors. Moreover, the approach to LLA has relevance and added value for local development plans and sustainable development objectives.

To document and capitalise on information and knowledge from relevant LLA initiatives in Senegal, deep dives in three field case studies with relevance to key prior NDC adaptation sectors were conducted. The objective was to explore motivations for action by local actors, existing adaptation strategies and practices, and challenges and opportunities, and to identify entry points through which various actions can be strengthened to better build the adaptation capacity of local communities. Additionally, this exercise aimed to generate lessons on the enablers of and barriers to climate change adaptation actions and to provide insights into the ways in which the implementation of the NDCs through LLA can influence livelihoods within the host and surrounding communities.

General case study approach

The methodological approach for the case study implementation was based on a number of key steps with specific methods and tools to meet the objectives of the research.

Literature review

The case study process was informed and guided by the literature review on experiences in documenting and capitalising on endogenous adaptation practices. The review used an operating matrix to identify, describe and analyse experiences on LLA according to the priority sectors of adaptation of the NDC.

Identification and selection of relevant LLA initiatives

The identification of relevant LLA experiences was achieved through a series of processes. These included the use of the APRI guide on the criteria for identifying endogenous community adaptation initiatives according to the NDC's priority adaptation sectors, which included the following:

- sectors of relevance to climate adaptation action;
- relevance to local social and cultural needs, values and aspirations;
- relevance to national, regional or local climate action policies and development strategies;
- actions and activities with potential to generate greater value beyond economic value, especially in support of life, livelihood and well-being needs for local communities;
- application of local strategies and practices for adaptation;
- a policy/stakeholder workshop organised on 31 October 2022 by APRI in collaboration with ENDA Energy in Dakar and a wide range of stakeholders operating in the climate change adaptation space.

The triangulation of the different sources of information made it possible to identify three relevant experiences linked successively to the priority adaptation sectors in Senegal. This aided the selection of three case studies: central Senegal for the agriculture sector in Daga Birame, coastal zones in Dionewar Island and health in Widou Thiéngoly.

Designing tools for data collection

Four methods were used to collect data: i) review of documents for relevant LLA initiatives ; ii) participatory observation, photography and interviews in the field with key; iii) individual interviews with key informants to address questions around local adaptation practices, achievements, lessons learned and best practices, barriers, needs and opportunities in LLA within NDC; and iv) focus group discussions to address questions on the conception of local adaptation, the motivations for conducting an adaptation initiative, the role of the actors involved in the process, the actions concretely carried out, the alignment and coherence with the NDC, as well as the lessons learned and best practices, the viability and sustainability of the actions taken, the added value for climate action, the potential for replicability or scaling up, and the challenges, gaps, barriers and needs related to this local adaptation initiative.

Conducting case studies/data collection

Field data collection in the targeted case studies was based on good planning of activities, organisation and coordination with the involved stakeholders after sharing the expectations, objectives and expected results of the project. Before deploying to the field for each case study, contact was established with resource persons and stakeholders to plan together the activities related to participant observations, individual interviews and focus groups. With the support of local guides in each of the areas identified for field data collection, information was gathered from a range of stakeholders.

Daga Birame for the agriculture adaptation sector: Data collection activities for the Daga Birame experience included one participant observation session with a key informant, six one-on-one interviews with project beneficiaries and key informants, four one-on-one interviews with project implementers, and one focus group of ten participants, including six men and four women.

Dionewar Island for the coastal zone adaptation sector: Data collection activities for the Dionewar experience included one participant observation session with a key informant, seven individual interviews with project beneficiaries and key informants, three individual interviews with project implementers and one focus group of ten participants, including eight men and two women.

Widou Thiéngoly for the health adaptation sector: Data collection activities for the Widou Thiéngoly experience included one participant observation session with a key informant, five individual interviews with project beneficiaries and key informants, four individual interviews with project implementers and one focus group of ten participants, including six men and four women.

Data documentation, analysis and reporting

Guided by the objectives and intended results of the questions addressed in the case studies, the data collected from the different sources (document review, participant observations, individual interviews and focus groups) was transcribed and triangulated in order to reveal the information that best reflects reality in relation to the experiences documented and capitalised through the studies.

After the data analysis and consolidation of the preliminary results, a workshop was held to share key findings and messages with stakeholders who participated in the inception workshop. This provided guidance and recommendations on the endogenous community adaptation practice experiences to be identified and documented. The workshop was an opportunity for stakeholders to give their views on the relevance and importance of LLA initiatives for climate action and their added value for the priority adaptation options of the NDC, but also to understand the gaps, barriers and additional knowledge needs related to these local community adaptation models.

Case study 1 - agriculture experience: The Daga Birame initiative

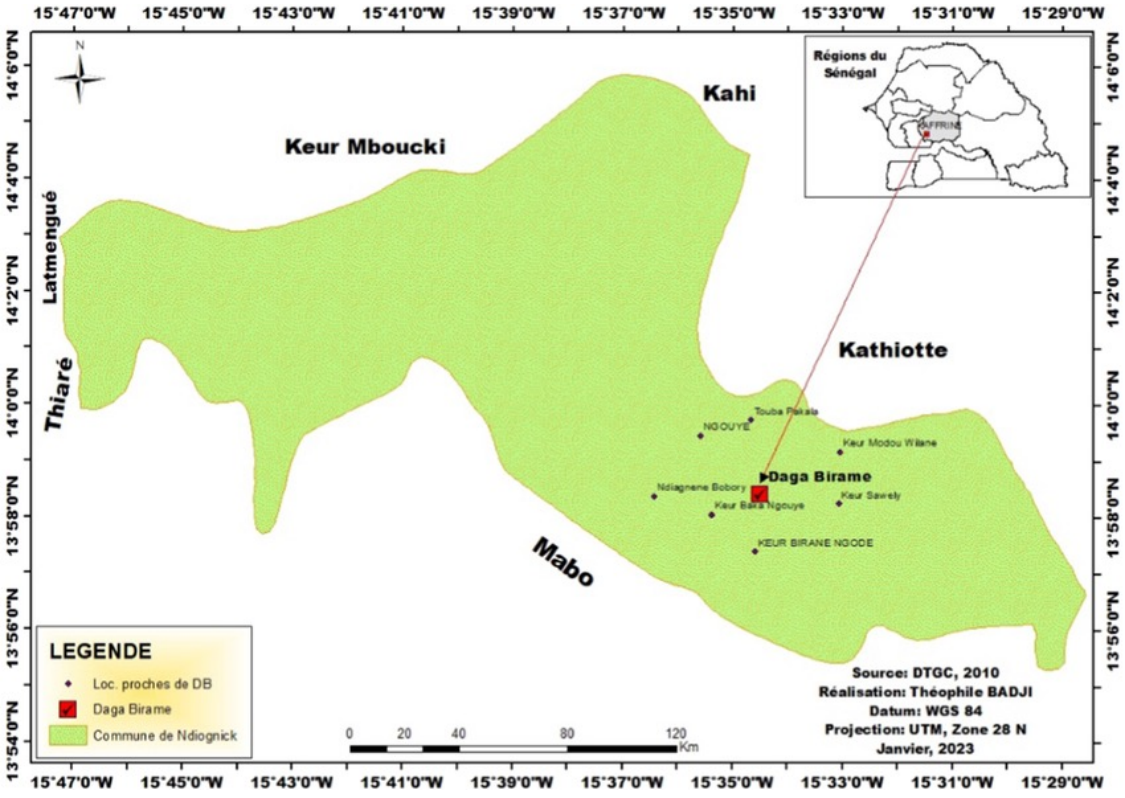
Background and context

The local adaptation initiative of women farmers in the climate-smart village of Daga Birame is an experience from the agriculture priority sector of the country's NDC. This village is located in the department of Kaffrine in the heart of the Senegalese agricultural basin (Figure 3). The local adaptation experience concerns a set of adaptation practices co-identified by the local community, scientists from ISRA and technical development services composed of ANACIM, the National Agency for Agricultural and Rural Advice (ANCAR), the Directorate of Agriculture (DA) and the Regional Directorate for Rural Development (DRDR). The aim was to achieve the desired changes for food security and the resilience of populations and ecosystems.

Following the identification of the village's constraints, the actions were structured around five components: i) the establishment of climate information services (CIS); ii) the development of agricultural practices adapted to climate change; iii) the capacity building of villagers; iv) the strengthening of knowledge of climate change and of local institutions; and v) the development of index-based agricultural insurance. The use of climate forecasts and information has helped to guide crop operations and the selection of adapted and resilient varieties according to seasonal forecasts with the 'Jokolanté' initiative.

This local adaptation experience was financially supported as part of a CGIAR initiative. CGIAR aims

Figure 3: Location of the Daga Birame study area/Kaffrine region in Senegal



Source: Author (2023)

to expand access to CIS and climate-smart agriculture (CSA) by building the capacity of public institutions and private companies in the field.

The case study was selected on the grounds of its relevance for climate adaptation action and the added value to support broader climate action and sustainable development.

Motivation for local adaptation initiatives

The results of the interviews reveal that the motivations that drive the community of the climate-smart village of Daga Birame to undertake adaptation actions are mainly financing, training and capacity building, access to fresh water, awareness raising and the provision of agricultural equipment to develop agroforestry and market gardening.

The members of this community have a good understanding of climate variability and change, which they associate with hydrometeorological events such as rainfall variability, temperature increase, frequency of strong winds, scarcity of water resources, frequency of rainfall breaks and irregularity of the rainfall cycle. The women farmers have experienced the impacts of these changes and variability on the development of the agricultural sector, in the form of soil impoverishment leading to lower agricultural yields, crop degradation due to rainfall breaks, the disappearance of plant biodiversity with the loss of several plant species, lower agricultural incomes and risks for the population's food security, and the deterioration of the population's health status. As this sector is

considered to be the main source of household income, these changes affect the living conditions and well-being of the inhabitants of the community.

The community's knowledge of climate risks for the agricultural sector and the impacts of climate change on production systems, living conditions and community welfare explains their commitment and engagement to the development and implementation of the project of the climate-smart village of Daga Birame. The driving force behind community participation has been the awareness and sensitisation to the challenges of climate risks and the existence of an inclusive and participatory approach with the implementation of a community-based approach to combat climate change. Thus, the community has understood that the response to the challenges of climate change requires commitment and mobilisation at the grassroots level.

Community practices and strategies

In order to cope with the impacts of climate change, the Daga Birame farming community have tried to adapt with local practices and strategies according to their level of knowledge and the adaptation options available with the means at their disposal. Thus, the implementation of the Climate Smart Village (CSV) project has encouraged the community to adopt a number of good farming practices to optimise and make their activities more profitable through the adoption of a technological package:

- the development of a community plot that favours the association of crops, the choice of crops according to climatic forecasts, sowing after the rain, the practice of agroforestry and the domestication of certain forest species;
- the construction of a borehole powered by photovoltaic solar panels to support crop watering;
- the use of climate services with the sharing of climate information with the 'Jokolanté' initiative provided by ANACIM;
- access to seeds adapted to climate change with the contribution of Senegalese Institute of Agricultural Research: National Centre for Forestry Research (ISRA/CNRF) to reduce agricultural vulnerability to climate uncertainties;
- agroforestry practices and the domestication of certain forest species through the reforestation of areas of non-timber forest products with shortened production cycles;
- the promotion of market gardening activities by women in particular and the processing of groundnuts into powder 'noflay';
- the practice of assisted natural regeneration (ANR) and reforestation in the fields to promote crop moisture and reduce wind erosion.

These practices and strategies are supported by consultation and awareness-raising activities between the project team and the beneficiaries, the awareness of climate risks by a large part of the population, the culture of community development, the existence of partnerships between the village and various structures and technical services of the state and development support organisations. The implementation of these practices and strategies highlights the capacities of the Daga Birame farmers' community to identify and implement adaptation options and measures with

Picture board 1: Community adaptation practices of Daga Birame climate-smart agriculture

Source: Author (2023)

the support and guidance of government technical services, NGOs and civil society. Interventions carried out within the framework of the CSV initiative in Daga Birame help to strengthen the resilience of the agricultural production system as the technologies used have facilitated adaptation to climate change and ensured a better yield from agricultural land.

Main outcomes of action/project

Our research shows that the Daga Birame initiative has achieved significant results with a considerable impact on improving the living conditions and well-being of beneficiaries:

- collaborative and sustainable management of agroforestry systems by beneficiaries;
- 128 hectares of forest protected to contribute to carbon sequestration and land fertilisation;
- increased agricultural yields and household resilience of the local community;
- control of a range of CSA technologies combining ANR, varieties and fertilisation (fertiliser, organic and microdose) through a field school and individual farmers' fields;
- increased knowledge and capacity building on seed quality;
- increased knowledge and capacity building on new and innovative agricultural practices

integrating climate risks;

- increased capacity building and knowledge of CIS;
- rational use of agricultural land within the framework of the Participatory and Integrated Climate Services Integrated Climate Services for Agriculture (PICSA);
- adoption of ANR by some farmers and protection of forests;
- women's involvement as a driving force and determinant in the implementation of the intervention's activities.

As part of the Daga-Birame initiative, an innovation platform (IP) consisting of 194 farmers, 110 of whom are women, was created as a driving force. This functional platform brings together all social strata of the community, including men, women, youth, traditional leaders and minority groups in the village. It also brings together external stakeholders such as technicians, administrative staff, locally elected officials and researchers, as well as members of associations, local organisations and savings and credit groups such as the economic interest group (EIG), also known as the Soukhali Daga Birame Association, responsible for the promotion of economic activities, the Protected Areas Committee (PAC), responsible for the sustainable management of the protected areas, and the Non Timber Forest Products (NTFPs) Promotion Committee, responsible for developing a business model for baobab fruit powder.

Co-benefits of the action/project

The intervention of Daga Birame has generated a number of co-benefits, the most important of which include:

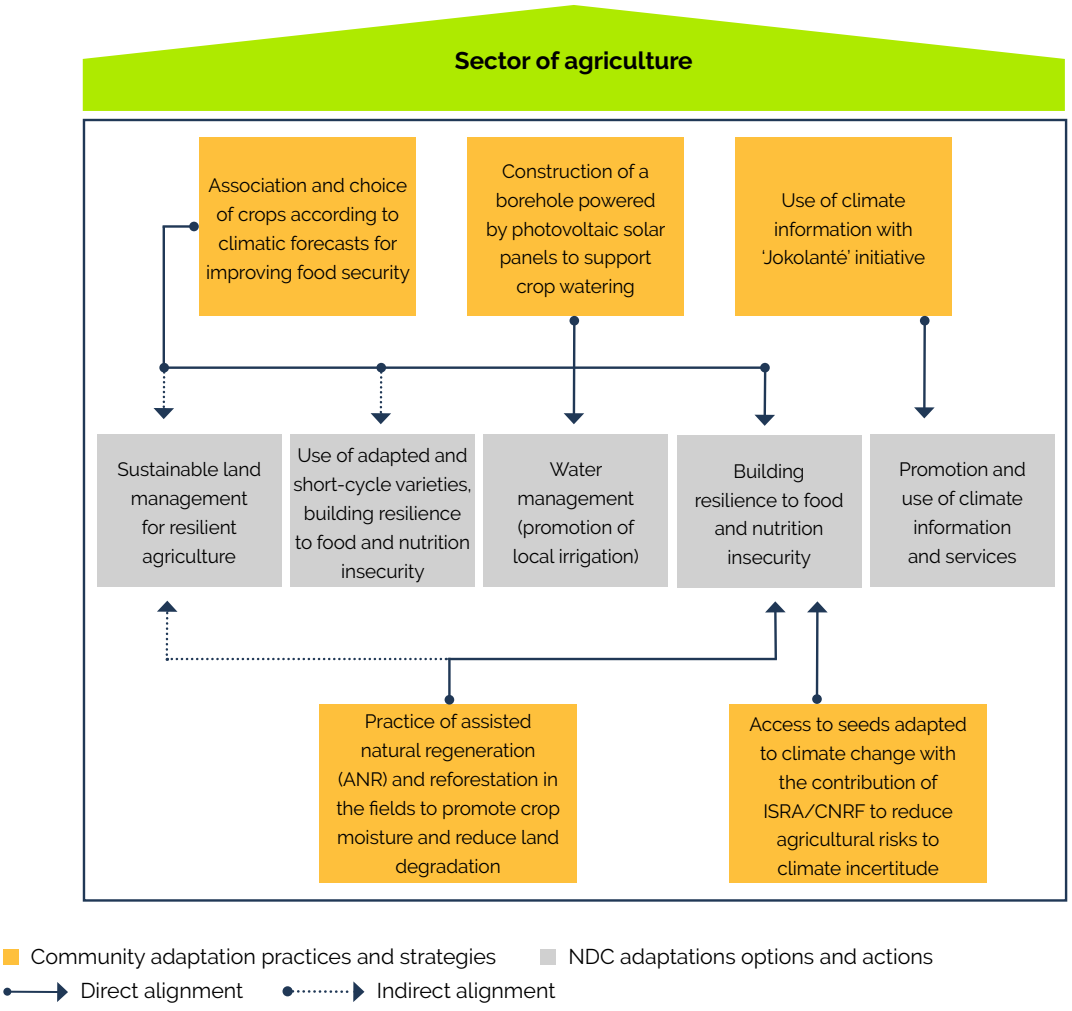
- the promotion of a culture of community and village development with a financial contribution of 2,000 CFA franc for each man and 1,000 CFA franc for each woman to be invested in local development actions;
- raising community awareness of the importance of nature protection, the environment, health preservation, local development, family farming, agroforestry and the risk of desertification for the village;
- the development by three major actors (researchers [ISRA/CNRF], technical services of the states and the population) of a new initiative: Enhancing the Resilience and Adaptive Capacity to Climate Change through integrated land, water and nutrient management in semi-arid West Africa (ENRACCA-WA);
- a contribution to the reduction of greenhouse gas emissions, carbon sequestration through reforestation and fertilisation of agricultural land;
- the promotion of solar (renewable) energy to power boreholes needed for drinking water and agriculture and to provide electricity to households;
- strengthening the food security, nutritional status and health of the beneficiary populations;

- the development of income-generating activities around a value chain economy incorporating agroforestry and production processing as well as climate services;
- supplying local markets with diversified agricultural products.

Connection/alignment to NDCs/national policies, strategies and actions

The practices and strategies of farming communities from Daga Birame are aligned or connected to the national adaptation actions of the NDC, especially in the agriculture priority sector (Figure 4). However, despite the direct and indirect alignment with national policies and strategies, the level of consideration and support given by central government (national climate policies) to the community-led climate adaptation needs and priorities of Daga Birame farmers remains very low. Indeed, support from central government or national state structures to the community to adapt to the impacts of climate change, build the climate resilience of women and vulnerable people, and

Figure 4: Alignment between local community adaptation strategies from Daga Birame and NDC adaptation options for agriculture sector



Source: Author's construct (2023)

address the inequalities faced by women, was rated as low to very low by key informants, as was the support provided to local institutions for more direct access to funding and decision-making power over how adaptation actions are defined. Similarly, support was rated low to very low for community access to predictable funding that can enable adaptation actions to be implemented, and for building resilience and promoting livelihoods for youth and women.

In contrast, the central government's actions in providing the community with the indigenous, local and scientific knowledge needed to inform their adaptation decisions, in supporting the establishment of early warning systems for better disaster risk management through technical services such as ANACIM, and in promoting gender-sensitive sustainable forest management were considered satisfactory to very satisfactory.

Lessons learned and best practices

A number of lessons and best practices can be drawn from the relevant experience of LLA conducted by the community of Daga Birame:

The successful model of the climate-smart village of Daga Birame demonstrates that adapting to climate change must be done in partnership with vulnerable communities capable of proposing viable and sustainable solutions to combat climate risks. Communities are able to domesticate local NDC adaptation options for the agricultural sector with new innovative farming practices. However, their impacts may be limited without access to technology transfer, technical capacity and funding to support implementation.

- Community-led local adaptation is a highly operational model of social commitment to climate action, but its impact on strengthening climate resilience may be limited in time, especially when state technical services withdraw.
- Good collaboration between researchers, technicians and communities (e.g. monitoring systems) has led to knowledge of new and innovative agricultural practices adapted to the new climate cycle and the strengthening of household resilience.
- Improved knowledge of CIS at the community level and capacity building in the use of climate services in climate risk management have led to improved agricultural practices.
- Climate change has been a factor in mobilising the community and connecting the village with the external context through the development of partnerships at the national and international levels.
- Community organisation, formalisation and training in organisational dynamics are important levers in the ownership of NDC adaptation options at the local level.
- The sustainability and impacts of community engagement models for adaptation are limited when the drivers of mobilisation are not active.
- The Climate Smart Village (CSV) IP is seen as an experiment that can be scaled up or replicated using a zonal approach.
- Providing technical and financial support to the populations is considered an important aspect of

ensuring the sustainability of their adaptation to climate change and the purchase of agricultural production and processing equipment.

Limitations and challenges

According to feedback from key informants and the review of relevant documents, the Daga Birame experience on LLA conducted by the community has revealed some limitations and challenges:

- Governance problems resulting from a lack of functioning of grassroots bodies and conflicts of interest after the success of the project, especially concerning the exploitation and marketing of wood. These problems limit the impacts of the intervention.
- Insufficient financial means for the reproducibility of skills acquired at the individual level.
- Lack of agricultural inputs and equipment considered as production factors can compromise adaptation.
- Lack of agricultural processing equipment to develop the value chain.
- Lack of technical and financial support to ensure the sustainability of adaptation to climate change and the purchase of agricultural production and processing equipment.
- Weak support for women's access to land, small-scale agricultural equipment and inputs (e.g. certified seeds adapted to the climatic context of the area) and also for developing and promoting income-generating activities such as market gardening and processing of agricultural products.

Entry points and opportunities

In LLA implementation processes, the gaps and challenges are related to access to technical capacities and funding to plan and implement adaptation projects at the local community level. In this regard, municipalities and local representatives have an important role to play in adapting to climate impacts: they decentralise climate action by facilitating better consideration of climate issues and the development of local initiatives to combat climate change. In the perspective of improving LLA implementation with the support of technical structures, the following entry points and opportunities could be considered:

- The implementation of numerous agricultural development initiatives integrating adaptation to climate change according to the model of CSA within the framework of projects supported by Senegal's technical and financial partners (Asian Development Bank [ADB] World Bank, BOAD, AFD, USAID, FAO, UNDP). These projects are a good opportunity to integrate the needs of locally driven adaptation in the implementation of activities.
- The implementation of the NAP for the agriculture sector, which was developed in March 2023 with the support of the UNDP-led NAP-GEF project. The NAP integrates the adaptation needs of the target regions (Ziguinchor, Kédougou, Kaffrine, Matam and Saint-Louis). The agriculture NAP has been broken down into several ideas for climate-resilient projects in the sector, each of

which takes into account the adaptation practices and strategies of communities in the priority areas to be submitted to different climate funds.

- The implementation of the Africa Adaptation Acceleration Program (AAAP) from the Global Center on Adaptation (GCA) in Senegal. The AAAP needs to ensure that action is locally led, that communities are involved in adaptation decision-making and the co-creation of solutions, and that climate finance reaches communities. This programme is a great opportunity to galvanise climate-resilient actions at the community level in the agriculture sector.

- The strengthening of existing institutions so they can provide expertise to local communities. There are numerous training and research programmes on climate issues and challenges for the agricultural sector, provided by institutions such as national universities, ISRA, and the African Centre of Excellence in Agriculture for Food and Nutrition Security (CEA-AGRISAN). These programmes are increasingly documenting endogenous adaptation strategies and practices and assessing the needs of communities in terms of climate resilience in agriculture.

Case study 2 - coastal zones experience: The Dionewar Island initiative

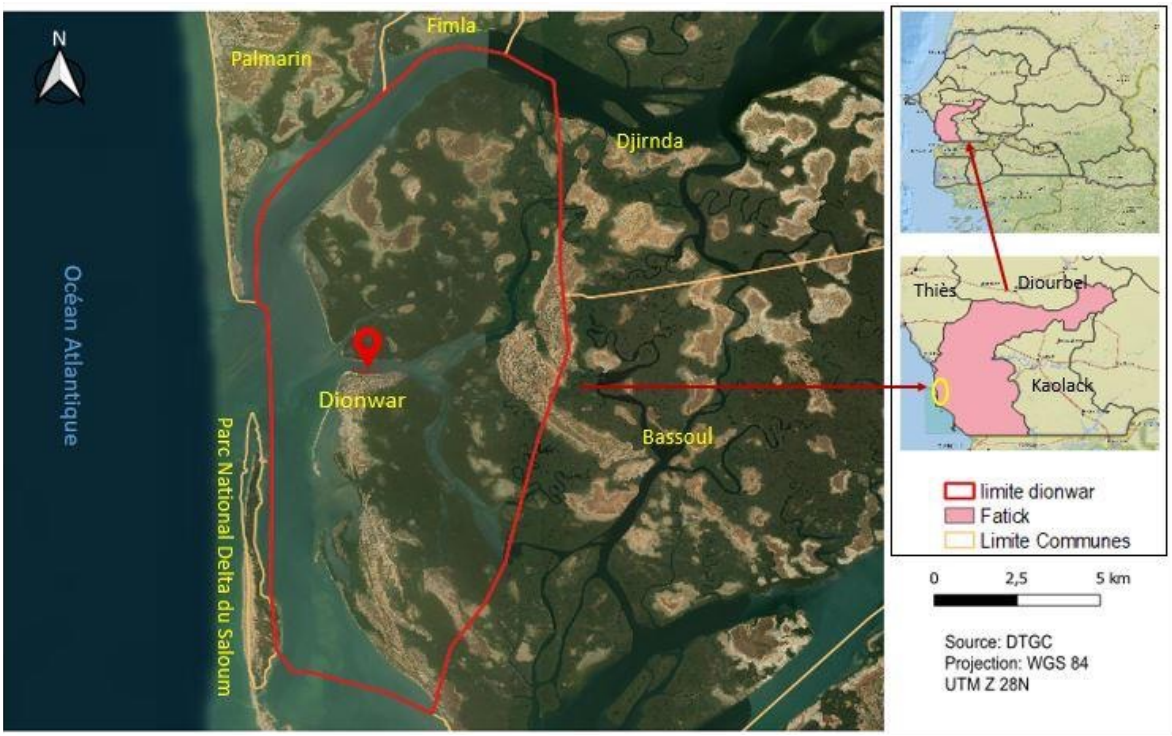
Background and context

The local adaptation to coastal erosion initiative of the island communities of Dionewar is a project from the priority coastal zones sector. The community of Dionewar is located in the central western part of Senegal (Figure 5). Following multiple warnings from the population, the CSE (Centre de Suivi Ecologique) in collaboration with the Association for the Development of Dionewar (ADD) set up the Reducing Vulnerability and Improving Resilience of Dionewar's Coastal Communities (REVARD) project financed by the AF to fight flooding. This local adaptation experience is related to the realisation of protection works against coastal erosion using the Epis Maltais Savard system, a local initiative supported by the Nébéday Association and the Delegation of the European Union in Senegal.

The Epis Maltais Savard initiative holds promise for the protection of land, houses and tourist camps against coastal erosion. Already successfully tested in Casamance, the technique consists of building groins from stakes and palm fronds to block the sand and form a natural barrier against the waves. Made from readily available local materials, these groins are both environmentally friendly and easily replicable, such that the technique is based on soft solutions in harmony with nature. The implementation of this adaptation strategy was facilitated by the mobilisation of the inhabitants of Dionewar, of whom more than 100 were volunteers trained in erecting the groins. The construction of the groins was a joint initiative between Nebeday and the CSE, under the supervision of the DEEC. The monitoring of these structures will be carried out by the children from the schools in which our environmental education programme is taking place. The Epis Maltais Savard initiative is a policy-relevant experiment in climate action with great added value to support the adaptation and sustainable development of coastal communities.

The financing of this initiative amounted to EUR 105,000 for a period of four years. It was provided by the French Global Environment Facility (FGEF) through the CSE within the framework of the coastal risk monitoring project in Senegal, Benin and Togo for the West African Coastal Management Programme (WACA), and the Nébéday Association, which benefited from European Union funding within the framework of the Integrated Coastal Zone Management project (ICZM).

Figure 5: Location of the Dionewar study area/Fatick region in Senegal



Source: DTGC

Motivation for the local adaptation initiative

The need to address the impacts of climate change on key livelihood activities was the main reason for the Dionewar community's participation in the LLA initiative. Actions were further motivated by the awareness and involvement of the people at the beginning of the project, the obligation to adapt to climate risks and the need for a solution that is easy to understand and implement.

The main sources of livelihood for the community of Dionewar are artisanal fishing; processing of fish products such as arches, oysters and cambiums; market gardening; and rain-fed agriculture. All of these are affected by rising sea levels, recurrent heavy swells and dwindling and/or scattered rainfall. The main impacts for the community are the rarefaction of arches, oysters and other halieutic products by the silting up of mudflats and the disappearance of the mangrove, where these species breed. Agricultural yields have also decreased as dry periods during the winter have lengthened, and salinisation has led to the loss of arable land. Tourist activity has also suffered from the loss of beaches and the associated destruction of houses, tourist camps and flora.

Community practices and strategies

The local adaptation practices implemented within the REVARD project using the Epis Maltais Savard system, as initiated by the Nébéday Association, are the following:

- practice of night fishing among men for the biological rest of fish;
- development of oyster farm activities among women to generate income;

- establishment of protective structures such as piles, dikes and bunds;
- implementation and monitoring of Maltese groins as a soft method to slow down the rate of coastal erosion;
- training students on environmental issues through an environmental education programme in order to create the eco-citizens of tomorrow;
- development of reforestation activities using local species to reduce coastal erosion;
- disaster risk management by establishing early warning systems such as flags and telephone messages for fishermen;
- installation of a weather station in the village to provide climate information.

The technology developed for this local adaptation initiative is based on the use of local materials to build light, soft infrastructure based on nature. The technique consists of laying out groins perpendicular to the swell with a width of 80 cm between the two rows and a distance of 70 cm between the poles. These stakes – made from eucalyptus and attached to the ground with palm or coconut leaves – trap the sand and encourage sedimentation in order to increase the coastline towards the sea. Control stakes are placed 20 m away on either side of the spur to allow students to measure the effectiveness of the initiative.

Picture board 2: Local community adaptation practices for coastal erosion resilience in Dionewar

Source: Author (2023)

Main outcomes of the action/project

The main stakeholders in the Dionewar local adaptation experiment are the CSE, ADD, the Nébéday Association, the Protected Marine Areas (AMP), the Ecole 2 de Dionewar and the populations responsible for the planning and implementation of actions. Together they have achieved significant results, with several positive impacts on living conditions and well-being:

- implementation of collaborative and sustainable management of coastal erosion;
- reconstitution of the beach by trapping sand, which has resulted in a gain of 2.6 m of beach;
- maintenance of income-generating activities, mainly related to fishing;
- improvement of the resilience of island communities to the threat of coastal erosion;
- establishment of an inclusive, community-based coastal erosion management process at the local level;
- appropriation of new nature-based coastal erosion control technologies;
- reduction of the risk of fishing-related disasters with access to climate information;
- increased knowledge and capacity building on innovative technology in the management of coastal erosion;
- strengthening community resilience through the development of oyster farming, fish processing and market gardening;
- improved livelihoods and living conditions of community members.

Co-benefits of the action/project

The Dionewar intervention has generated a number of co-benefits, the most important of which are:

- the reduction of coastal erosion and the development of socio-economic activities;
- training of students on environmental issues through an environmental education programme;
- raising community awareness of the importance of nature protection, the environment, health preservation, local development and family fishing;
- contributing to the reduction of greenhouse gas emissions as a result of carbon sequestration through reforestation;
- strengthening food security, nutritional status and health;
- integration of a gender dimension in the process of managing coastal erosion and environmental resources, including forests;

- use of appropriate technology that is less costly, easy to replicate and gentle on nature and the ecosystem.

In addition to these co-benefits are the integration of gender in the project implementation process and the consideration of other adaptation strategies such as tyre and shell dams next to the Maltese groins.

Connection/alignment to NDCs/national policies, strategies and actions

As illustrated by Figure 6, the island community of Dionewar has developed several practices and strategies which are directly or indirectly aligned or connected with the national adaptation options and actions of the NDC coastal zones sector.

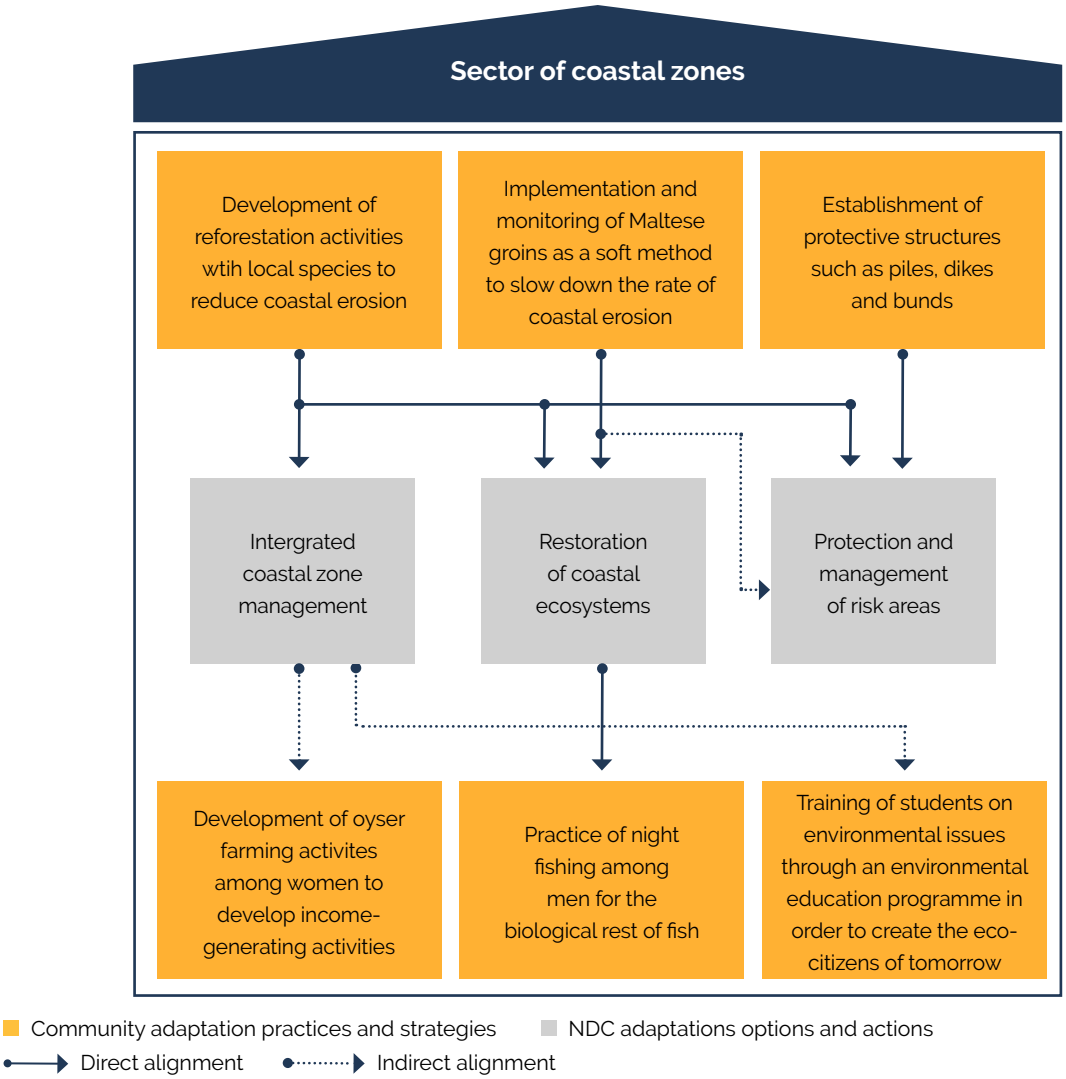
This case demonstrates the level of consideration given by central government to the LLA needs of the Dionewar Island community through direct financial and implementation support. This support was rated as satisfactory to very satisfactory by key informants in the following areas:

- adapting to the impacts of climate change;
- addressing the inequalities faced by women;
- accessing indigenous local and scientific knowledge and information needed to inform adaptation decisions;
- improving the climate resilience of women and vulnerable people;
- building resilience and promoting livelihoods for young people;
- accessing climate services for early warning and disaster risk management;
- integrating gender aspects in climate action.

However, support from government was rated as weak to very weak by the key informants in the areas of:

- improving (direct) access to finance;
- building the capacity of the community to understand climate risks and uncertainties;
- enabling transparency in the financing, design and implementation of climate change projects.

Figure 6: Alignment between local community adaptation strategies from Dionewar and NDC adaptation options for coastal zones sector



Source: Author's construct (2023)

Lessons learned and best practices

Several lessons learned and best practices can be drawn from LLA conducted by the community of Dionewar Island:

- Nature-based soft methods can be considered as alternative solutions to coastal erosion control, demonstrating that it is possible to heal nature with nature.
- Local adaptation is more effective and efficient if actions are carried out by technical committees or small groups of community members rather than by larger or extended groups which often experience communication problems or conflicts of interest.
- The use of Maltese groins can be an effective and sustainable solution if monitoring is carried out regularly and according to the requirements of the technology used.

- The use of coconut leaves rather than palm trees is more effective for coastal erosion protection structures, especially for sediment trapping.
- The decline in population engagement, especially in periods of high swell, can compromise the expected results, which is why the system must be reinforced during risk periods.
- Successful coastal erosion control depends on the awareness and commitment of all segments of the community.
- The mobilisation of the population at the beginning of the project, in particular during the installation of the first groins, which gave immediate and convincing results, was a factor in the success of the initiative.

Limitations and challenges

According to feedback from key informants and the review of relevant documents, the Dionewar Island experience on LLA conducted by the community has some limitations and challenges, as summarised below:

- the lack of viability of the technological solution applied with the Maltese groins in Dionewar due to the low resistance to the force of certain swells;
- the lack of sustainability of the actions due to poor communication between the different actors (partners and community);
- the lack of transparency in the financing of activities (e.g. absence of information on the budget and the cost of the activities or actions);
- a decline in population engagement linked to the weak results;
- the absence of symbolic remuneration for the laying of branches;
- the lack of follow-up with the management committee of the Maltese groins despite frequent interruptions in the collection and transport of palm or coconut leaves due to the lack of financial means to continue the sand-trapping process;
- insufficient financial means to intensify and extend the installation of Maltese groins for a greater impact on coastal erosion and the maintenance of income-generating activities.

Entry points and opportunities

Improving the results of the LLA experiment would involve a series of actions, including integrating local knowledge in the implementation of adaptation projects, empowering populations to develop their own strategies for combating the impacts of climate change and supporting local associations that carry out climate adaptation projects. This also requires actions such as the empowerment of community associations and local authorities in the implementation of adaptation strategies; the multiplication of popular forums to collect the needs of the populations in terms of adaptation strategies; strengthening the technical, organisational and financial capacities of the monitoring

committee to ensure the continuity of the project's activities; and involvement of the populations in the financial set-up and the expenses of the project. Based on the findings from this case study, the following entry points and opportunities could be considered:

- Numerous initiatives (vulnerability mapping, construction of protective dykes, breakwaters, groins, tetrapods, beach nourishment, reforestation) could be implemented to combat coastal erosion in Senegal through projects such as the West Africa Coastal Areas Resilience Investment Project (WACA-RESIP), WACA-GEF, ICZM and Grand Saloum, supported by Senegal's technical and financial partners (AfDB, World Bank, BOAD, AFD, USAID, FAO, UNDP). These projects are a good opportunity to integrate the needs of LLA by communities in the implementation of activities combating coastal erosion.

- The NAP for the coastal zones sector could be developed and implemented with the support of the UNDP-led NAP-GEF project, integrating the adaptation needs of the target regions (Ziguinchor, Kédougou, Kaffrine, Matam and Saint-Louis). The coastal zones NAP has been broken down into several ideas for climate-resilience projects. These take into account the adaptation practices and strategies of communities in the priority areas to be submitted to different climate funds.

- The existence of numerous training and research programmes on climate issues and challenges for the coastal zones sector, involving institutions such as national universities and research centres. These are increasingly focusing on endogenous adaptation strategies and practices as well as community needs for climate resilience in the context of coastal erosion.

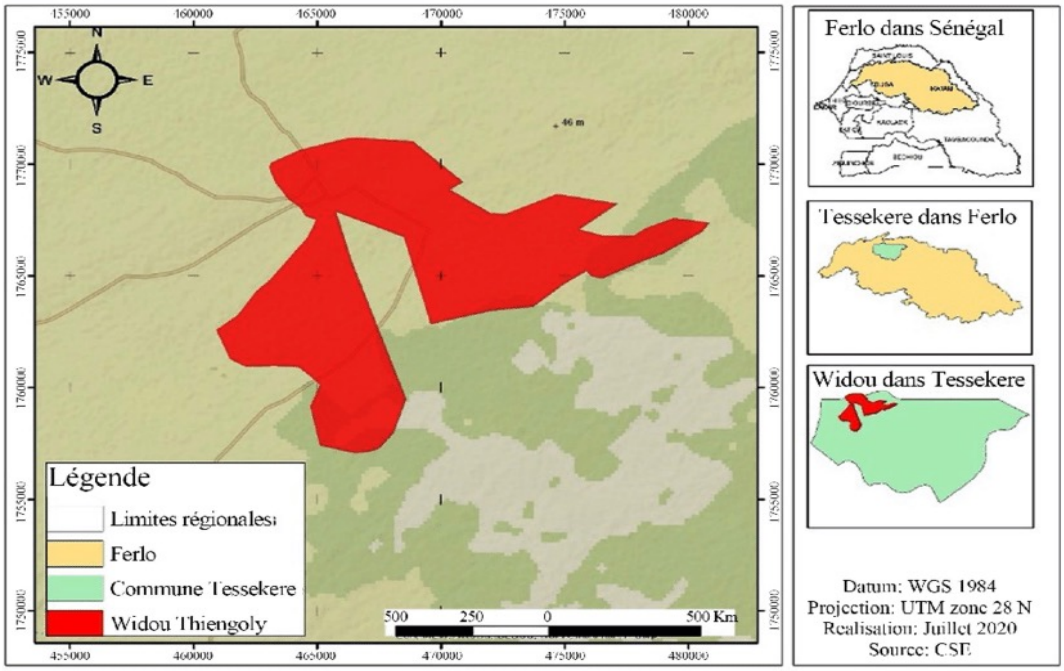
Case study 3 - forestry and sylvopastoral experience: The Widou Thiéngoly initiative

Background and context

The village of Widou Thiéngoly is located in the commune of Téssékéré in the heart of the sylvopastoral zone, and includes Widou Bourg and the camps located within a 15 km radius (Figure 7). The semi-arid tropical climate has a long dry season from October to June which is characterised by very high temperatures that can reach 46 to 48°C. The local community adaptation initiative in resilience to the health impacts of heatwaves in Widou Thiéngoly is related to the priority health sector of the country NDC. The adaptation action on the health impacts of heatwaves in the northern part of Senegal lies within the context of two projects: Alert to Heatwaves and Health Impacts in the Sahel (ACASIS), and implementation of an early warning system to strengthen the resilience of communities to the health impacts of heat waves (CR4D).

This local community adaptation has been implemented by organisations such as the Directorate of Civil Protection (DPC), which is responsible for the disaster risks reduction plan, ANACIM and the National Oceanic and Atmospheric Administration (NOAA), which provides climate information and services. In addition, UCAD and UGB support the knowledge management and capacity-building process, and the CSE conducts vulnerability and adaptation assessments of the community and healthcare system. The Ministry of Health, through the General Directorate of Health and the Health Districts, is in charge of the alert bulletin dissemination; the Senegalese National Red Cross (CRNS) supports community health surveillance with the cooperation of local administrative authorities and community radio stations; and the Great Green Wall Agency (AGMV) accompanies the village reforestation actions in concessions and public spaces. Local community organisations such as the health development committee (CDS) and the Association of Borehole Users (ASUFOR) are involved

Figure 7: Location of the Widou Thiéngoly study area/Louga region in Senegal



Source: Author (2023)

in several social services.

Motivation for local adaptation initiative

The village of Widou Thiéngoly, like all the localities in the sylvopastoral zone, is marked by the hazards of climate change, which affect production systems, ecosystems, health and the well-being of the community. The population of this village is composed mainly of livestock farmers whose main sources of income depend on the livestock value chain. However, the scarcity of rainfall reduces the availability of fodder for the herd and the reduction of water points puts pressure on boreholes and grazing areas. Alternative livelihood options, such as farming, are hindered by water availability and the exclusive use of the area for livestock.

Climate change is perceived by this community through the increase in temperatures that cause very marked heatwaves, the irregularity of rainfall and the frequency of extreme climatic events such as droughts, floods and bush fires. The variability of these climatic parameters impacts the livelihoods of the community, with the loss of livestock, animal production and agricultural yields linked to the scarcity of water resources and pasture.

Furthermore, these changes affect human and social capital, with a considerable increase in certain chronic pathologies. In particular, they expose vulnerable groups such as the elderly, young children, pregnant women, and people with chronic illnesses and co-morbidities to increasing and complex health risks. These recurrent health impacts have been the basis of the community's sensitivity and commitment to the challenges of climate change. The existence of a community-based approach to combat climate change appears to be the driving force of the population's participation: they

have clearly understood that the response to the challenges of climate change requires strong commitment and mobilisation at the grassroots level.

Community practices and strategies

Adaptation strategies are often individual, reactive and spontaneous. However, when they are collectively practised as community responses to the impacts of heatwaves, they are relevant to climate action policies and objectives and add significant value to support adaptation and sustainable development for the health sector.

Adaptation to the health risks associated with the impacts of heatwaves requires community organisation in the form of practices and strategies which reduce vulnerability and build resilience to the present and future effects of rising temperatures. Thus, the adaptation actions initiated in Widou Thiéngoly in response to the health impacts of heatwaves are built on:

- the development and implementation of an early warning system based on the provision of climate services using an intersectoral approach to prevent the occurrence of heatwaves, monitor climate-sensitive diseases and manage health risks;

- the implementation of capacity-building actions for local actors in the management of health risks related to heatwaves, with a focus on the development of information, education and communication on health impacts, seeking advice from medical staff and the implementation of an early warning system and early warning bulletin;

- the implementation of reforestation actions in public spaces and concessions with the support of the AGMV, aiming to mitigate the effects of heat and air pollution while preserving existing forest ecosystems which sequester carbon and reduce greenhouse gas emissions;

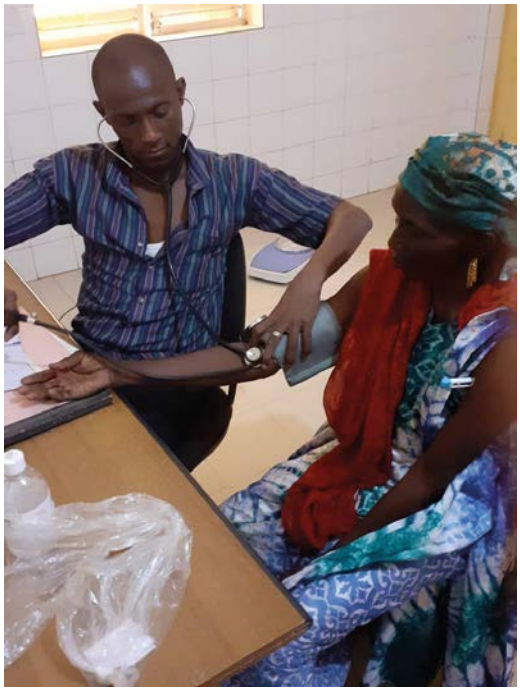
- promoting the construction of heat-adapted habitats with low-carbon buildings, allowing the use of bioclimatic architecture principles based on local materials as per the framework of the Nubian Vault Fouta Programme with the support of the Yvelines department, the Nubian Vault Association, the Partnership Association and the Maison des Yvelines;

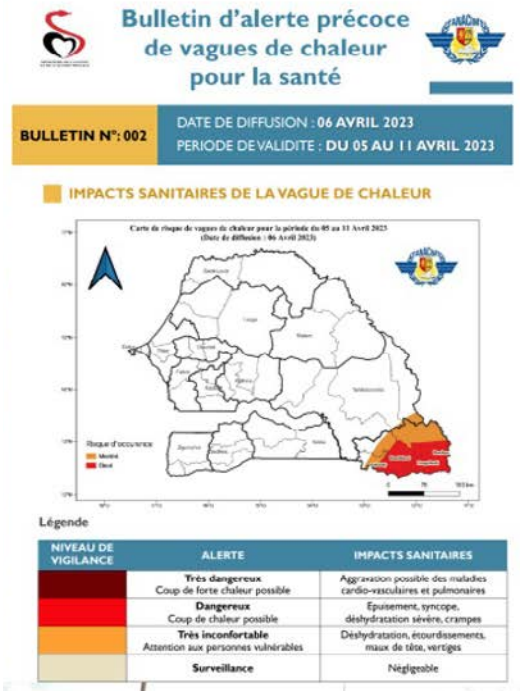
- the implementation of a strategy of free medical consultations with the support of the Observatoire Homme-Milieu International (OHMI), offering care for climate-sensitive diseases such as acute respiratory infections, cardiovascular diseases, high blood pressure, asthma and diabetes to reduce health risks linked to heatwaves;

- strengthening the surveillance of vulnerable and at-risk groups (the elderly, young children, pregnant women, etc.) and using alerts to warn these groups of rising temperatures and heatwaves in order to minimise health risks such as dehydration, heat stroke, hyperthermia, fevers and influenza.

Inspired by other experiences in setting up early warning systems for agriculture, artisanal fisheries, maritime navigation and flood management, the heatwave adaptation initiative in Widou Thiéngoly was carried out using an intersectoral approach involving different institutions with well-defined responsibilities in the actions implemented. These institutions included the DPC, ANACIM, NOAA,

Picture board 3: Local community adaptation practices for health risks resilience in Widou Thiéngoly





Source: Author (2023)

UCAD, UGB, CSE, the Ministry of Health and Social Action (MSAS), CRNS, AGMV and local community organisations such as the CDS and ASUFOR.

Main outcomes of action/project

The adaptation practices and strategies implemented by the community of Widou Thiéngoly with the support of a range of organisations have enabled the population to adapt to climate change and increase their resilience to health risks. The following elements outline the main results of this community's experience:

- capacity building in heatwave health risk management through awareness campaigns and messages organised in collaboration with health staff, community leaders and other local actors to reach a wider audience;
- consideration and integration of health sector adaptation strategies at the local level through improved knowledge and capacity building in the prevention of climate-sensitive diseases;
- improved knowledge on the importance of climate services in the fight against climate-sensitive diseases with the improvement of knowledge on the use of climate information facilitated by the creation of a network for sharing the early warning bulletin;
- reduced morbidity of climate-sensitive diseases and the improved health and well-being of the community as a result of free consultation campaigns to monitor climate-sensitive diseases;
- strengthening community resilience to health risks associated with heatwaves via early detection of signs and symptoms of dehydration, such as intense thirst, headache, fatigue and confusion, malaise, dizziness, nausea or vomiting;
- reduction of the harmful effects of rising temperatures with reforestation actions, contributing to the mitigation of health impacts on the community.

Co-benefits of the action/project

The adaptation practices and strategies implemented by the community of Widou Thiéngoly to adapt to climate change and increase the population's resilience to health risks have generated a number of co-benefits:

- reducing the burden of climate-sensitive diseases (high blood pressure, hyperthermia, heart problems, asthma, fevers, heat stroke, syncope, pneumonia), leading to improved community health status and reduced health costs for households and the health system;
- reforestation combats the effects of temperature increase by conserving ecosystems and land, sequestering carbon, reducing greenhouse gas emissions and developing income-generating activities;
- the construction of bioclimatic buildings offers many economic and ecological advantages by allowing the construction of solid and durable houses offering thermal, acoustic and aesthetic comfort at a lower cost than 'traditional' constructions;
- improving community capacity to address climate change in local activities contributes to the governance of climate action at a national level.

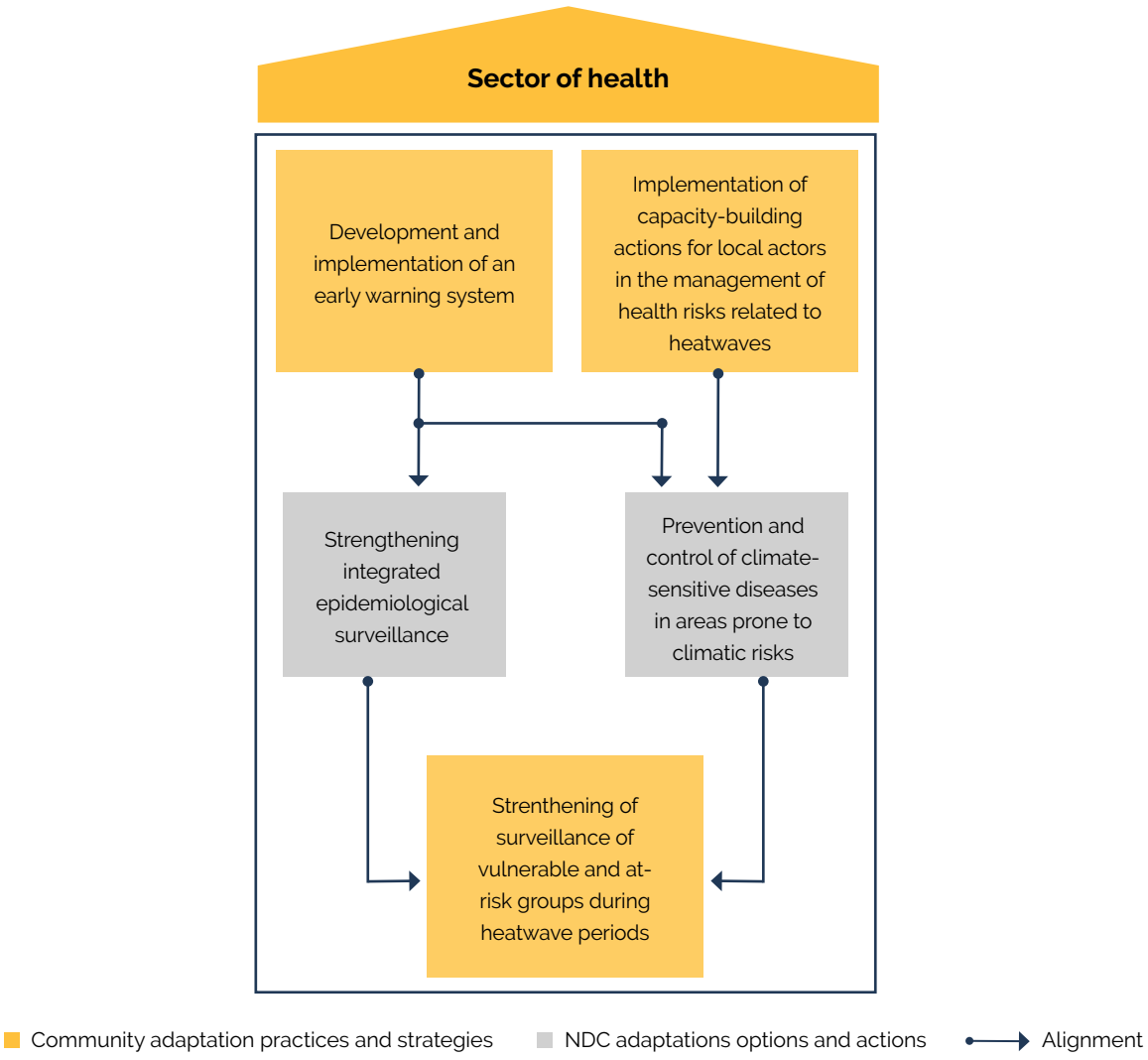
Connection/alignment to NDCs/national policies, strategies and actions

As demonstrated in Figure 8, Widou Thiéngoly's actions to combat health risks due to climate change are well aligned with the key adaptation options of the health sector of the NDC. However, according to key informants, the level of consideration given by central government (national climate

policies) to the LLA needs of this community remains weak to very weak for a range of actions: facilitating direct access to climate finance and decision-making; predictable funding to implement adaptation actions; building capacity in understanding climate risks and uncertainties; enabling transparency in the financing, design and implementation of climate change programmes; improving the climate resilience of women and vulnerable people; building resilience and promoting livelihoods for young people; managing health risks related to climate change impacts; and integrating gender aspects in climate action.

On the other hand, the informants rated the following areas as satisfactory to very satisfactory: the

Figure 8: Alignment between local community adaptation strategies from Widou Thiéngoly and NDC adaptation options for health sector



Source: Author's construct (2023)

participation of the government actions in the community to address the inequalities faced by women; accessing indigenous, local and scientific knowledge and information needed to inform adaptation decisions; providing climate services for early warning and disaster risk management; and promoting gender-sensitive sustainable forest and integrated water resources management.

Lessons learned and best practices

The experience of LLA conducted by the community of Widou Thiéngoly suggests a number of lessons learned and best practices to highlight:

- local communities have the capacity to adapt to the health impacts of climate change with endogenous practices when they have access to reliable and timely information for action;
- early warning systems based on easy-to-understand and ready-to-use climate services are one way to prevent climate-related health risks;
- good coordination and synergy between academic institutions, technical services and communities is one of the keys to the success of a community-based resilience model to climate-related health risks;
- early warning systems for grassroots communities are easier to use if the messages are in text and voice;
- the internalisation and institutionalisation of the use of climate information has been integrated in community healthcare;
- capacity building and awareness raising are the drivers for successful community engagement and mobilisation;
- lack of material and financial resources to support the dynamic mobilisation of key actors around the implementation of early warning systems is a limitation to the impact of the intervention;
- it is difficult to raise awareness of health risks and protection measures in an essentially pastoral and mobile population such as Widou Thiéngoly.

Limitations and challenges

According to feedback from key informants and the review of relevant documents, the Widou Thiéngoly experience on LLA conducted by the community has some limitations and challenges:

- the low technical and financial capacity of the local actors involved in the initiative limits the potential to ensure the sustainability of local adaptation to climate change;
- the limited efficiency and performance of the heatwave early warning system requires the establishment of an automated platform for monitoring climate-sensitive diseases;
- the weak integration of local adaptation in the priority options of the health sector in the NDC demands the authorities' awareness of climate impacts on human health;

- in order to improve the early warning system, the difficulty of accessing daily morbidity data to determine an alert threshold according to biometeorological parameters requires collaboration with health actors at the health structure level;

- the multifactorial impacts of heatwaves impose the need to integrate the value chain issue across sectors and jurisdictions by collaborating with agriculture, livestock, fisheries and trade.

Entry points and opportunities

The health sector's documented local adaptation initiative has raised confidence that communities are aware of climate risks, and are active participants in changing their situation. This underscores their role as agents of change in their respective communities, and will in the long run contribute to better policies and plans.

From the perspective of improving LLA implementation by communities with the support of technical structures, the following entry points and opportunities could be considered:

- the implementation of the NAP for the health sector, which was developed in March 2023 with the support of the UNDP-led NAP-GEF project, integrating the adaptation needs of the target regions (Ziguinchor, Kédougou, Kaffrine, Matam and Saint-Louis). The health NAP has been broken down into several ideas for climate-resilience projects in the health sector. These take into account the adaptation practices and strategies of communities in the priority areas to be submitted to different climate funds. This is an opportunity to support adaptation micro-projects implemented by local health workers and community-based health surveillance;

- the development of a health system and community-resilience project by Save the Children and MSAS under evaluation by the GCF to be implemented in the five target regions of the NAP-GEF (Ziguinchor, Kédougou, Kaffrine, Matam and Saint-Louis). This proposal integrates the needs of communities for locally driven adaptation, including local epidemiological surveillance practices and strategies;

- the implementation of the World Health Organization COP26 commitments on climate change and health. MSAS and the Country Representative are working on this roadmap. Ultimately it will lead to the development of the National Health Adaptation Plan (NHAP) and the proposal of a project for the resilience of the health system and communities to the impacts of climate change. The implementation of the recommended adaptation options should integrate communities' needs for locally driven adaptation;

- the implementation of the Community Health Strategy Plan (CHSP) of MSAS, which sets out the health policy at the level of the health districts, with strong involvement and mobilisation of local communities. This strategy, which also addresses the issue of health determinants, including the environment and climate change, would be a good opportunity to take into account communities' locally directed adaptation needs;

- the existence of numerous training and research programmes on climate issues and challenges for the health sector within institutions such as national universities and research centres. These

programmes increasingly take into account endogenous adaptation strategies and practices as well as the needs of communities for climate resilience in the health sector through the African Centre of Excellence for Health, Environment and Societies (AGIR) and the Regional Disease Surveillance Systems Enhancement (REDISSE).

Synthesis, analysis and summary of the key findings emerging from the case studies

Findings from the documentation of the three case studies on LLA for the NDC priority sectors of agriculture, coastal zones and health show that the impacts of climate change on production systems, livelihoods and social well-being are the main sources of motivation for communities to engage and mobilise for climate action.

With the support of national institutions and development organisations, communities are organising, developing and implementing adaptation strategies in the agriculture, coastal zone and health sectors. These strategies have produced results that contribute to building the resilience of target groups to climate change impacts. The different results of LLA in the Daga Birame, Dionewar and Widou Thiéngoly areas also present clear co-benefits for climate action at both the community and national levels. In most cases, the strategies developed by the populations are also well aligned with the adaptation options of the NDC priority sectors of agriculture, coastal zones and health. However, in terms of the development and implementation of policies related to climate change, these adaptation practices and strategies have a generally low level of consideration in the actions of the central government. This is partly as a result of constraints related to direct access to climate finance and the strengthening of technical and organisational capacities in the implementation of climate policies at the local level.

Nevertheless, the lessons and best practices learned from these three case studies demonstrate the real capacity of communities to identify and implement key adaptation strategies that can contribute to improving the effectiveness and efficiency of climate action in the country.

Given the alignment between the adaptation options of the NDC, the Local Development Plans (LDPs and Communal Development Plans [CDPs]) and the SDGs, the question remains as to how to make LLA one of the pillars, drivers or levers of climate action in Senegal. In this perspective, the launch of the Local Climate Adaptive Living Facility (LoCAL) initiative can serve as an opportunity to integrate climate change adaptation into local government planning and budgeting systems by connecting scientific research to the identification and documentation of experiences and best practices of community-led adaptation, and how these can be capitalised on to the benefit of adaptation processes at the national and community levels.

SECTION FOUR

General analysis and discussions

What constitutes LLA in Senegal?

According to the GCA and the World Resource Institute (WRI), LLA is the process by which individuals, communities, networks, organisations, private entities and governments set their own agendas, develop solutions to climate change adaptation and provide the capacity, leadership, and resources to make these solutions a reality.[51] Additional definitions note that LLA involves the support of local capacities to design, implement, monitor and maintain measures, including the management of financial resources to develop long-term sustainable outcomes and institutional capacities.[52] Others have argued that in LLA processes, local actors decide which local adaptation technologies to implement, which approaches to advocate for and which actors to mobilise to provide climate planning and improved institutional capacity.[53] These changes can directly benefit the target populations and create conditions for the flow of climate adaptation finance from national to local governments, thereby improving the health and well-being of vulnerable communities.[54]

In Senegal, stakeholders in climate action, including decision-makers, local representatives, technical experts, development practitioners and the research community, share a common vision of adaptation that is very close to, or even inspired by, the IPCC conception and organisations such as the UNDP, FAO, GCA and WRI, which consider this issue as a coherent and coordinated response to the climate challenge. The term 'local' in LLA emphasises the importance of community participation, ownership and empowerment in developing and implementing adaptation strategies. Further, findings from this research reveal that LLA strategies exhibit unique characteristics, vulnerability-reducing actions, resilience-enhancing strategies and delivery mechanisms that can be distinguished from the traditional/business-as-usual approaches. These include:

- LLA practices are participatory, meaning that community members are actively involved in the planning and implementation of the adaptation measures and interventions, with positive impacts on their climate resilience.
- LLA strategies often involve a range of different combinations of measures, rather than relying on a single solution. These measures also make use of traditional knowledge and practices, which can be critical in ensuring that the measures are appropriate and effective.
- LLA strategies also often prioritise the most vulnerable members of the community, such as women, children and the elderly. These strategies include measures such as improving food security and strengthening social networks and community resilience.
- LLA strategies also typically utilise local knowledge, leadership, expertise and capacity to reduce vulnerability and enhance resilience to the impacts of climate change.

Overall, many segments of Senegalese society are adapting spontaneously to climate change. This in contrast to the anticipated and planned adaptation in the medium and long term supported by a large number of the stakeholders in climate action in Senegal, who appear to ignore the spontaneous, individual and community adaptation applied by a large part of the population. The perspectives and dynamics of adaptation solutions call for the integration of both the planned and anticipated dimension and the reactive, spontaneous and community dimension. Furthermore, the issue of climate change adaptation is blended with sustainable development objectives and priority economic and social investment policies with a sectoral approach, including key areas such as agriculture and food security, water resources, disaster risk reduction, coastal zones, infrastructure,

health and biodiversity. Each of these raises enormous needs in terms of technical, scientific, organisational and financial capacities. However, despite the value and importance of these local efforts in climate and development actions, they are often not incorporated into national and global solutions. In view of this, it is critical that local adaptation actions are documented and capitalised upon in order to facilitate adaptation solutions at the national, regional and global levels, when appropriate.

LLA implementation in national and local climate actions

Findings emerging from this research show that LLA is crucial to national and local climate change actions as it recognises the need to involve local communities and their knowledge, needs and aspirations in the development and implementation of climate change adaptation strategies. It acknowledges that local communities are often the most vulnerable to climate change impacts and that they possess valuable knowledge and experience of their local environment. Moreover, LLA ensures that adaptation strategies are tailored to the specific needs of local communities and are culturally appropriate, socially acceptable and economically feasible.

Further, findings from our research show that key adaptation sectors in the NDC, such as agriculture, livestock, fisheries, coastal zones and health, have experienced locally driven adaptation characterised by the development of strategies and practices by communities with the support of technical services, civil society and NGOs. Indeed, communities very early on spontaneously mobilised to invent so-called soft and nature-based adaptation solutions to adapt to the impacts of climate change even before the intervention of state authorities. Some of these solutions can be classified as LLA strategies.

Thus, LLA is crucial to the current debates and discussions on national climate change actions. It provides an entry point for empowering local communities to take ownership of their adaptation strategies and become active participants in climate change actions. It also fosters community ownership and empowerment and ensures that the people most affected by climate change have a say in how their communities respond. LLA further recognises that local communities have the best understanding of their environment and are well positioned to identify and implement effective adaptation strategies. LLA actions can therefore enhance the effectiveness of climate change actions by ensuring that adaptation strategies are targeted, needs-responsive and efficient.

Furthermore, LLA ensures that adaptation strategies are sustainable by aligning them with the social, economic and cultural needs of local communities. This approach increases the likelihood that adaptation measures will be adopted and maintained over the long term, and stands a better chance of strengthening the resilience of local communities by enabling them to identify and address their vulnerabilities to climate change impacts.

While the main findings from the case studies in Daga Birame for the agriculture sector, in Dionewar for the coastal zone sector and in Widou Thiéngoly for the health sector demonstrate that the strategies developed by the communities are well aligned in most cases with the adaptation options of the priority sectors of the NDC, these community adaptation practices and strategies are generally not taken into account in the actions of the central and local governments. This is due to obstacles or constraints related to direct access to climate financing and technical and organisational capacity building in the implementation of climate policies. In addition to the lack of funding, other structural factors may also be considered, such as the institutional problem posed by climate governance, which is incapable of effectively integrating the adaptation practices initiated by communities.

In Senegal, the climate actions planned in the framework of the NDC and the NAP are aligned and coherent with the economic and social development policies in the framework of the PSE, SDGs, CDPs and Departmental Development Plans (DDPs). In this framework, adaptation to climate change has been considered a priority and a cross-cutting issue to be integrated in interventions at different national, regional and local levels. However, this dimension of climate change adaptation is still poorly reflected in activities and budgets in development policy planning processes such as the Multiannual Expenditure Planning Documents (MEPPDs). Addressing challenges and issues related to access to technical capacities and funding to plan and implement adaptation projects at the local level, municipalities and local representatives play an important role in adapting to climate impacts in the context of decentralising climate action by facilitating better consideration of climate issues and the development of local initiatives to combat climate change.

The main findings from the case studies for agriculture, coastal zones and health sectors show an alignment of communities' adaptation practices with the NDC's priority adaptation options, proving that indigenous and expert types of knowledge combine to solve local problems in combating the impacts of climate change. This situation should lead us to reflect on the power dynamics between actors in the different knowledge systems and on the mechanisms for ensuring that local knowledge is properly integrated into Senegal's adaptation planning process.

Gaps, challenges and barriers to LLA in Senegal

Despite the significant contributions and added value of LLA demonstrated in the case studies, endogenous practices and strategies are not sufficiently taken into account by institutional climate governance mechanisms. The reasons for this may lie in the low level of knowledge of endogenous adaptation strategies and practices, which are often poorly documented. There is also a lack of involvement from institutions capable of providing communities with long-term support, and the weakness or rigidity of climate governance systems do not give priority to LLA.

Climate change is perceived by national stakeholders in climate action as a disrupter of the economic and social development process to which sectors and territories have to adapt in the context of a low capacity for resource mobilisation. However, the analysis of the implementation process of climate action and adaptation policies in Senegal highlights a number of gaps and barriers related to:

- poor integration of climate risks in the planning of sectoral development policies;
- inequalities in access to climate financing between priority adaptation sectors and vulnerable territories;
- the weakness of technical and scientific capacity to transfer and take ownership of innovative adaptation strategies with a high impact on communities;
- the low consideration of communities' and local actors' adaptation needs;
- the lack of a framework to monitor and evaluate performance in climate policies' implementation, such as the MRV system.

Adaptation to climate change in Senegal raises three principal challenges in relation to the NDC

implementation according to the country priority sectors.

The first challenge concerns access to evidence-based knowledge on climate change to inform climate policies by connecting the science produced by the research community and the action of practitioners on the ground. This could be achieved through the development of climate services, the training of a critical mass of experts, support for vulnerability and adaptive capacity assessments, and adaptation plans for sectors and territories.

The second challenge lies in the weakness or absence of climate change considerations in the planning and implementation of economic and social development policies, which raises the question of equity and climate justice across sectors and territories. For a long time, climate change adaptation planning, in particular the NAPA and national communications on climate change, have been processes isolated from sectoral and territorial development policies and plans. In Senegal, the compartmentalised implementation of development policies and NAPs has been an obstacle to the integration of climate change. Indeed, studies carried out in the framework of the 2021 NAP-GEF project have shown that climate change is weakly or unevenly integrated into sectoral development policy planning documents and local development plans.

The third challenge relates to taking into account endogenous adaptation practices developed by local communities that global climate action tends to neglect. This is despite the evidence from key sectors such as agriculture, livestock, fisheries, coastal zones, floods, biodiversity and health, which should prompt a paradigm shift to integrate the lived experiences and initiatives of these populations without the assistance of central or local government.

Adaptation priorities and needs will depend on the capacity of stakeholders in sectors and territories vulnerable to the impacts of climate change to integrate the climate risk dimension into national and local development policy planning, in accordance with the country's priorities.

Opportunities and entry points

The experiences of LLA documented through these case studies are extensible and replicable to communities living in similar contexts. To do this, it is necessary to capitalise on the lessons learned and best practices by highlighting the co-benefits of LLA for climate action in Senegal, and to revise sectoral and territorial development policy documents in order to integrate successful experiences into local adaptation practices and strategies.

In the process of national and local climate action implementation with NDC, several initiatives have been identified as opportunities to address climate challenges, such as:

- the willingness of the state to establish a framework for harmonising climate and national economic development policies and a climate-sensitive budgeting mechanism to facilitate the integration of climate change into the planning and implementation process of sectoral development policies. Indeed, the lack of financial resources at the central government level has meant that the issue of adaptation has long been relegated to second place among the priorities of economic and social development policies;

- the development of climate change adaptation planning documents at the local level, such as

the NAP, ITCP, PLACC and PROGEP, supported by development cooperation agencies such as UNDP, USAID, GIZ, AFD, and civil society and private organisations (CSE, ENDA Energy, IPAR);

- the revision of Local Development Plans (PDC and PDD) to integrate climate change adaptation into the planning and budgeting process with the support of the NAP Global Environment Facility (PNA-FEM) project. One of the recommendations of the integration guide of the Ministry of Territorial Governance is to take into account local and endogenous knowledge on climate change adaptation in the agricultural sector;

- the existence of numerous projects and programmes that implement sustainable development actions with adaptation value, such as the Community Development Emergency Plan (PUDC), the City Modernization Programme (PROMOVILLE) and the Food Security Support Project (PASA), supported by donors such as the ADB and the World Bank;

- the implementation of the strategy for integrating climate change into the national education sector of the MEDDTE with the support of AFD, which aims to strengthen training and research in Senegalese universities in order to take climate issues into account. One of the important recommendations of this strategy is to take into account the adaptation needs led locally by communities for different sectors, including agriculture;

- the favourable international context with the establishment of several facilities to mobilise financing for adaptation, notably the AF, GCF, GEF, the Climate Change Fund for Africa (CCAF) and the GCA;

- the implementation of the AfDB CCAF project to remove barriers and build the technical capacity of local actors to access climate finance. This initiative places particular emphasis on locally driven adaptation to better address the needs of communities in the agriculture sector;

- the launch of the LoCAL initiative. This serves as a mechanism to integrate climate change adaptation into local government planning and budgeting systems and increase awareness and responses to climate change at the local level through the PDC and PDD, along with the adaptation options of the priority sectors of the NDC and the NAP;

- the need to build on a research initiative to connect science to climate action at the local level in order to have more impact on climate change adaptation in local communities. Such an initiative would identify, document and capitalise on experiences and best practices in community-led adaptation to support the adaptation process at the local level and guide the capacity building of local actors and the financial resource mobilisation strategy;

- the need for LLA research provides a good opportunity to link the LoCAL initiative with APRI's 'Climate Adaptation, Strategies, Practices and Initiatives: Issues and Pathways in Senegal' project for connecting science to action and guiding mobilisation funds for local governments.

Adapting to the changing climate requires not only understanding future climate projections and risks, but also implementing projects and programmes to ensure Senegal's development is sustainable and resilient. In order to address the vulnerability of production systems and key social sectors, the State of Senegal has developed adaptation measures according to priority areas through the NDC and the NAP. These align with the economic and social policies set out in the PSE and the Agenda 2030 SDGs. The interconnection between climate action and national development policies explains why adaptation is perceived by stakeholders as an important dimension of sustainable development that contributes to the resilience of production systems and social sectors.

Although climate change is a global issue, its impacts are experienced locally. LLA strategies are therefore essential for ensuring that the most vulnerable communities are not left behind and have a say in decisions that affect their lives. However, adaptation initiatives are typically not led by local communities. Local people and organisations that are most affected by climate change are often excluded from decision-making processes that address its impacts, resulting in top-down approaches driven by more powerful actors such as funders, large intermediaries, international organisations and central governments. It is crucial to shift towards LLA to ensure effective and sustainable adaptation to the impacts of climate change. Our research highlights the critical importance of LLA in Senegal as a means of enhancing climate change resilience, reducing vulnerability and promoting sustainable development.

Findings from LLA in Daga Birame, Dionewar and Widou Thiéngoly present clear co-benefits for climate action at both the community and national levels. The strategies developed by these populations are well aligned in most cases with the adaptation options of the CND priority sectors of agriculture, coastal zones and health. However, these strategies have a generally low level of consideration in the actions of the central government in terms of the implementation of policies related to climate governance.

Relevant lessons learned and best practices from the three case studies on LLA initiatives demonstrate the real capacity of communities to identify and implement key adaptation strategies that can contribute to improving the effectiveness and efficiency of climate action in the country. However, limits to access to climate finance and technical capacities must be addressed.

As Senegal continues to develop policies, strategies, actions and other initiatives to respond to the impacts of climate change, the following are some suggested pathways through which the NDC can be utilised to deepen LLA as part of its implementation across the country: i) recognise and support local climate change practices, strategies and initiatives; ii) foster community participation and ownership in climate actions; iii) promote the integration of indigenous and local knowledge in NDC adaptation strategies; iv) increase financial and technical support to community adaptation strategies; v) address gender and social inequalities in the implementation of adaptation priorities; and vi) ensure coherence and coordination between stakeholders at the national and local levels.

The research has identified a range of challenges, barriers and opportunities for promoting LLA in Senegal. These include the need to address institutional and governance challenges, enhance

Conclusion

access to financial resources and leverage the socio-cultural and economic motivations of communities to support LLA efforts. The research further highlights that greater attention to LLA could strengthen Senegal's climate action by ensuring that such efforts incorporate traditional knowledge, practices and systems which have been developed over generations and have proven to be sustainable.

While Senegal has made significant progress in developing climate policies, strategies and initiatives, this study has shown that the rate and scale of adaptation progress at the national and local level is not enough to keep up with the growing needs of communities. For example, community-led adaptation, including endogenous climate change knowledge and know-how, is not yet reflected in adaptation strategy planning documents such as the NDC and NAP. This is despite the alignment between local adaptation strategies and practices and the adaptation options of priority sectors. In this respect, there is a need to enhance the coherence and alignment of these efforts with LLA practices across the different ecological zones of the country.

The research underscores the critical importance of engaging with local communities and promoting their active participation in the design and implementation of climate change policies and strategies. By empowering communities to lead their adaptation efforts, Senegal can develop more effective, inclusive and sustainable climate policies that respond to the needs and priorities of its most vulnerable populations.

In conclusion, the significant evidence from the documented experiences of LLA, as yielded by the case studies, should convince climate policy makers of the relevance of local adaptation solutions, based on endogenous knowledge, which strengthen the resilience of vulnerable communities to the impacts of climate change.

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