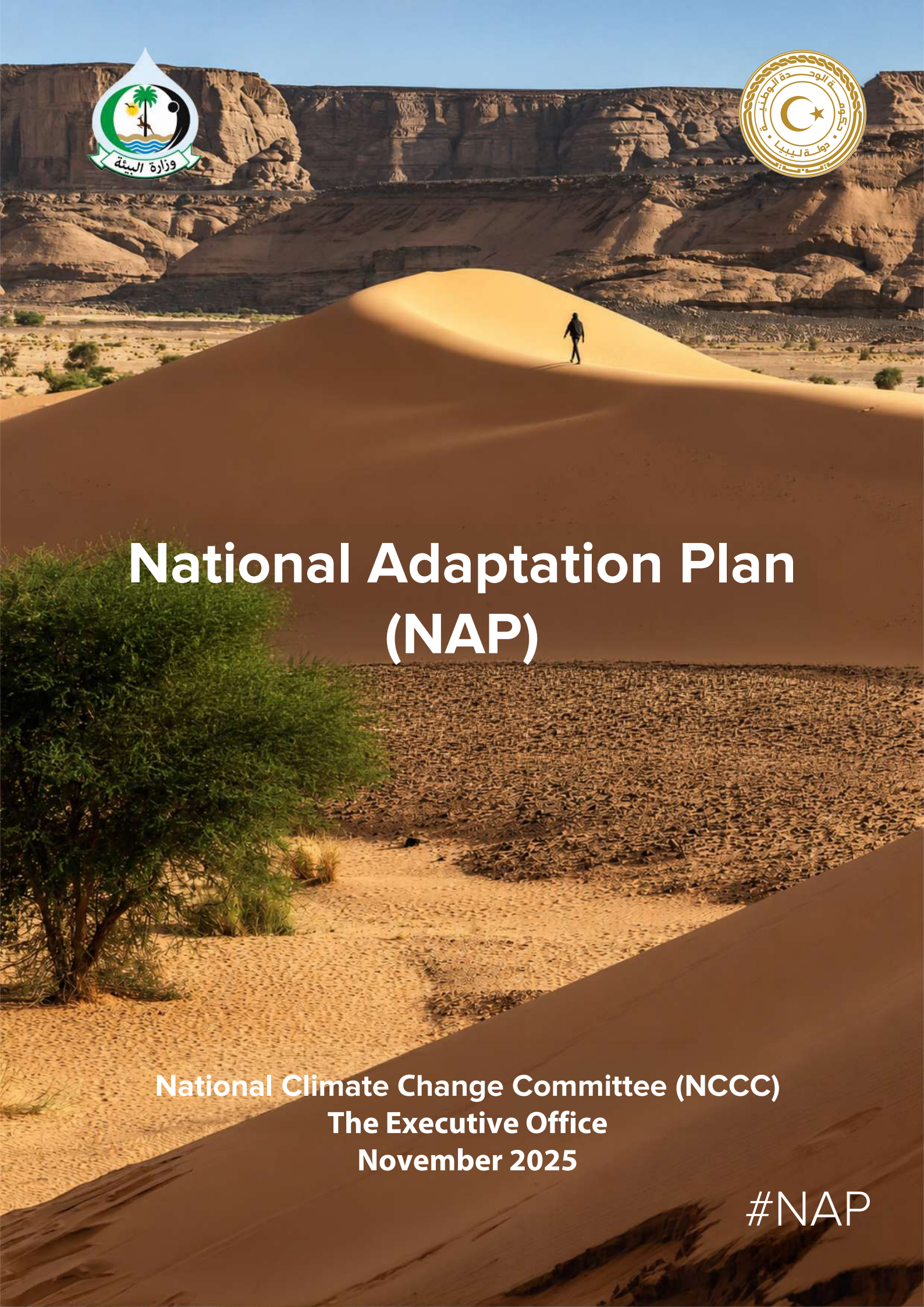


National Adaptation Plan (NAP)

National Climate Change Committee (NCCC)
The Executive Office
November 2025

#NAP

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Government
of National Unity

Endorsement of the National Climate Documents in the State of Libya

The Government of the State of Libya hereby endorses the National Adaptation Plan (NAP) as official national document. This document reflect Libya's commitment to climate action and sustainable development, while advancing the country's national priorities.

This document was prepared with the support of the Government of National Unity through the Ministry of Environment, in collaboration with relevant national institutions and stakeholders, through an inclusive and consultative process. They provide a national framework to guide the implementation of climate change actions and contribute to fulfilling Libya's national and international commitments.

By virtue of this endorsement, This document is approved for official use and shall serve as the national reference for the implementation of climate-related policies and measures in the State of Libya.



Mr. Abdul Hamid Dbeibah
Prime Minister of the
Government of National Unity

Signature:

Date: __ / __ / __

Official Stamp:

Acknowledgement

The Ministry of Environment (MoE) of Libya, on behalf of the Government of Libya, extends its sincere gratitude to all contributors to the development of Libya's first National Adaptation Plan (NAP). This Plan represents a collective national effort to advance climate resilience, sustainable development, and social inclusion across Libya.

Special thanks are extended to members of the National Climate Change Committee (NCCC) and its Executive Office (EO-NCCC) for their leadership and coordination, as well as to the Sectoral Adaptation and Climate Change Committees (SACCCs) from the Ministry of Agriculture (MoA), the Ministry of Water Resources (MoWR) and the biodiversity department within Ministry of Environment(MoE), who provided valuable input. Their collaboration ensured that national priorities were effectively aligned with sectoral and local realities.

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Appreciation is further extended to representatives from civil society organizations, academia, women and youth groups whose engagement and insights enriched NAP's inclusiveness and relevance.

This NAP is the product of shared vision, national ownership, and collaborative effort toward a climate-resilient and sustainable future for Libya.

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Executive Summary

Libya's National Adaptation Plan (NAP) represents a decisive step towards building a resilient, inclusive, and climate-adaptive society. As one of the most climate-vulnerable countries in the Mediterranean and North African region, Libya faces escalating risks from extreme heat, prolonged droughts, urban floods, sea-level rise, and ecosystem degradation. With over 95% of its landmass classified as arid or hyper-arid, and a 1,770 km coastline exposed to multiple coastal hazards, climate change threatens not only natural systems but also national development, public health, and social cohesion.

This NAP has been developed through a nationally driven, evidence-based process that integrates the findings of the 2025 Climate Risk Assessment (CRA) and reflects Libya's commitments under the Paris Agreement, the Global Goal on Adaptation (GGA), and the Sendai Framework for Disaster Risk Reduction. It provides a strategic framework for the medium- and long-term planning and implementation of adaptation actions at national, sectoral, and local levels.

Strategic Vision

The NAP envisions a climate-resilient Libya that proactively manages risk, restores ecological systems, and promotes equitable and sustainable development. Adaptation is framed not merely as a reactive response, but as a pathway for transformation grounded in science, inclusion, and intersectoral cooperation.

Key Vulnerabilities and Risk Hotspots

The CRA identifies five Climate-Related Risk Regions (C-RRR), each with specific exposure and vulnerability profiles. Critical challenges include:

- Aquifer depletion and salinization in R1 and R2 due to drought, overextraction, and ecosystem degradation.
- Rural out-migration and food insecurity in R3 and R4 as rainfed agriculture becomes increasingly unviable.
- Storm surges, coastal erosion, and urban flooding threatening critical infrastructure in R1 and R5.
- Limited participation of vulnerable groups, including women, youth, internally displaced persons (IDPs), and local communities, which constrains adaptive capacity.

Priority Adaptation Measures

Based on multi-criteria analysis and stakeholder validation, the NAP defines 14 Priority Adaptation Measures across water, agriculture, biodiversity, health, infrastructure, and institutional governance. Key strategic priorities include:

1. **Water security:** modernization of the Man-Made River (MMR), aquifer protection, desalination, and reuse systems.

2. **Resilient food systems:** drought-tolerant crops, climate-smart irrigation, and rural adaptation support.

3. **Coastal and urban resilience:** integrated coastal zone management, flood control infrastructure, and urban planning reform.

4. **Biodiversity and ecosystem protection:** restoration of degraded lands, conservation corridors, and nature-based solutions.

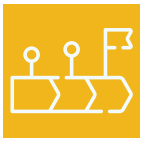
5. **Inclusive governance:** operationalization of the National Climate Change Committee (NCCC), establishment of SACCCs, and participatory planning at municipal levels.



Institutional Architecture and Enabling Environment

The NAP is backed by an evolving institutional framework involving:

- EO-NCCC for national coordination.
- SACCCs for sectoral integration.
- Territorial Adaptation Action Plans (TAAPs) for localized action.
- Legal and policy reforms to align adaptation planning with development, land-use, and environmental laws.



Financing Strategy and Investment Roadmap

The NAP presents a phased Adaptation Investment Roadmap, combining domestic resource mobilization, public budgeting integration, and access to international climate finance (GCF, GEF, AF). It outlines enabling conditions for investment, such as:

- Climate budget tagging.
- Bankable project pipelines.
- MRV systems for adaptation finance.
- Multi-actor financing platforms and public–private partnerships.



Monitoring, Evaluation, and Learning (MEL)

A robust MEL system is embedded within the NAP to track implementation, ensure accountability, and support learning. It incorporates:

- Sector-specific and cross-cutting indicators.
- Integration with the national statistical system and ETF reporting.

Participatory evaluations and feedback mechanisms to adjust pathways as needed.
The Libya NAP is both a strategic roadmap and a commitment to climate justice, resilience, and sustainable development. It reflects the national will to transition from vulnerability to strength, from fragmentation to integration, and from reactivity to transformation, anchored in scientific evidence, grounded in Libyan realities, and aligned with global responsibility.

Part I. Introduction and Strategic Orientation

Libya is among the countries most exposed to the multifaceted impacts of climate change in the Mediterranean and North African regions.

Over 95% of its territory is classified as arid or hyper-arid, while its 1,770-kilometre Mediterranean coastline faces increasing vulnerability to sea-level rise, coastal erosion, and salinization. This ecological fragility is further compounded by demographic pressures, institutional fragmentation, and decades of unsustainable resource use. Climate-related hazards, such as prolonged droughts, extreme heatwaves, intense urban flooding, seawater intrusion, and desertification, are becoming more frequent and severe, placing growing stress on water availability, agricultural productivity, public health, and fragile ecosystems.

The 2025 Climate Risk Assessment (CRA) for Libya identified five Climate-Related Risk Regions (C-RRR), each with distinct exposure and vulnerability profiles. These findings highlighted not only spatial and sectoral disparities in climate impacts, but also significant gaps in institutional response capacities. The devastating 2023 Derna floods exemplified these systemic weaknesses, particularly in early warning, land-use planning, and disaster preparedness.

Furthermore, Libya's vulnerability is heightened by its socio-political landscape: recurrent conflict, weak public institutions, and limited fiscal space constrain adaptive governance and threaten the continuity of adaptation efforts. Nevertheless, recent progress, such as the formulation of an updated NDC, the launch of the 2025–2050 Water Security Strategy, and the national stakeholder validation of 14 priority adaptation measures, demonstrates a renewed commitment to advance toward long-term climate resilience.

The formulation of the National Adaptation Plan (NAP) responds to Libya's urgent need to establish a coherent, country-owned, and forward-looking framework for adaptation. It consolidates and builds upon existing sectoral initiatives while addressing structural constraints, such as fragmented planning, limited data availability, and weak cross-sectoral coordination, that hinder effective adaptation implementation.



Photo credit: Malek Elmaghrebi

Specifically, the NAP serves to:

- Provide a structured, long-term strategy for climate adaptation that aligns with Libya's Vision 2030, the Sustainable Development Goals (SDGs), and the Sendai Framework for Disaster Risk Reduction.

- Operationalize the adaptation commitments under Article 7 of the Paris Agreement and contribute to the Global Goal on Adaptation (GGA) by enhancing resilience, reducing vulnerability, and strengthening adaptive capacity across sectors and communities.

- Integrate climate risk and vulnerability considerations into national, subnational, and sectoral planning and budgeting processes.

- Catalyse the mobilization of international climate finance (e.g., GCF, GEF, AF) by identifying concrete, evidence-based adaptation priorities and project pipelines.

- Guide investments in data systems, institutional capacities, and community-based adaptation, particularly in water, agriculture, and biodiversity, ensuring that adaptation measures are inclusive, participatory, and territorially balanced.

The development of this NAP also reflects Libya's understanding that adaptation is not merely a reactive necessity, but a transformational opportunity to promote equitable development, safeguard natural capital, and lay the foundations for climate-resilient governance.

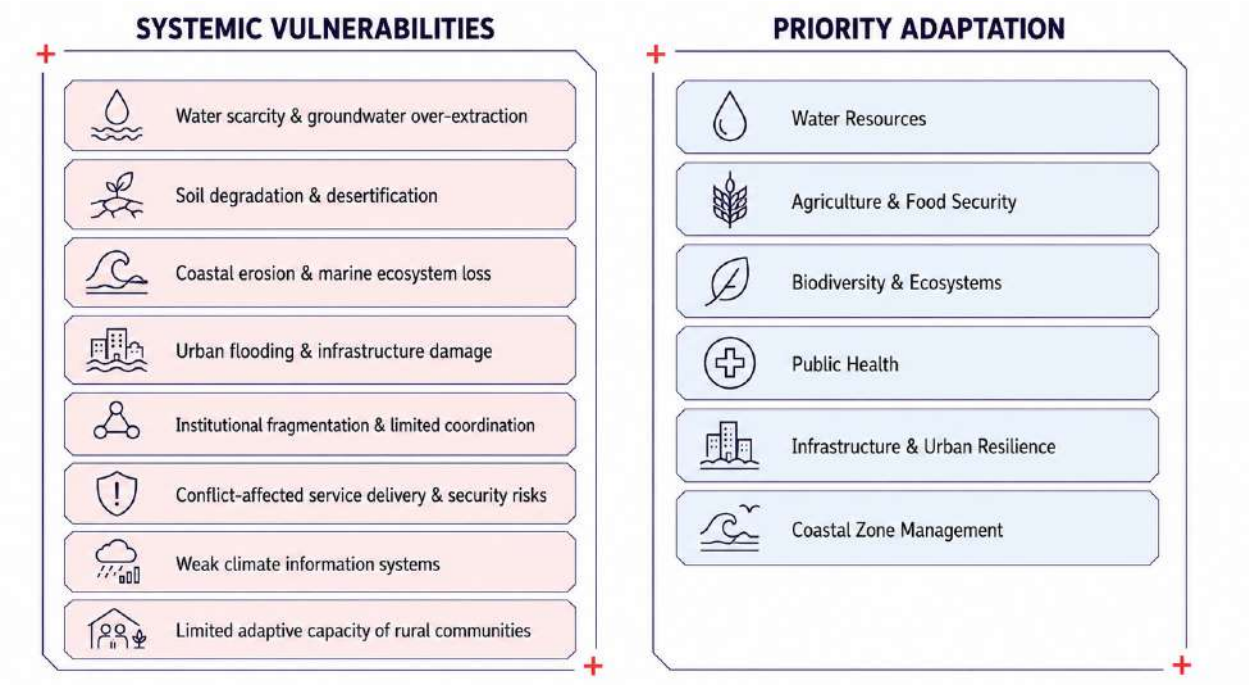


Figure 1: Systemic Vulnerabilities and Priority Sectors

1.1 Objectives and Scope of the NAP

The National Adaptation Plan (NAP) of Libya is designed to serve as a strategic and operational instrument that guides the country's efforts to reduce vulnerability to climate change and to strengthen adaptive capacity across all sectors and regions. Rooted in the principles of country ownership, evidence-based planning, and participatory governance, the NAP aims to support Libya in transitioning from isolated and reactive adaptation actions to an integrated, forward-looking framework for climate-resilient development.

The overarching objectives of the NAP are:

- To reduce the vulnerability of populations, ecosystems, and critical infrastructure to current and projected climate risks, particularly in the water, agriculture, and biodiversity sectors.
- To strengthen institutional and technical capacity for climate risk assessment, planning, budgeting, and implementation at national and subnational levels.
- To integrate adaptation systematically into national, sectoral, and territorial policies, plans, and public investment frameworks, including land-use, disaster risk management, urban development, and environmental protection.
- To ensure inclusive and just adaptation processes, with attention to vulnerable groups, women, youth, and conflict-affected communities.
- To facilitate access to international climate finance, including from the Green Climate Fund (GCF), the Adaptation Fund, and other multilateral and bilateral sources, by identifying bankable and transformative adaptation measures.
- To establish a national system for monitoring, evaluation, and learning (MEL) that tracks progress, informs decision-making, and supports reporting under the Enhanced Transparency Framework (ETF) of the Paris Agreement.

These objectives reflect Libya's commitment to the Global Goal on Adaptation (GGA) and the Sendai Framework, as well as its aspiration to link adaptation with long-term peacebuilding, ecological restoration, and socio-economic recovery.

Scope of the National Adaptation Plan.

The NAP has a medium- to long-term scope, guiding adaptation planning and implementation from the present (2025) to 2045 and beyond. It takes a phased and iterative approach, designed to evolve through continuous learning, monitoring, and updates. Its scope covers:

Thematic Scope. The NAP prioritises water security, food and agricultural resilience, biodiversity conservation, coastal protection, and the sustainable management of natural ecosystems. Cross-cutting themes include governance, science-policy integration, and climate information systems
Sectoral Scope. The NAP targets the integration of climate adaptation in key sectors: water resources, agriculture and food systems, health, ecosystems and biodiversity, infrastructure, and energy. Sectoral adaptation measures are detailed through MACC profiles and prioritized using multi-criteria analysis (MCDA).
Territorial Scope. The NAP is spatially disaggregated based on the five Climate-Related Risk Regions (C-RRR) identified in the CRA. This enables adaptation to be planned and implemented in ways that reflect regional specificities, such as coastal vulnerability, arid-zone fragility, or mountain-ecosystem degradation.

Institutional Scope. The NAP engages all levels of government, national ministries, municipalities, sector coordination committees (SACCCs), and the Executive Office of the National Climate Change Committee (EO-NCCC), alongside civil society, academia, and the private sector. It provides a platform for multi-actor dialogue and coordination.
Temporal Scope. The NAP articulates short-term (2025–2030), medium-term (2030–2035), and long-term (2035–2045) adaptation measures, sequenced by priority, feasibility, financing readiness, and territorial urgency.
By clearly defining these parameters, the NAP ensures that adaptation planning is not only strategic and aligned with Libya's development trajectory, but also actionable and responsive to the evolving climate risks that threaten national stability and ecological security.

1.2 Alignment with National and International Frameworks.

Libya's National Adaptation Plan (NAP) is firmly anchored in both its national development vision and its international climate obligations. The alignment ensures coherence across planning instruments, enhances institutional efficiency, and reinforces Libya's commitment to integrated, inclusive, and forward-looking climate governance.

Alignment with National Planning Instruments. The NAP operationalizes Libya's Vision 2030, which identifies climate resilience as a cornerstone for inclusive growth, environmental sustainability, and institutional transformation. Through its sectoral strategies and cross-cutting priorities, the NAP strengthens adaptive capacity across water, agriculture, biodiversity, health, and infrastructure systems. Specifically, the NAP is aligned with:

- **Libya Vision 2030.** Ensuring environmental sustainability and climate resilience as enablers of national development.
- **National Biodiversity Strategy (2023–2030).** Supporting ecosystem-based adaptation and biodiversity conservation.
- **Water Security Strategy (2025–2050).** Advancing integrated water governance and aquifer recharge.
- **National Strategy for Social Justice (2025–2027).** Promoting equity and climate justice.
- **Climate Risk Assessments (CRA).** Grounding adaptation actions in evidence-based diagnostics.
- **Emerging urban resilience and land-use plans.** Integrating risk-informed planning and green infrastructure.
- **Nationally Determined Contribution (NDC 3.0, under technical review).** Aligning Libya's medium-term adaptation priorities with Article 7 of the Paris Agreement, and supporting coherence across mitigation, adaptation, and finance components.
- **National Food Security Strategy (2025–2035)** – Promoting resilient food systems, rural adaptation, and sustainable land use.
- **National Strategy for Renewable Energies and Energy Efficiency (2023–2035)** – Enhancing energy resilience and enabling low-emission adaptation solutions.

This alignment facilitates the mainstreaming of adaptation into development and budgetary processes, while reinforcing cross-sectoral cooperation through platforms such as the Sectoral Adaptation Climate Change Committees (SACCCs) and the National Climate Change Committee (NCCC).

Alignment with the UNFCCC and the Paris Agreement. Libya's NAP fulfils its obligations under Article 4 of the UNFCCC and Article 7 of the Paris Agreement. The NAP process:

- Enhances adaptive capacity, strengthens resilience, and reduces vulnerability, core pillars of the Global Goal on Adaptation (GGA).
- Adopts a country-driven, participatory, and evidence-based approach, informed by the CRA and the Multi-Criteria Decision Analysis (MCDA).
- Supports the Enhanced Transparency Framework (ETF) through an integrated Monitoring, Evaluation and Learning (MEL) system.

Moreover, the NAP serves as a foundational instrument for future Adaptation Communications (ADCOMs) and Biennial Transparency Reports (BTRs), allowing Libya to systematically track progress and identify remaining gaps.

Contribution to the 2030 Agenda and the Sustainable Development Goals (SDGs). Libya's adaptation strategy advances at least eight SDGs through concrete, locally relevant actions:

SDG	Contribution from Libya's NAP
SDG 1	Livelihood diversification in vulnerable zones
SDG 2	Climate-smart agriculture, food corridors
SDG 3	Health-heat action plans, resilient infrastructure
SDG 5	Women-led adaptation in agriculture and water
SDG 6	Aquifer recharge, solar desalination, IWRM
SDG 11	Green infrastructure, risk-informed planning
SDG 13	MEL systems and risk-based prioritization
SDG 15	Ecosystem restoration and biodiversity corridors

Table 1: Libya's SDGs

Coherence with the Sendai Framework for Disaster Risk Reduction (2015–2030). The NAP complements Libya's efforts under the Sendai Framework by addressing all four priorities:

Priority 1: Understanding risk via CRA and impact chains.

Priority 2: Strengthening governance through SACCCs and legal reforms.

Priority 3: Investing in resilience (e.g., dryland restoration, EWS).

Priority 4: Enhancing preparedness through platforms like CIDSS and NAICP.

Contribution to the Kunming-Montreal Global Biodiversity Framework (GBF). Libya's NAP integrates biodiversity considerations by:

- Promoting ecosystem-based adaptation in coastal, oasis, and wetland zones.
- Avoiding infrastructure expansion in ecologically sensitive areas.
- Supporting implementation of GBF Targets 1, 2, 3, 10, and 14, particularly through biodiversity-monitoring within the MEL system.

Framework Alignment

Framework	NAP Alignment
Paris Agreement (Art. 7, GGA)	Enhancing adaptive capacity, resilience, and reducing vulnerability
2030 Agenda (SDGs)	Promoting climate-smart food systems, clean water access, men-women social roles-fairness, sustainable cities
Sendai Framework	Risk-informed governance, early warning systems, investment in resilience
Kunming-Montreal GBF	Nature-based adaptation, protection of critical habitats, biodiversity integration
Libya Vision 2030	Climate-resilient development, ecological and institutional transformation

Table 2: Illustrative Matrix of Strategic Alignment

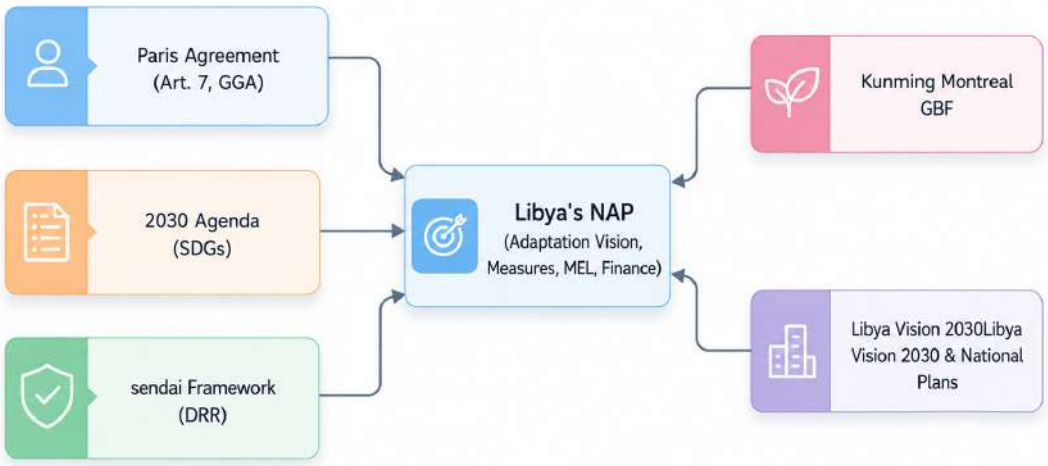


Figure 2: Strategic Coherence Nexus of Libya's NAP

1.3 Guiding Principles

The formulation and implementation of Libya's National Adaptation Plan (NAP) is guided by a coherent set of principles that reflect the country's national priorities, institutional values, and its international commitments under the United Nations Framework Convention on Climate Change (UNFCCC), the Paris Agreement (Article 7), and the Global Goal on Adaptation (GGA) as articulated in CMA.4. These principles ensure that the adaptation process is inclusive, science-based, territorially responsive, and aligned with sustainable development.

- **National Leadership and Ownership.** The NAP process is nationally driven, with strong institutional anchoring in the National Climate Change Committee and its Executive Office of the National Climate Change Committee (EO-NCCC) and active participation from key sectoral institutions. Ownership extends across levels of governance, from national ministries to subnational authorities, ensuring that adaptation is integrated into Libya's public policy architecture. Priority sectors such as water resources, agriculture, and biodiversity play a central role in defining, implementing, and monitoring adaptation measures.

- **Inclusion, Equity, and Climate Justice.** The National Adaptation Plan is grounded in a human rights-based approach, ensuring the meaningful participation of all segments of society, particularly those most vulnerable to climate impacts. This includes women, youth, local communities, and populations living in fragile or conflict-affected areas. The principle of intergenerational equity is of paramount importance, ensuring that today's adaptation choices safeguard the well-being of future generations and avoid causing harm. The National Adaptation Plan also upholds climate justice, recognising the differentiated responsibilities and capacities across Libya's regions and communities.

- **Evidence-Based and Knowledge-Informed Planning.** Adaptation measures are informed by the best available science, including national climate observations, impact modelling, and systematic risk assessments (CRA). The NAP promotes the integration of climate data, socio-economic indicators, and geospatial analyses to support robust planning. Where applicable, the plan also respects and incorporates traditional and local knowledge, particularly in water harvesting, land management, and biodiversity stewardship. Monitoring, Evaluation and Learning (MEL) is a cross-cutting principle, enabling continual refinement and transparency in decision-making.

- **Prevention. NAP adopts both the precautionary and preventive principles.** Given the uncertainties inherent in climate modelling and the high cost of inaction, the plan facilitates early action to reduce long-term risks. It prioritizes anticipatory and no-regret measures that strengthen resilience without requiring perfect foresight. This proactive stance is especially relevant in regions exposed to compound risks such as drought, conflict, and institutional fragility

- **Coherence and Intersectoral Synergies.** The NAP promotes policy coherence and institutional synergies across national planning instruments. It aligns with the Sustainable Development Goals, particularly SDG 13 (Climate Action), SDG 6 (Water), SDG 2 (Food Security), and SDG 15 (Life on Land), and seeks complementarity with Libya's NDC, national biodiversity strategies, and water security plans. Special emphasis is placed on promoting cross-sectoral actions through the Water-Energy-Food-Ecosystems (WEFE) Nexus, linking climate adaptation to integrated resource governance and territorial planning.

- **Sustainability and Transformative Resilience.** The NAP is guided by a commitment to both environmental and financial sustainability. It prioritizes cost-effective solutions, including nature-based solutions (NbS) that deliver adaptation co-benefits while preserving Libya's ecological integrity. At the same time, the plan embraces a vision of transformative resilience: moving beyond vulnerability reduction to structural shifts in governance, resource management, and development pathways. This long-term orientation underpins Libya's ambition to build a society that is not only climate-resilient, but also more inclusive, equitable, and ecologically balanced.

Part II. Climate Risk and Vulnerability Assessment

Observed and Projected Climate Trends. Libya is already experiencing the intensifying impacts of climate change across its five Climate-Related Risk Regions (C-RRRs). Rising temperatures, declining and erratic precipitation, sea-level rise, and more frequent extreme events are reshaping the country's natural systems, socio-economic dynamics, and institutional capacities. Understanding these trends is essential to prioritize and tailor adaptation measures.

2.1 Observed Climate Trends

Temperature Increase. Libya's average surface temperature has increased by approximately 1.5°C since the 1970s, nearly double the global average. This warming has accelerated since 2000, with 94 major heatwave episodes recorded between 1982 and 2021. Inland and southern areas, such as Fezzan and Kufra, frequently experience summer peaks of 46–48°C, with Tripoli reaching 47°C in 2018.

Precipitation Decline and Variability. Nationally, average annual precipitation is extremely low (~26 mm/year). Since the 1960s, rainfall has declined 7–15%, with pronounced drying trends in the Fezzan and Sirte Basin.

Droughts now recur every 2–5 years, with some areas transitioning toward chronic water stress. Coastal regions show increased winter rainfall intensity, but this does not compensate for broader drying patterns.

Flash Floods and Storm Events. Extreme rainfall events have become more intense and frequent, particularly in urban areas such as Tripoli and Derna. Storm Daniel (2023) delivered ~400 mm in under 24 hours, causing catastrophic flooding, dam collapses, and over 4,300 fatalities.



Photo credit: Malek Elmaghrebi

Sand and Dust Storms (SDS). Driven by desertification and vegetation loss, SDS have become more frequent, especially in southern and interior regions (R3, R4). Annual SDS events have risen by over 30% since 2010, now affecting transport, health, and visibility.

Sea-Level Rise. Libya's coast has experienced a rise of 3–4.5 mm/year, aligned with global averages. This is causing saltwater intrusion into freshwater aquifers, threatening coastal agriculture and drinking water security.

Projected Climate Trends (2020–2100). Based on IPCC-aligned models (SSP5–8.5), Libya is projected to face more severe and compound climate hazards throughout the 21st century:

- **Temperature Projections.** National average surface temperatures may increase by +4°C to +5°C by 2100. Days with a Heat Index > 41°C are projected to rise from 70% (2020–2039) to over 76% nationally, with >94% in R3 and R4.

- **Precipitation and Droughts.** 7% decline in mean annual rainfall by 2070. Droughts may last over 6 months/year, particularly in Fezzan and Sirte. SPEI Index classifies national drought risk as very high (>90%).

- **Sea-Level Rise**. Coastal waters may rise by 0.46–0.92 meters by 2100, increasing the risk of coastal erosion, flooding, and infrastructure damage in region 1 (R1).

- **Desertification and Ecosystem Stress.** Desertification will expand due to combined temperature rise and precipitation decline. In R2 and R4 are identified as desertification hotspots, with hazard levels exceeding 90%.

- **Flash Floods and Cyclones.** Despite reduced total rainfall, extreme events are expected to intensify, increasing flood risk in urban zones without adequate drainage or catchment protection.

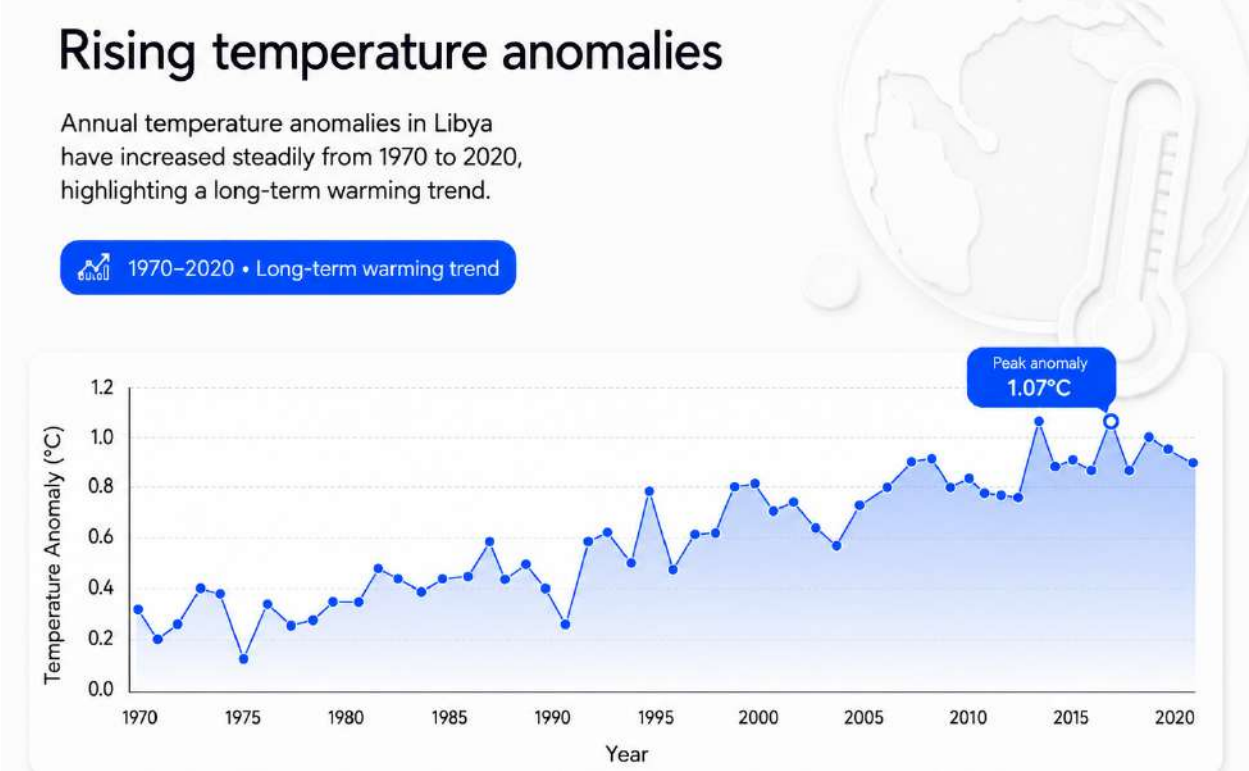


Figure 3: Annual Temperature Anomalies (1970-2020)

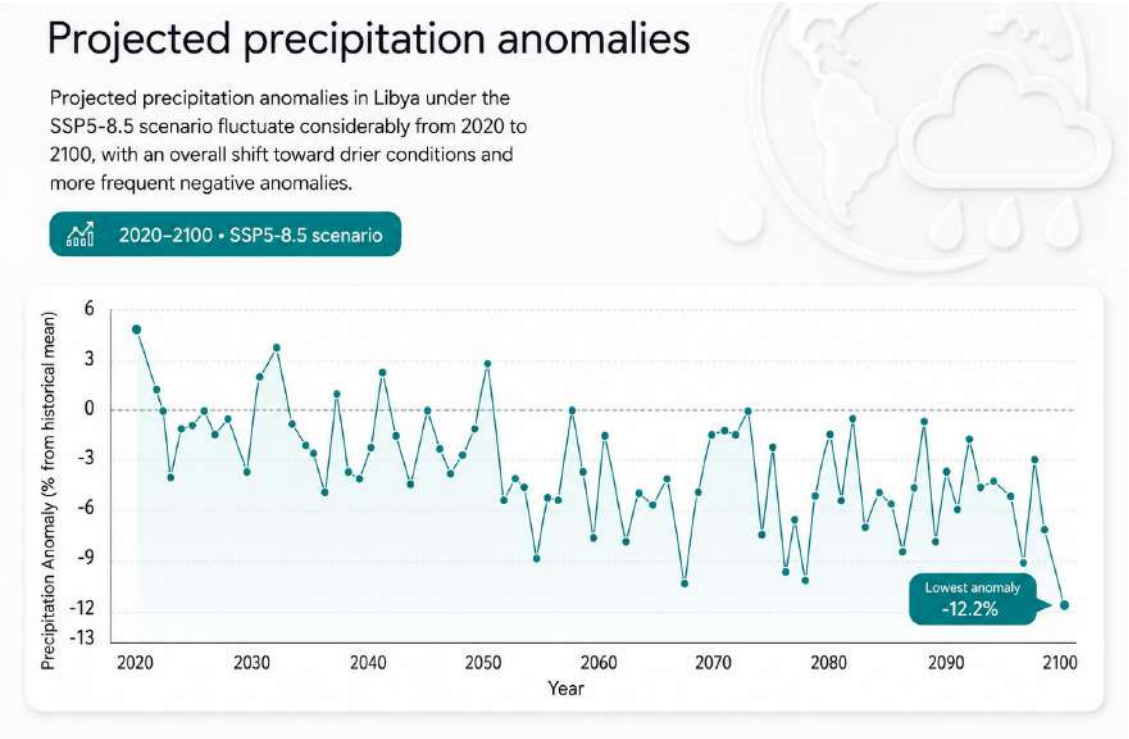


Figure 4: Projected precipitation changes under SSP5-8.5

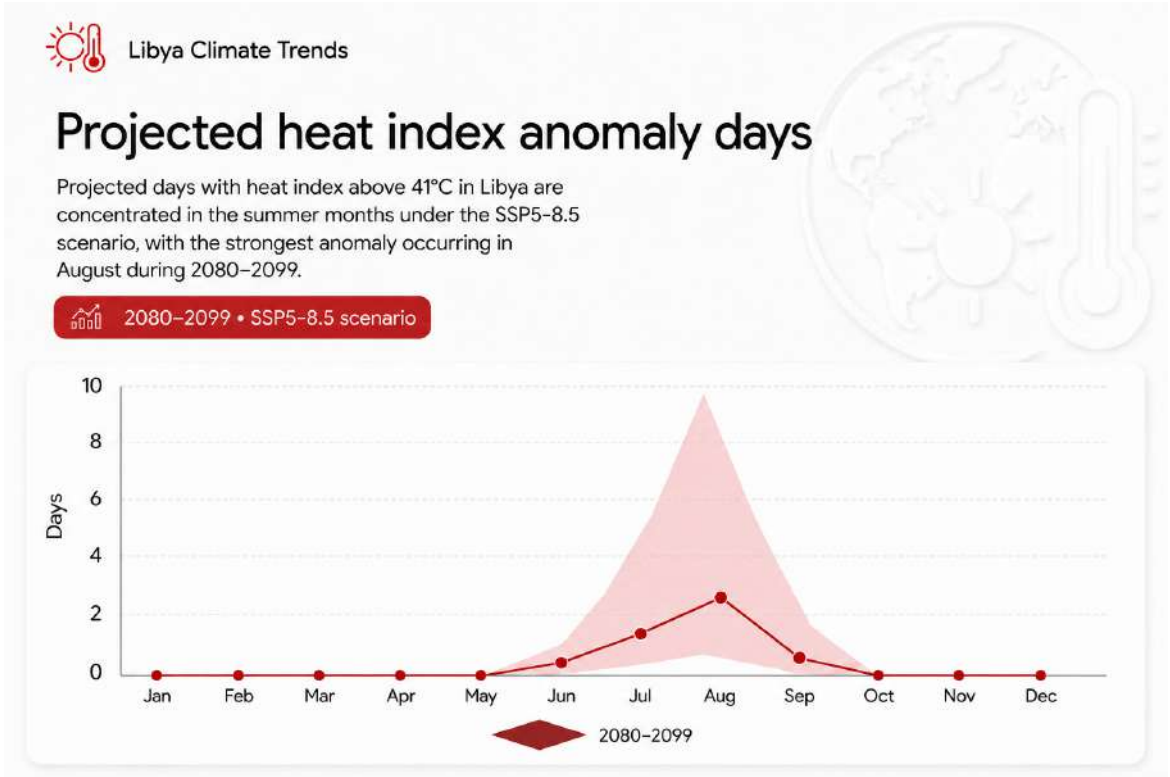


Figure 5: Projected Heat Index >41ºC Anomaly for 2080-2099 Libya

2.2 Geographic and Sectoral Exposure Mapping.

Exposure to climate-related hazards exhibits a high degree of spatial and sectoral differentiation. In alignment with the IPCC SREX definition, exposure refers to the presence of people, assets, ecosystems, and services in locations that may be adversely affected by climate-related events. The national Climate Risk Assessment (CRA) has classified Libya into five Climate-Related Risk Regions (C-RRR), based on climatic gradients, ecosystem sensitivity, infrastructure distribution, and socio-economic patterns. These regions form the analytical backbone for context-specific adaptation strategies.

Regional Exposure Differentiation

Region 1 Mediterranean Coastal–Marine Belt. Exposure Level: Very High (90)
This region concentrates Libya's population and infrastructure, including key cities such as Tripoli, Benghazi, and Misrata. It is exposed to multiple compound hazards including flash floods, sea-level rise, salinization, and coastal erosion. Informal settlements in flood-prone areas further amplify vulnerability. Strategic exposure overlaps: hospitals, ports, roads, desalination plants.

Region 2 Coastal–Semi-Arid Transition Zone. Exposure Level: High (70). Encompasses peri-urban and rural zones with expanding settlements near wadis. Exposure to flash floods, desertification, and drought is growing. Roads and water infrastructure intersect with hazard-prone areas, exacerbating systemic risks.

Region 3: Interior Arid Gradient. Exposure Level: Medium (50). Characterized by sparse population, semi-nomadic livelihoods, and extractive industries. Critical infrastructure, including segments of the GMMR pipeline, faces heat and erosion stresses. Drought and land degradation are the primary hazards.

Region 4: Hyper-Arid Continental and Depressions. Exposure Level: Low (20). Despite low demographic density, this region contains ecologically and hydrologically critical oases (e.g., Murzuq, Kufra). Exposure is driven by aquifer depletion, sandstorms, extreme heatwaves, and climate-sensitive livelihoods. Infrastructure is minimal but highly sensitive.

Region 5: Marine and Coastal Waters Zone. Exposure Level: High (70).
Includes Libya's coastal lagoons, ports, wetlands, and exclusive economic zone. Highly exposed to sea-level rise, ocean acidification, and marine storms. Strategic marine assets, such as fisheries and desalination systems, are increasingly at risk.

2.3 Sectoral Exposure Overview

Water Resources.

Libya's extreme reliance on non-renewable groundwater aquifers and uneven water distribution renders the water sector acutely exposed:

- R1, R2, R3 host aquifers facing overextraction and salinization.
- Coastal aquifers suffer saltwater intrusion.
- GMMR pipelines (especially in R3–R4) are vulnerable to temperature-induced deterioration.

Agriculture and Livelihoods.

Rain-fed and oasis-based agriculture are severely affected by:

- Increasing drought frequency in R2, R3.
- Groundwater depletion and desertification in R4.
- Heatwaves impacting crop yields across transition zones.

Critical Infrastructure.

Roads, hospitals, and water networks intersect high-hazard zones:

- R1: Urban infrastructure exposed to flash floods, aging networks under strain.
- R2: Peri-urban roads and clinics frequently disrupted by floods.
- R3: Infrastructure faces stress from erosion, subsidence, and lack of redundancy.

Vulnerable Populations.

Socioeconomic vulnerability amplifies climate exposure:

- R1 urban poor often reside in informal settlements located on floodplains and vulnerable coastal zones, increasing their exposure to flash floods and sea-level rise.

- R3 and R4, pastoralist communities face increasingly degraded rangelands, desertification, and chronic water scarcity, which undermine their livelihoods and mobility.

- In R2 and R4, individuals in rural, oasis, and remote communities (particularly those with caregiving responsibilities or limited mobility) often face significant barriers to accessing basic services, economic opportunities, and climate adaptation resources. These limitations reinforce pre-existing disparities across age groups and social roles, reducing overall resilience and adaptive capacity at the household and community level.

Biodiversity and Ecosystems.

Ecosystems under threat include:

- Coastal habitats in R1 and R5 facing erosion and acidification.
- Oasis ecosystems in R4 stressed by unsustainable use and climate shocks.
- Lack of marine conservation exacerbates ecological decline in R5.

2.4 Cross-Sectoral Risk Interlinkages

Libya's exposure landscape is not compartmentalized by sector. Cascading risks, such as drought reducing agricultural productivity, or flood-induced infrastructure collapse leading to water shortages, demonstrate the need for integrated, cross-sectoral adaptation planning.

R1–R2: Flash flood hotspots coincide with dense infrastructure and poor urban communities.
R3–R4: Desertification belts intersect with water and food systems.
R5: Sea-level rise and acidification impact ports, desalination, and fisheries.

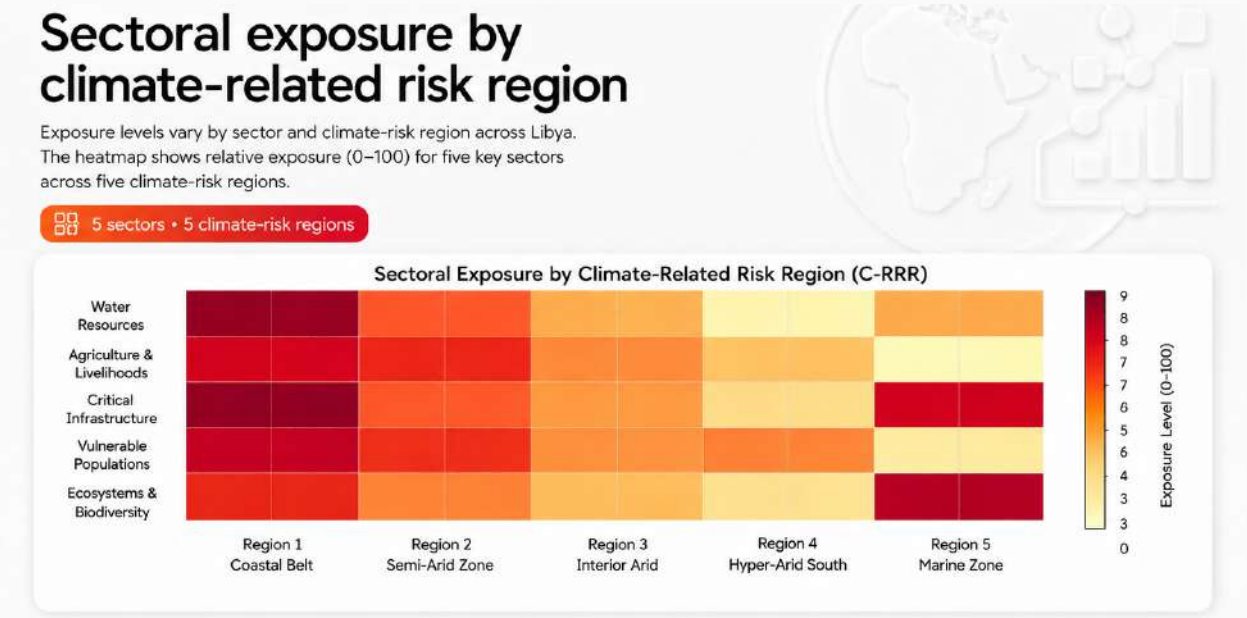


Figure 6: Sector-region exposure overlaps

2.5 Systemic Vulnerabilities and Root Causes

Libya's vulnerability to climate change is not limited to exposure to environmental hazards; rather, it is deeply rooted in the country's prevailing social, economic, environmental, and institutional conditions. These structural conditions form the basis of contextual vulnerability — a central concept in the National Climate Risk Assessment — and underscore the need for adaptation strategies that go beyond sectoral responses and address systemic fragility.

This section applies the Pressure and Release (PAR) model to illustrate the root causes, dynamic pressures, and unsafe conditions that underpin climate vulnerability in Libya.

Root Causes. At the foundation of Libya's vulnerability lie multiple interconnected structural deficits:

- **Rentier economy and dependence on hydrocarbons.** Libya's overreliance on oil, accounting for over 90% of public revenue, exposes the country to external shocks and limits fiscal flexibility to invest in adaptation. The lack of economic diversification constrains livelihood alternatives, especially in rural and climate-sensitive regions.

- **Inequitable governance and regional disparities.** Historical centralization of power and investment in coastal cities has left interior and southern regions with inadequate infrastructure, limited access to services, and weak state presence. This spatial inequality exacerbates differential vulnerability.

- **Weak rule of law and fragmented institutions.** Since 2011, Libya has operated under competing administrations and overlapping mandates. The resulting fragmentation undermines coherent planning and obstructs the development of a unified climate governance system.

Dynamic Pressures. These root causes translate into systemic stressors that erode resilience over time:

- **Institutional and coordination gaps.** The lack of effective inter-ministerial coordination, especially across the water, agriculture, and biodiversity sectors, leads to fragmented responses and duplicated efforts. Local institutions often lack the mandates or resources to implement climate actions.
- **Environmental degradation.** Expanding desertification, declining groundwater levels and aquifer recharge, coastal salinization, and the collapse of wetlands and oases have severely reduced

the natural buffers that mitigate climate shocks.

- **Social Exclusion and Underrepresentation:** While Libya's legal and constitutional framework affirms equity among all citizens, regardless of their social roles, age, or geographical origins, without any formal discrimination in rights or duties, multiple assessments and stakeholder consultations reveal the persistence of inequities in practice. Certain vulnerable segments of society often face limited participation in climate-related decision-making processes, restricted access to public services, and barriers to adaptation resources and technologies. These disparities do not stem from legislation, but rather from institutional fragmentation and uneven state presence, particularly in remote and conflict-affected areas. The NAP acknowledges this gap between legal principles and lived reality, and therefore adopts an inclusion-focused approach to ensure that adaptation planning effectively addresses justice and fairness.

Unsafe Conditions. These dynamic pressures manifest in localized conditions of acute vulnerability:

- **Critical infrastructure fragility.** Water pipelines, electricity grids, roads, and health facilities across many regions are aging, poorly maintained, and unprepared for climate extremes such as floods and heatwaves. The 2023 Derna disaster tragically illustrated these compound failures.

- **Peripheral and informal settlements.** Large segments of the population live in hazard-prone urban peripheries or remote rural areas with little state support. These populations face compounding risks of service disruption, displacement, and food and water insecurity.

- **Breakdown of social cohesion.** Years of conflict and displacement have eroded traditional coping systems and communal trust. In their absence, community-based adaptation is weakened, and reliance on external or informal actors increases.

2.6 Vulnerable Populations and Livelihoods

Libya's vulnerability to climate change is not solely defined by physical exposure to climatic hazards, but by deeply embedded social, economic, and territorial inequalities that condition the capacity of its people and institutions to prepare for, respond to, and recover from climate-related stressors. These systemic asymmetries manifest across population groups and livelihood systems, creating climate risk hotspots that demand urgent and differentiated adaptation responses.

Disproportionately Affected Populations. Certain groups are consistently overrepresented among those most exposed and least protected from climate risks. Based on the Climate Risk Assessment (CRA) and the NDC3.0 analysis, the most vulnerable populations include:

- **Women and Girls:** Although public water networks and private wells exist across most Libyan cities and villages, access to reliable, safe, and affordable water remains uneven, particularly in rural, oasis, and peri-urban areas where infrastructure is weak, groundwater is saline or depleted, and service interruptions are frequent. In such contexts, women and girls often carry the primary responsibility for managing household water needs, including water purification, rationing, storage, and coping with scarcity. This invisible labor is further intensified during droughts or infrastructure breakdowns. Moreover, women in agriculture frequently engage in unpaid or under-recognized labor in water-dependent activities without secure land rights or access to irrigation technologies. These structural disadvantages, though not always visible in formal statistics, shape differentiated patterns of vulnerability to climate change and limit the ability of affected groups to participate meaningfully in climate adaptation planning and finance.

- **Youth:** Representing more than half of Libya's population, youth face acute unemployment, marginal participation in climate governance, and limited skills for climate-resilient livelihoods.

As climate-induced livelihood disruptions escalate, youth exclusion could generate long-term societal costs and missed adaptation dividends.

- **Pastoralist Communities:** Concentrated in the arid interior (Region 3) and hyper-arid south (Region 4), pastoralists face severe mobility restrictions, degradation of rangelands, and competition over water sources. Their traditional adaptation strategies are increasingly eroded by desertification, resource conflict, and insecure land tenure.
- **Urban Poor and Internally Displaced Persons (IDPs):** Often residing in flood-prone informal settlements along the coast (Region 1), these populations lack secure land tenure, access to services, and basic infrastructure. The concentration of multiple hazards, heatwaves, flash floods, salinization, compounds their vulnerability in unregulated urban growth corridors.
- **Children:** Across all regions, but especially in R2–R4, children face climate-related risks to health, nutrition, mobility, and education. Their dependence on adult caregivers, women-social roles and vulnerability dynamics, and sensitivity to service disruptions position them as a priority demographic for protective adaptation.

Livelihoods Under Climate Stress. Libya's most climate-sensitive livelihood systems are being rapidly undermined by the intersection of environmental degradation and institutional fragility:

- **Agriculture:** Rainfed farming, especially in semi-arid and other areas, is increasingly unviable due to prolonged droughts, groundwater depletion, and land salinization. Under SSP5 scenarios, rural out-migration, food insecurity, and ecological collapse are projected to accelerate unless systemic adaptation investments are made.

- **Fisheries:** Critical for coastal livelihoods, fisheries face mounting pressures from sea-level rise, ocean acidification, and marine biodiversity loss. Infrastructure, including landing sites, ports, and cold chains, is highly exposed to storm surges and coastal erosion.

- **Informal Economies:** A growing segment of urban and peri-urban livelihoods, the informal sector remains unprotected against climate shocks. Workers often lack safety nets, insurance, or regulatory inclusion, heightening economic insecurity under climate disruption.

Spatial Dynamics of Social Vulnerability. The CRA classifies the exposure of vulnerable populations across Libya's four terrestrial climate risk regions:

Region	Urban Poor	Pastoralists	Women	Children	Exposure Summary
R1 Coastal Corridor	Very High (90)	Low (30)	Very High (90)	Very High (90)	Multi-hazard, dense population, weak infrastructure
R2 Peri-urban/Agricultural	High (70)	Medium (50)	High (70)	High (70)	Land pressure, service gaps, urban expansion
R3 Interior Arid	Medium (50)	High (70)	High (70)	High (70)	Drought, degraded infrastructure, displacement
R4 Hyper-Arid South	Low (20)	Very High (80)	Medium (40)	Medium (40)	Water dependency, isolation, mobility loss

Table 3: Spatial Dynamics of Social Vulnerability

These spatial disparities reflect not only climatic gradients but also differential institutional presence, public service provision, and livelihood viability. As climate stress intensifies, without targeted adaptation strategies, vulnerability trajectories will widen.

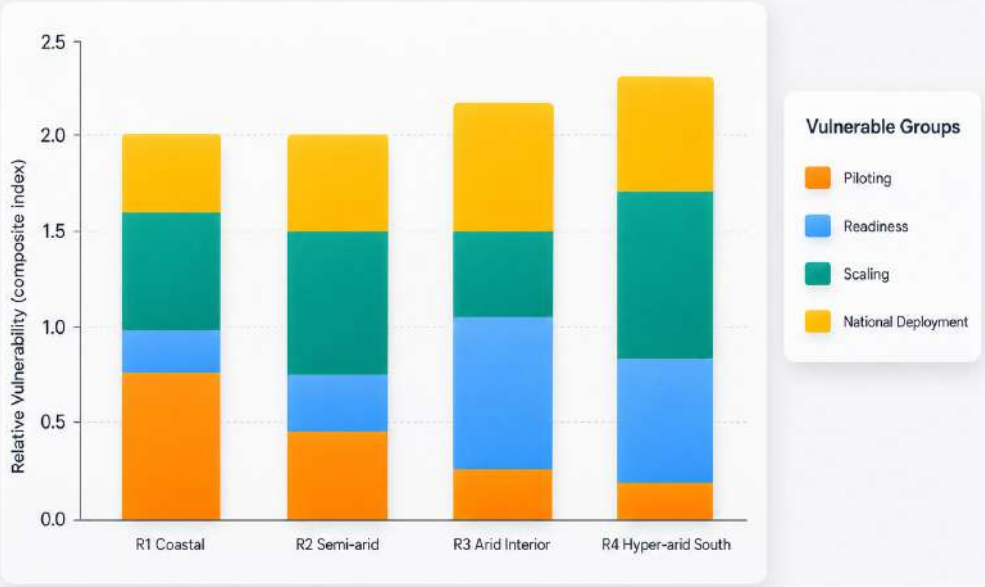


Figure 7: Spatial Dynamics of Social Vulnerability

Future Projections and Risk Amplification (2025–2045).

Under high-growth/high-emissions scenarios (SSP5), Libya's vulnerability will be shaped by:

- Continued urbanization in hazard-prone coastal zones
- Accelerated out-migration from climate-degraded rural areas
- Widening social roles and generational inequalities
- Diminishing institutional capacity for social protection and public service delivery
- Rising socio-political tensions linked to resource access and displacement.

This evolving risk landscape demands a people-centered and equity-driven approach to adaptation, one that recognizes the differentiated needs of vulnerable groups and integrates their voices into planning, decision-making, and benefit-sharing.

Region ↓ / Group →	Urban poor	Herders	Women	Children
R1	90	30	90	90
R2	70	50	70	70
R3	50	70	70	70
R4	20	80	40	40

Vulnerability score: Very high (80–100) High (60–79) Medium (40–59) Low (<40)

Figure 8: Regional Distribution of Vulnerable Groups in Libya

2.7 Impacts on Ecosystems, Infrastructure, and Essential Services

Climate change is exerting significant and compounding pressures on Libya's ecosystems, critical infrastructure, and essential public services. These impacts, while sectorally distinct, are deeply interconnected and mutually reinforcing, particularly in the context of systemic vulnerabilities and weak institutional preparedness.

Impacts on Ecosystems and Natural Resources. Libya's ecosystems, including coastal wetlands, inland oases, seagrass beds, and semi-arid rangelands, are under acute threat from rising temperatures, declining precipitation, desertification, and saline intrusion.

- Coastal and marine ecosystems face degradation from sea-level rise, storm surges, and increasing sea surface temperatures. Key habitats such as the Gulf of Sirte and Farwa Lagoon are experiencing biodiversity loss and erosion of fishery productivity.

- Wetlands and oases, critical for both biodiversity and livelihoods, are degrading due to aquifer depletion and salinization. Over 50% of the remaining wetlands are at high risk of collapse.

- Terrestrial ecosystems, including the Jabal Nafusa highlands and desert margins, are losing vegetation cover due to overgrazing, drought, and unsustainable land use. This exacerbates soil erosion, dust storms, and pest outbreaks.

Without enhanced investment in ecosystem-based adaptation and nature-based solutions, the collapse of ecological functions could become irreversible.

Impacts on Infrastructure. Libya's critical infrastructure, particularly water, energy, health, and transport systems, is highly exposed to both chronic and acute climate stressors:

- Water infrastructure, including the Great Man-Made River (GMMR), is vulnerable to drought, structural degradation, and conflict-related sabotage. Coastal aquifers are already experiencing saltwater intrusion, compromising urban water supplies.

- Electricity generation and transmission systems, largely fossil-fuel-based and coastal, are increasingly disrupted by heatwaves, dust storms, and peak demand. Prolonged blackouts during heatwaves are already common, and infrastructure failures are likely to intensify.

- Public health infrastructure suffers from war damage, energy dependency, and insufficient resilience design. Clinics and hospitals are increasingly unable to respond to climate-related disease outbreaks, heat stress, and flooding emergencies.

- Transport networks, particularly in coastal and desert zones, face risks from erosion, land subsidence, and flash floods. Bridges, roads, and culverts in wadis remain un-adapted to changing hydrological patterns.

Impacts on Essential Services. Infrastructure disruption translates into service failures, particularly for vulnerable populations:

- Water supply disruptions are widespread, particularly in rural areas, with growing reliance on informal water markets.

- Health service breakdowns are increasingly common during climate extremes, such as the 2023 Derna floods, which overwhelmed local medical capacities.

- Urban service inequality is growing due to the expansion of informal settlements in high-risk areas, often lacking drainage, sanitation, or legal recognition.

Cascading Risks and Nexus Dynamics. Climate hazards trigger cascading effects across sectors. For example:

- Water scarcity (e.g., aquifer depletion) increases energy demands for pumping and desalination, exacerbating power outages.
- Energy instability disrupts health services, water purification, and food logistics.
- Ecosystem degradation diminishes flood regulation and carbon sequestration, amplifying hazard intensity.

These interactions underline the importance of a WEFE-Nexus-based adaptation approach to break reinforcing cycles of vulnerability.

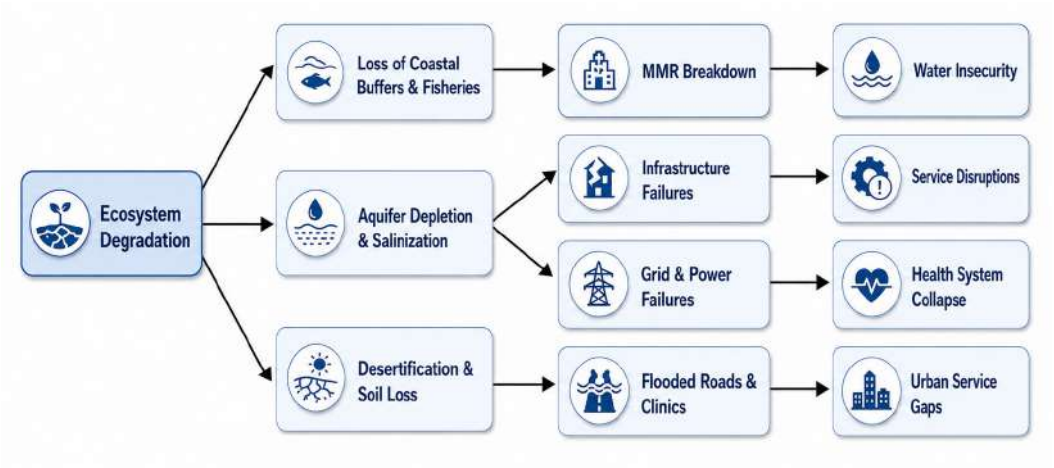


Figure 9: Cascade of Climate Impacts Across Sectors in Libya

Ecosystem Degradation and Systemic Water Insecurity in Libya

In Libya's arid and semi-arid landscapes, ecosystems play a silent but essential role in sustaining water availability, regulating recharge processes, and protecting critical infrastructure. However, on-going ecosystem degradation, through desertification, land mismanagement, and coastal erosion, has set off a chain of cascading impacts that directly threaten aquifers, food systems, and even national infrastructure such as the Great Man-Made River (GMMR).

Ecosystem Degradation → Aquifer Depletion and Salinization

- Loss of vegetation and soil structure reduces infiltration, limiting aquifer recharge and accelerating surface runoff and evaporation.
- Oasis degradation diminishes local water storage and increases overreliance on groundwater extraction, leading to falling water tables.
- Overuse of chemical inputs and poor drainage in irrigated zones contributes to rising soil and aquifer salinity, particularly in closed inland basins.
- Coastal wetland destruction removes natural barriers that once protected aquifers from seawater intrusion.

Together, these dynamics transform once-productive zones into high-risk areas for water scarcity, soil salinization, and eventual livelihood collapse.

Loss of Coastal Buffers & Fisheries → GMMR Breakdown Risk

- As coastal ecosystems degrade, shallow freshwater lenses and local aquifers become salinized, reducing community access to potable water.
- Fisheries collapse undermines coastal livelihoods, increasing migration toward cities and placing unplanned demand on already stressed urban GMMR nodes.
- With no viable alternative water sources, reliance on the GMMR intensifies, stretching its distribution network, increasing maintenance burdens, and magnifying vulnerability to sabotage or operational failure.

Without intervention, these coupled dynamics could shift Libya into a systemic water crisis where ecological collapse leads to infrastructure failure.

Key Implication for Adaptation Planning

- Protecting and restoring degraded ecosystems is not a peripheral issue,it is central to water security, rural resilience, and the survival of national infrastructure systems. The NAP must therefore prioritize nature-based solutions, integrated watershed planning, and coastal ecosystem protection as strategic pillars of adaptation.

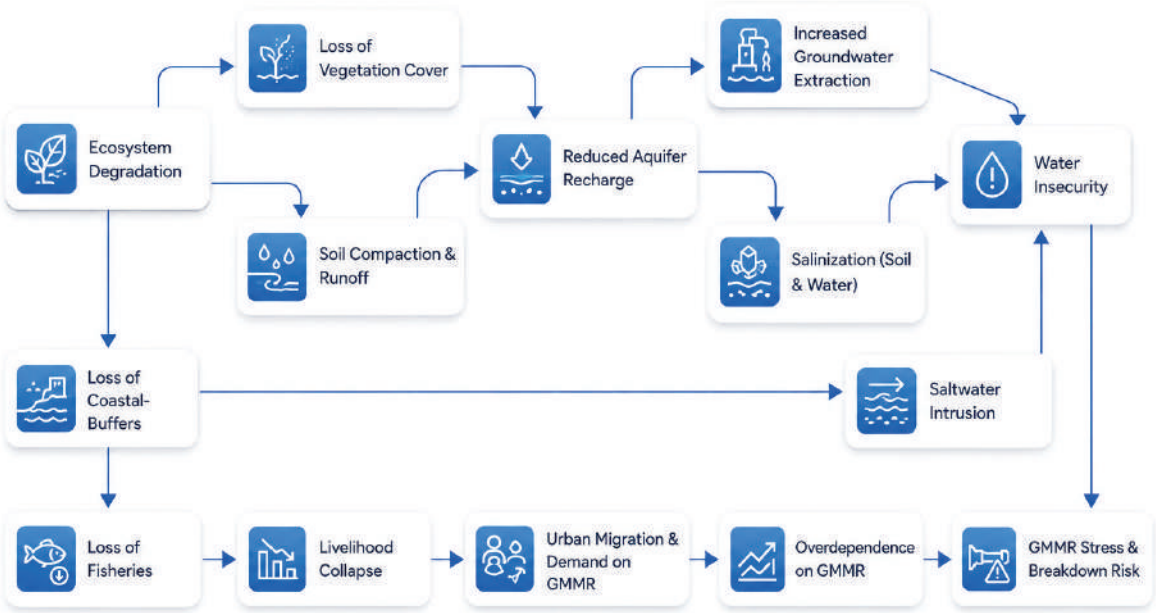


Figure 10: Impact Chain: Ecosystem Degradation to Aquifer and MMR Stress

2.8 Climate Risk Hotspots and Implications for Adaptation Planning

The synthesis of observed and projected climate trends, sectoral exposure, systemic vulnerabilities, and social fragilities reveals the emergence of multi-hazard climate risk hotspots across Libya. These hotspots represent the convergence of high exposure to climate hazards, structural vulnerabilities, and low adaptive capacity. They are spatially differentiated but functionally interdependent, requiring coordinated and strategic adaptation responses.

Identified Climate Risk Hotspots

Based on the Climate-Related Risk Region (C-RRR) framework and cross-sectoral overlays, the following territories are classified as priority hotspots for adaptation planning:

- **Urban Flood and Infrastructure Failure Zones (Region 1: Coastal Belt).** Includes Tripoli, Derna, Benghazi, Misrata, Zawia, Tobruk, Zwara, and others. These areas face compounding risks from sea-level rise, flash floods, saltwater intrusion, heatwaves, and informal settlement expansion. Critical water, health, and transport infrastructure intersect with high-exposure zones, placing large populations at risk.

- **Oasis and Pastoral Livelihood Collapse Zones (Region 3 & Region 4).** Areas such as Murzuq, Sabha, and Kufra are at high risk of desertification, aquifer depletion, and loss of productive land. Traditional pastoralist systems and oasis agriculture are degrading, while water scarcity and land tenure conflicts are intensifying.

- **Peri-Urban Expansion Corridors with Governance Gaps (Region 2).** Towns expanding beyond regulatory control face mounting pressures from flood exposure, drought-sensitive agriculture, and service infrastructure lag. Vulnerable groups, particularly women, youth, and IDPs, are concentrated in these zones.

- **Marine Ecosystem and Fisheries Decline Zones (Region 5).** Coastal lagoons and near-shore fisheries (e.g., Sirte Gulf, Farwa Island) are under pressure from ocean warming, acidification, and unregulated fishing. Loss of marine livelihoods, biodiversity, and natural buffers is accelerating.

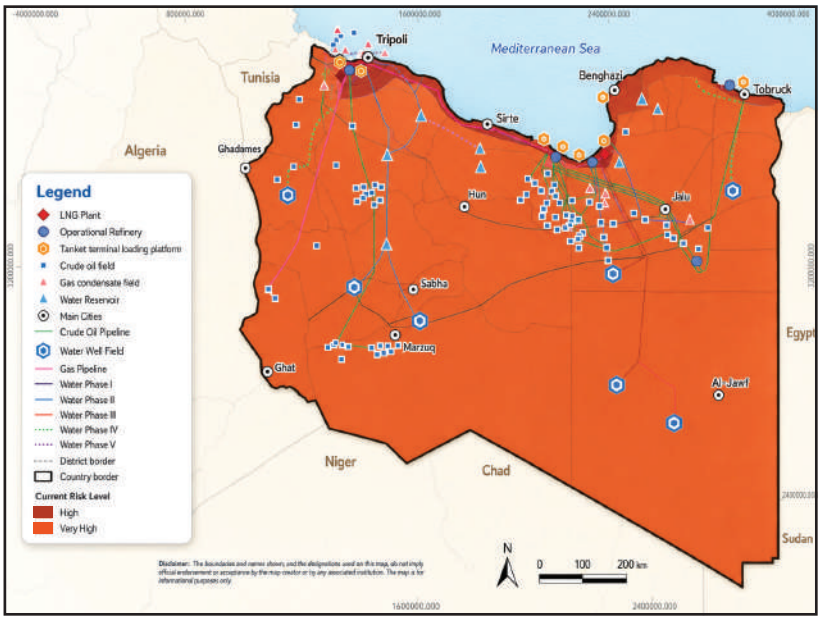


Figure 11: Energy & Water Infrastructure - Current Risk Level

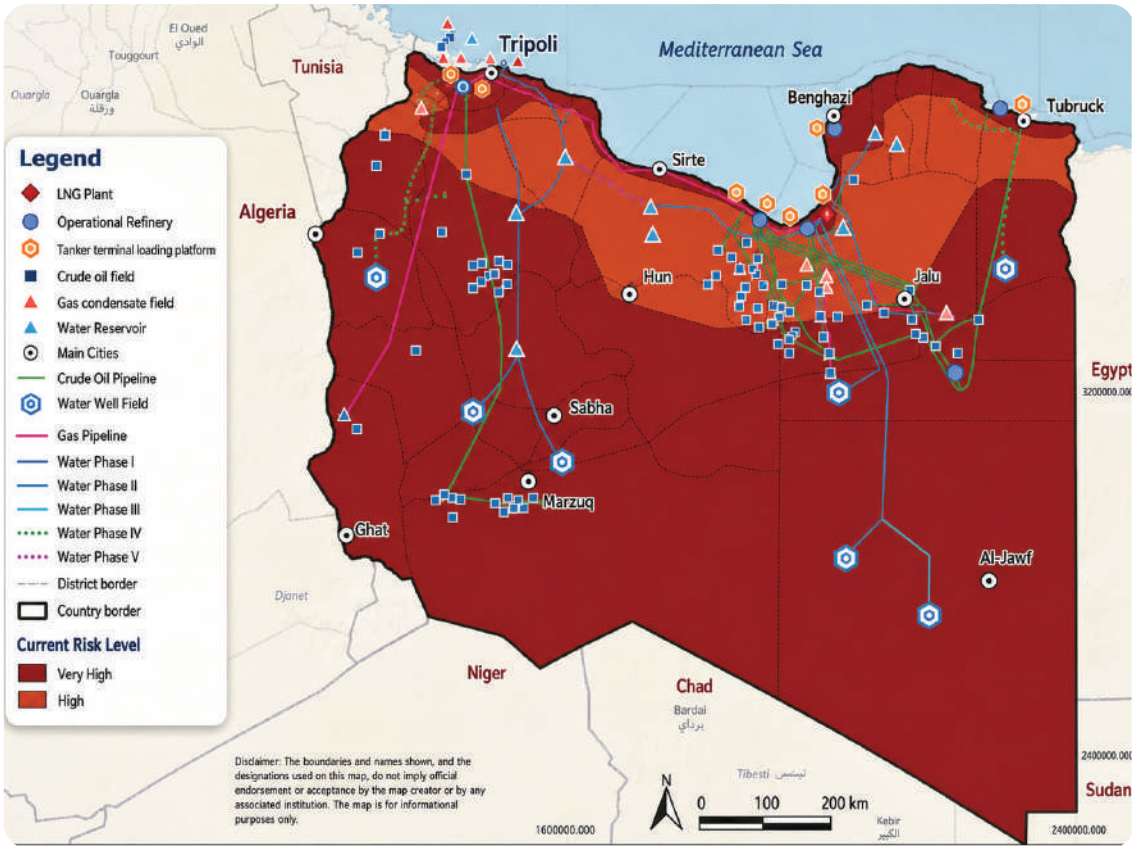


Figure 12: Energy & Water Infrastructure - Projected Risk Levels

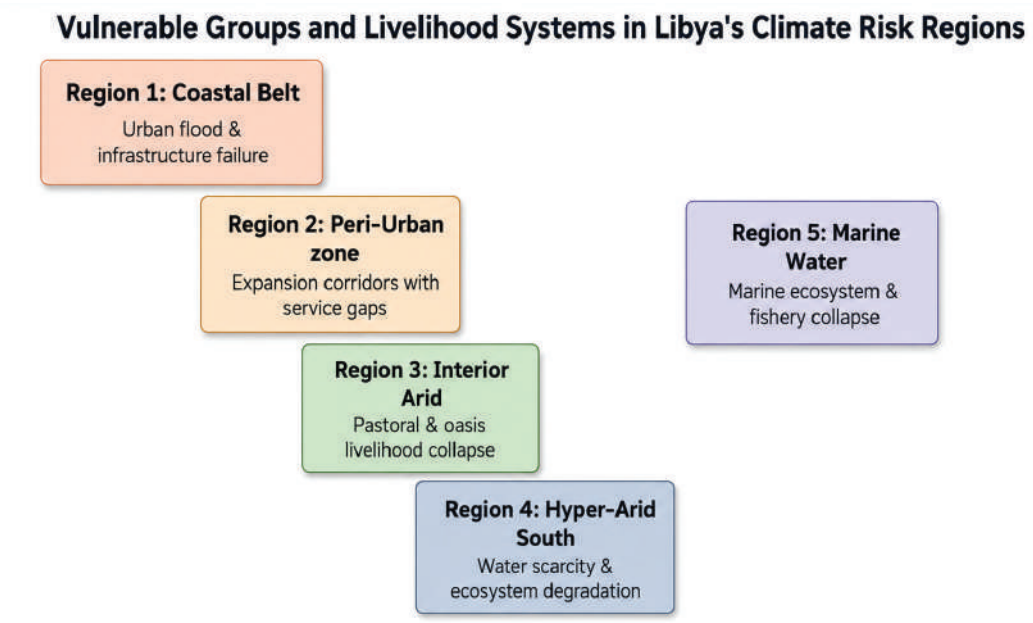


Figure 13: Spatial Dynamics of Social Vulnerability

Strategic Implications for Adaptation Planning.

The identification of these hotspots has direct implications for the strategic orientation, prioritization, and territorial anchoring of adaptation interventions:

Prioritize No-Regret and Early Action Measures in Hotspots

- Flash flood mitigation in urban areas
- Restoration of degraded oases and rangelands
- Coastal protection and aquifer recharge measures
- Climate-proofing of health and water infrastructure

Target vulnerable groups through inclusive programmes that address the needs of women.

- Expand services and social protection for women, youth, and displaced persons
- Involve community-based organizations in local adaptation governance

Use Hotspots to Anchor Integrated Adaptation Planning and Nexus Actions

- Enable cross-sectoral planning platforms (e.g., SACCCs) to work within hotspot territories
- Use WEFE Nexus approaches to identify leverage points (e.g., integrated water-energy infrastructure in oasis towns)

Align Public Investments and Climate Finance toward Hotspot Resilience

- Channel domestic and external funds to hotspots with greatest risk-concentration
- Ensure risk-informed budget allocation and M&E focus on high-priority areas

Use Risk Hotspot Mapping to Monitor Spatial Progress and Equity

- Develop MEL indicators disaggregated by hotspot
- Monitor equity outcomes and climate justice metrics across territories

Part III. Institutional, Policy and Governance

The institutional architecture for climate adaptation in Libya has undergone substantial evolution since the country ratified the Paris Agreement in 2021. Recognizing the need for a coordinated and inclusive governance system, the State has progressively established a multi-tiered framework that integrates national leadership, sectoral expertise, and territorial implementation capacities.

3.1 National Climate Governance Bodies.

At the apex of the adaptation governance structure is the National Climate Change Committee (NCCC), chaired by the Minister of Environment. Created under Cabinet Decree No. 336/2021, the NCCC provides political oversight, strategic alignment across ministries, and formal engagement with international climate processes. Its primary mandate includes supervising Libya's climate agenda, ensuring intersectoral coherence, and promoting adherence to national and international obligations related to climate adaptation and mitigation.

To operationalize its mandate, the Executive Office of the NCCC (EO-NCCC) was established in 2023 as a multi-sectoral coordination body. Serving as the technical and operational arm of the NCCC, the EO-NCCC convenes representatives from key ministries, including those responsible for Water Resources, Agriculture, Industry, Electricity, Oil and Gas, Transport, Local Government, Health, Planning, and Finance. Its functions encompass:

- **Leading the development and implementation of the National Adaptation Plan (NAP);**
- **Supporting the formulation of Sectoral Adaptation Plans (SAPs).**
- **Coordinating the Adaptation Finance Strategy (AFS).**
- **Facilitating monitoring, evaluation and learning (MEL) systems.**
- **Promoting public participation and transparency.**



Photo credit: Malek Elmaghrebi

To reinforce technical ownership and coherence, the EO-NCCC has also initiated the establishment of **Sectoral Adaptation Climate Change Committees (SACCCs)** in sectors like Health, Agriculture, Water Resources and Biodiversity. These committees are hosted within lead sectoral ministries and include participation from affiliated departments, subnational entities, academia, the private sector, and civil society organizations. Their role is to:

- Conduct climate risk assessments at the sectoral level.
- Propose and validate adaptation measures.
- Integrate sector-specific priorities into the national NAP and AFS.
- Monitor implementation and provide feedback for iterative learning.

3.2 Subnational and Local Institutional Anchors.

The decentralization framework laid out in the 2012 Law on Local Administration and Ministerial Decree No. 1500/2021 legally empowers municipalities to deliver climate-relevant public services, including water, sanitation, land-use planning, and public health. Despite this legal mandate, local adaptation capacities remain uneven across regions due to disparities in fiscal autonomy, staffing, and technical support.

To overcome these limitations, the EO-NCCC has launched a vertical integration agenda that includes the design of **Territorial Adaptation Action Plans (TAAPs)**, localized risk assessments, and the provision of targeted capacity-building. These instruments aim to embed adaptation within municipal governance while enhancing local ownership, especially in climate-vulnerable territories such as southern oases, flood-prone coastal cities, and the arid interior.

3.3 Technical Coordination Mechanisms.

The adaptation governance system is further reinforced by the **National Technical Coordination Mechanism**, which serves as an inclusive platform linking government institutions with academia, civil society, private actors, and local communities. This body provides advisory support to the EO-NCCC and SACCCs by offering:

- Scientific and technical inputs.
- Socially grounded knowledge and traditional practices.
- Recommendations for participatory and inclusive planning.

This mechanism is intended to build cross-sectoral trust, improve data sharing, and ensure that adaptation decisions are informed by the best available evidence and reflective of Libya's socio-cultural diversity.

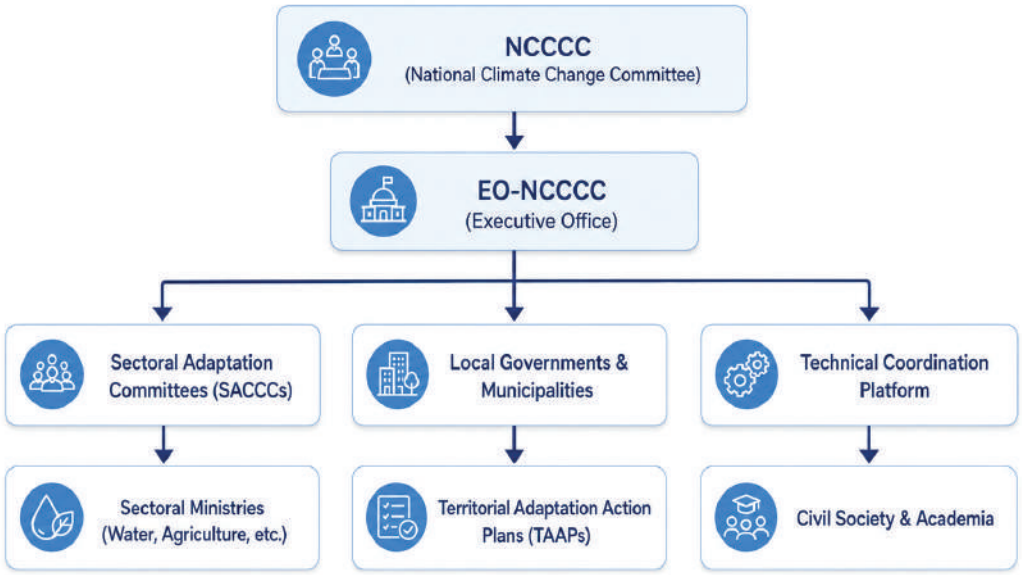


Figure 14: Simplified Institutional Architecture for Climate Adaptation in Libya

3.4 Policy and Legal Frameworks

Libya's policy and legal architecture for climate adaptation is gradually evolving but remains fragmented, outdated, and inadequately aligned with contemporary climate risk realities. While key legislative instruments exist across sectors, such as environmental protection, water resources, agriculture, biodiversity, and land-use planning, their limited integration of climate change provisions constrains effective governance and cross-sectoral coordination. This section assesses the current legal landscape, identifies key regulatory gaps, and outlines the country's legal reform agenda to establish an enabling environment for adaptation.

Existing Legal Instruments Relevant to Adaptation. Libya's foundational environmental governance rests on **Law No. 15/2003** on Environmental Protection. Complementary sectoral laws include:

- Law No. 7 (1982) on Environmental Protection
- Law No. 3 (1982) on Water Use and Drilling
- Law No. 5 (1982) and Law No. 14 (1992) on Forest and Rangeland Protection
- Law No. 15 (1992) on Agricultural Land Conservation
- Law No. 14 (1989) on Marine Biodiversity
- National Spatial Policy (2006–2030)

These laws provide a partial but insufficient basis for systemic adaptation. Most do not reference climate risk, nor do they require the integration of climate scenarios into planning or regulatory decisions.
At the subnational level, **Law No. 59 (2012)** on Local Governance delegates adaptation-relevant responsibilities to municipalities, particularly in water, sanitation, urban resilience, and public health. However, enabling decrees, financial mechanisms, and technical capacities remain underdeveloped, limiting implementation.

Institutional and Executive Instruments

- Cabinet Decree No. 336/2021 formally established the National Climate Change Committee (NCCC) and mandated its coordination role.
- A Ministerial Decree (2023) created the Executive Office of the NCCC (EO-NCCC), responsible for technical coordination, adaptation planning, and inter-ministerial alignment.
- Ministerial Decree No. 1500/2021 further delineated municipal responsibilities in climate-sensitive sectors.

While these decrees offer procedural scaffolding, they lack the legal force and coherence to mandate cross-sectoral adaptation planning and implementation.

Strategic Gaps and Reform Needs. The Climate Risk Assessment (CRA), NDC 3.0, and initial NAP consultations reveal five critical limitations in Libya's legal framework:

1. **Absence of a Comprehensive Climate Change Law.** No umbrella law defines adaptation responsibilities, mandates climate risk assessments, or ensures policy integration across sectors.
2. **Fragmentation and Obsolescence.** Many sectoral laws are outdated and conflict with each other, impeding the operationalization of approaches such as the WEFE nexus.
3. **Weak Vertical Integration.** Despite decentralization laws, local authorities lack legal instruments, resources, and mandates to act on adaptation.
4. **Limited Integration of International Commitments.** Libya's legal instruments do not yet reflect its obligations under the Paris Agreement (Art. 7), the Sendai Framework, or the Kunming-Montreal Global Biodiversity Framework.
5. **Lack of Climate Risk Mainstreaming.** Planning instruments such as the National Spatial Policy do not incorporate hazard zoning, resilient infrastructure codes, or climate-informed development rules.

Legal Reform Priorities

The EO-NCCC has outlined a legal reform roadmap structured around five priorities:

Legal Reform Priority	Objective
1. Codify Climate Risk Integration	Develop a Climate Change Law that mandates integration of climate risks into national budgeting, infrastructure, and development planning.
2. Modernize Sectoral Legislation	Update water, agriculture, biodiversity, and urban laws to enable climate-smart, ecosystem-based, and resilience-focused practices.
3. Empower Local Governance	Issue decrees that formally assign adaptation mandates to municipalities and provide financial/legal tools for implementation.
4. Align with International Frameworks	Harmonize national laws with the Paris Agreement, Sendai Framework, and CBD to enable access to climate finance and promote global coherence.
5. Institutionalize Coherence Mechanisms	Establish legal provisions for intersectoral planning, nexus governance (WEFE), and horizontal coordination.

Table 4: EO-NCCC's priorities

Towards a Coherent Legal Enabling Environment. Legal reform is not simply a technical necessity; it is a strategic enabler of Libya's climate adaptation vision. A coherent, inclusive, and climate-informed legal framework is essential for:

- **Supporting access to international finance (e.g., GCF, AF, GEF)**
- **Enforcing accountability across governance levels**
- **Institutionalizing MEL and risk-informed development**
- **Translating national goals into territorial implementation**

Criteria	Water Law	Agriculture Law	Biodiversity Law	Spatial Planning Law	Local Governance Law	Climate Decrees
References Climate Risk	1	1	1	0	1	1
Mandates Risk Assessment	0	0	0	0	0	1
Enables Vertical Integration	0	0	0	0	0	1
Supports Cross-Sectoral Action	1	1	0	1	1	1

Figure 15: Legal Coherence Matrix for Climate Adaptation in Libya



Figure 16: Legislative Reform Roadmap for Adaptation Governance in Libya

3.5 Stakeholder Engagement and Participatory Planning

In Libya's complex governance and socio-ecological landscape, stakeholder engagement is not merely a procedural requirement, but a foundational pillar of effective, legitimate, and equitable climate adaptation. This principle is enshrined in Article 7.5 of the Paris Agreement, Decisions 9/CP.24 and 18/CMA.1, and the NAP Technical Guidelines, and is particularly salient given Libya's history of centralized planning, institutional fragmentation, and social exclusion.

Recognizing this context, the National Adaptation Plan (NAP) adopts a **deliberately inclusive and multi-level engagement strategy,** aimed at co-producing knowledge, policies, and practices that are both technically sound and socially grounded. Stakeholder participation in Libya's NAP formulation and implementation is thus guided by six interrelated principles:

Inclusiveness and Representation. Stakeholder engagement ensures broad participation across ministries, municipalities, CSOs, academia, private sector, and international partners. Special emphasis is placed on empowering historically vulnerable groups, such as women, youth, and displaced populations.

- **Transparency and Accountability.** Consultation processes are systematically documented. Inputs are captured and used to inform planning decisions, with regular feedback mechanisms and reporting by EO-NCCC and SACCCs.

- **Territorial and Institutional Coherence.** Participatory planning is embedded within the national adaptation governance architecture, anchored by the NCCC, coordinated by EO-NCCC, and operationalized through SACCCs and municipal platforms. Engagement is tailored to the five Climate Risk Regions (R1–R5), ensuring territorial equity.

- **Empowerment and Capacity-Building.** Institutional, technical, and financial constraints are addressed through targeted support to CSOs, municipalities, and youth/women-led organizations. Training and digital tools expand access to adaptation planning spaces.

- **Conflict Sensitivity and Cultural Appropriateness.** Stakeholder dialogues are designed to be context-specific and culturally grounded. This includes safe spaces for participation and localized facilitation to mitigate grievances and prevent climate-related conflicts.

- **Continuity and Learning.** Engagement spans the entire adaptation cycle, from risk assessment to MEL (Monitoring, Evaluation, and Learning). Feedback loops are institutionalized to support adaptive governance and policy refinement over time.

A wide range of participatory modalities are used depending on the actor group and territorial conditions. **The following table summarizes key engagement mechanisms:**

Stakeholder Group	Engagement Modalities	Participation Channels	Considerations
National Ministries	Policy dialogues, technical working groups	In-person, official correspondence	High-level coordination, requires vertical coherence
Local Governments	Municipal workshops, participatory planning sessions	Mobile platforms, local media	Constrained by capacity and security in R3 and R4
Civil Society Organizations	Focus groups, outreach campaigns, localized dialogues	Community meetings, WhatsApp, radio	Need for trust-building and protection in fragile zones
Women's Networks	Dedicated consultations, inclusive strategy forums	Community-based and female-led spaces	Requires facilitation to address socio-cultural barriers
Youth Networks	Peer dialogues, online platforms	Mobile apps, webinars	Engagement rising but structurally limited
Private Sector	Investment dialogues, public-private roundtables	Sectoral platforms, bilateral meetings	Limited by risk perceptions and fragmented policies
Academia and Research	Joint assessments, policy validtation panels	Working groups, data-sharing platforms	Key technical role but needs more interdisciplinary ties
Development Partners	Roundtables, bilateral consultations	In-person + virtual	Strong engagement, key for knowledge and finance

Table 5: Stakeholder Engagement Modalities and Channels

In fragile and fast-evolving contexts like Libya, this participatory approach plays a dual role, as a technical enabler and a peacebuilding mechanism. By fostering inclusion, transparency, and co-ownership, stakeholder engagement strengthens institutional legitimacy and enhances the durability and effectiveness of adaptation investments.

To further support implementation, the EO-NCCC will operationalize an online NAP Stakeholder Platform with multilingual access (Arabic, Tamazight, English), supported by digital tools for public consultation, data sharing, and feedback collection. This platform will also host the Audit Trail System as described in Section VI, ensuring full traceability of stakeholder inputs across NAP components

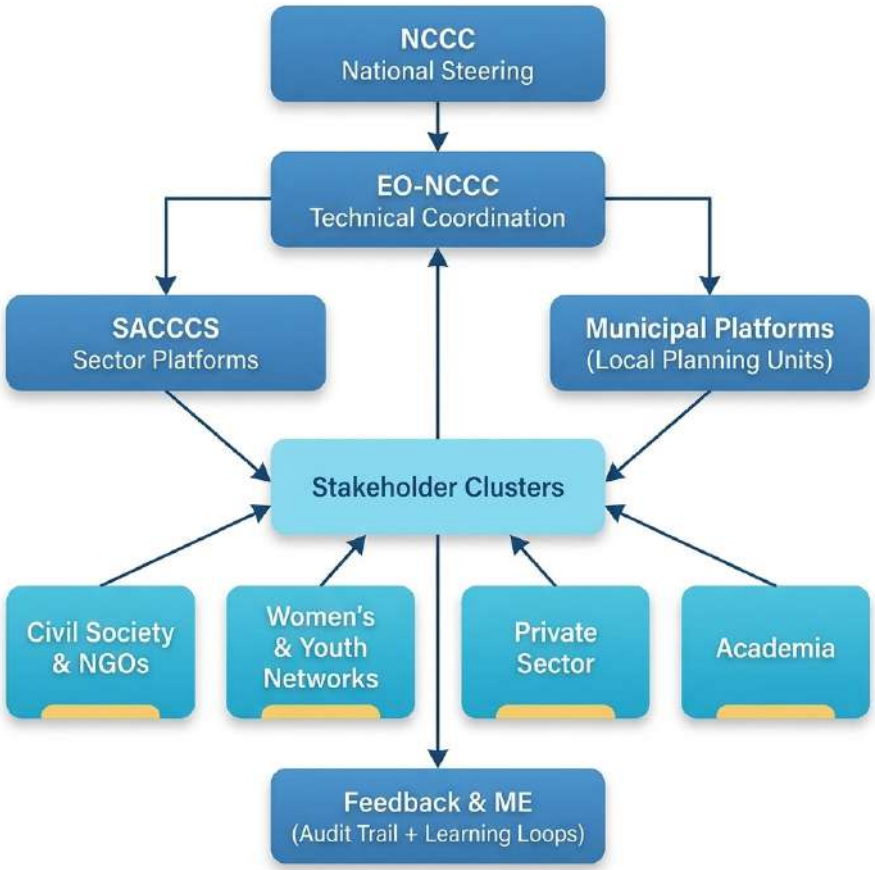


Figure 17: Participatory Governance Flows for Climate Adaptation in Libya

3.6 Coordination Mechanisms and Intersectoral Synergies

Effective adaptation to climate change in Libya requires an integrated, multisectoral governance system capable of addressing the country's interconnected vulnerabilities. Recognizing this imperative, Libya has progressively established a series of coordination mechanisms to foster synergies across sectors, institutions, and governance levels. These mechanisms are designed to ensure that adaptation planning is inclusive, coherent, and aligned with national development priorities and international obligations.

At the core of this coordination architecture is the **Executive Office of the National Climate Change Committee (EO-NCCC),** which operates as the central hub for adaptation governance. Its primary function is to lead the formulation and implementation of the National Adaptation Plan (NAP), the Sectoral Adaptation Plans (SAPs), and the Adaptation Finance Strategy (AFS). To this end, it convenes sectoral focal points from key ministries, such as Water Resources, Agriculture, Biodiversity and Environment, Energy, Local Government, and Health, to promote dialogue, data sharing, and cross-sectoral policy alignment.

To enhance sectoral ownership and ensure technical coherence, Sectoral Adaptation Climate Change Committees (SACCCs) have been established. These bodies are responsible for formulating SAPs, aligning sectoral plans with the NAP, identifying priority measures, and integrating adaptation into sector-specific policies. The SACCCs serve not only as planning platforms but also as channels for resource mobilization, monitoring, and adaptive management at the sectoral level.
One of the defining features of Libya's coordination system is the incorporation of WEFE Nexus thinking, an integrated approach that recognizes the interdependencies between Water, Energy, Food, and Ecosystems. The implementation of initiatives such as the National Integrated Water Governance for Climate Resilience (NIWG-CR) and the WEFE Resilience Hubs illustrates how this nexus-based governance is being operationalized to foster systemic resilience and co-benefits across sectors.
In addition, the EO-NCCC collaborates closely with national technical bodies such as the Libyan Meteorological Centre, the Libyan Climate Change Research Centre, and academic institutions to ensure that evidence-based planning underpins coordination efforts. These institutions play a key role in providing climate data, modelling outputs, and vulnerability assessments that inform intersectoral strategies.

Despite these advances, challenges remain. Institutional fragmentation, overlapping mandates, and disparities in technical capacity across sectors continue to affect the fluidity of coordination. To address these issues, the EO-NCCC is developing a set of formal protocols for intersectoral cooperation, including shared planning cycles, data harmonization mechanisms, and integrated monitoring frameworks. These protocols are expected to be institutionalized through updated ministerial decrees and supported by capacity development initiatives and digital coordination platforms.
Municipalities also play a key role in the coordination framework, particularly in translating national adaptation priorities into locally grounded action. Although vertical coordination between national and subnational levels remains uneven, efforts are underway to establish clearer coordination protocols between the EO-NCCC and local governments, especially in areas of water management, disaster risk reduction, and land use planning.
In sum, Libya's adaptation governance model is progressively evolving toward a multi-level, multi-actor coordination system that enables horizontal (cross-sectoral) and vertical (national–local) integration. By embedding synergies across institutions and sectors, Libya seeks not only to improve the efficiency and coherence of adaptation efforts, but also to catalyse transformative resilience-building across its territory.

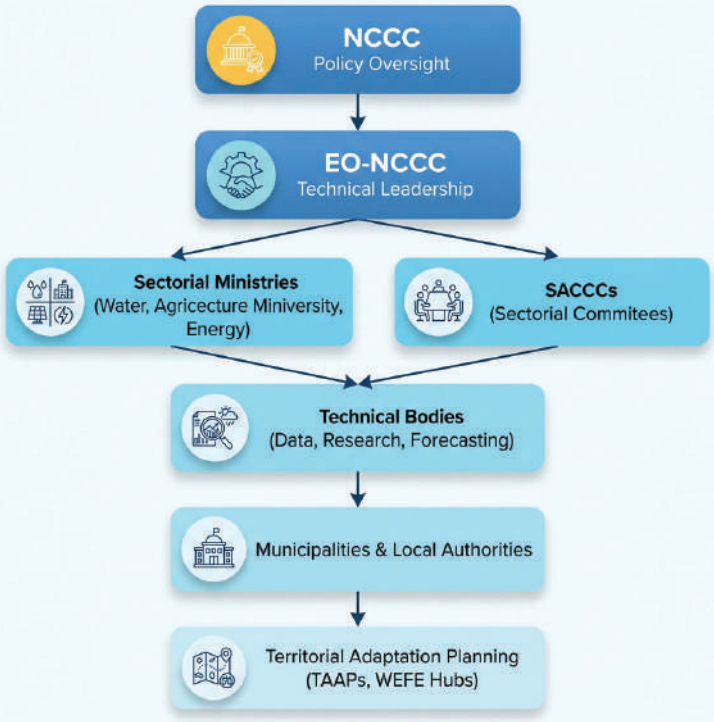


Figure 18: Coordination Mechanisms and Intersectoral Synergies for Adaptation

Part IV. Adaptation Vision, Goals and Strategic Priorities

Libya's national adaptation vision articulates a long-term pathway toward a climate-resilient society that is inclusive, ecologically sustainable, and capable of proactively managing current and future climate risks. This vision reflects Libya's evolving climate governance maturity and its commitment to international climate goals, particularly Article 7 of the Paris Agreement, the Global Goal on Adaptation (GGA), and the 2030 Agenda for Sustainable Development.

This vision is not limited to addressing immediate vulnerabilities but is conceived as a systemic transformation, one that realigns governance, investment, and social cohesion around adaptive, inclusive, and nature-compatible development.

4.1 Long-Term Strategic Vision.

"To build a climate-resilient Libya that ensures ecological integrity, social equity, and adaptive prosperity by integrating risk-informed governance, restoring critical ecosystems, and transforming development models to meet the demands of a changing climate."

This vision recognizes adaptation as both an imperative and an opportunity: an imperative due to Libya's acute exposure to climate hazards in the context of fragile institutions and environmental degradation; and an opportunity to catalyse just transitions, reduce structural vulnerabilities, and regenerate the foundational systems of human and ecological wellbeing.



Photo credit: Malek Elmaghrebi

4.2 Foundational Pillars of the Vision.

Libya's adaptation vision is grounded in three foundational pillars:



Inclusive Resilience

- Climate adaptation must prioritise the needs of vulnerable groups, including women, youth, displaced populations, and vulnerable communities.
- Specific measures aim to enhance vulnerable groups responsive governance, promote green employment for youth, and protect the rights of those disproportionately exposed to climate pressures.
- Platforms such as the WEFE Resilience Hubs will serve as territorial anchors for inclusion, innovation, and local climate governance.



Territorial and Ecosystem Integration

- The strategy prioritizes place-based and ecosystem-based adaptation, restoring and protecting Libya's critical ecological zones, including oases, coastal wetlands, drylands, and marine habitats.
- These landscapes serve not only as environmental buffers, but also as engines of livelihood security and cultural continuity.



Climate Intelligence and Adaptive Governance

- A robust national climate intelligence system will underpin this vision, integrating early warning, scenario-based planning, and participatory MEL mechanisms, aligned with the Enhanced Transparency Framework (ETF).
- This system will be instrumental in ensuring that adaptation remains iterative, evidence-based, and responsive to evolving risks.

4.3 Alignment with International and Regional Commitments.

This vision coheres with the principles and targets of multiple global frameworks:

- Paris Agreement (Art. 7 & GGA) – Promoting adaptive capacity, resilience, and vulnerability reduction through nationally determined, inclusive, and transparent strategies.
- 2030 Agenda and SDGs – Particularly SDGs 1, 2, 3, 5, 6, 11, 13, 14, and 15, through direct and cross-cutting co-benefits.
- Sendai Framework – Advancing risk-informed development, early warning systems, and disaster risk governance.
- Kunming-Montreal Global Biodiversity Framework – Through nature-positive adaptation, restoration corridors, and spatial planning coherence.
- Libya Vision 2030 and the National Climate Change Strategy – By embedding adaptation into national investment frameworks and territorial development pathways.

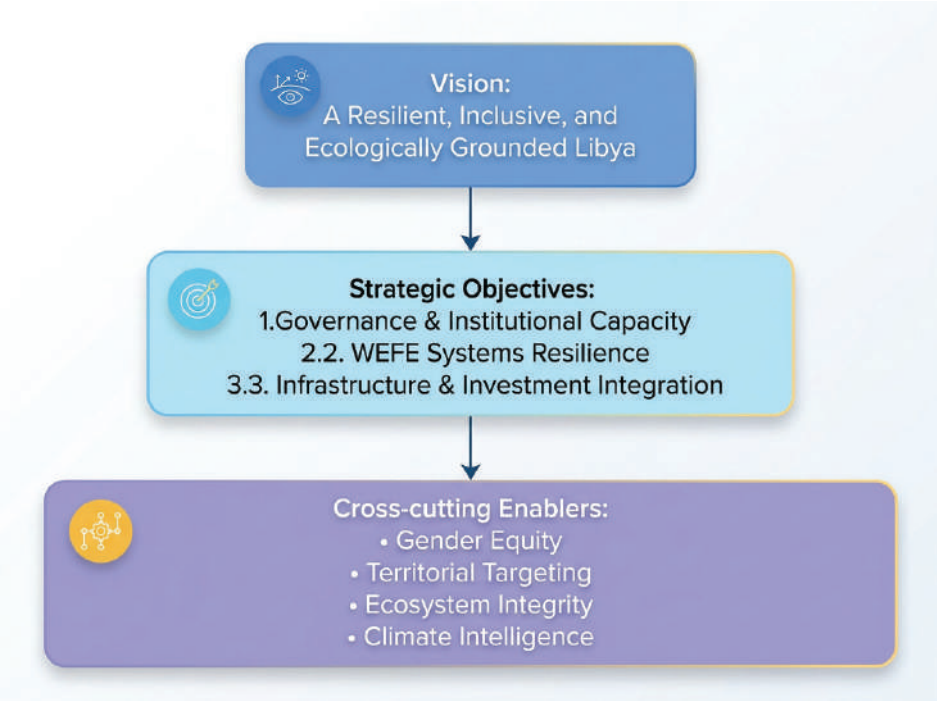


Figure 19: Coordination Mechanisms and Intersectoral Synergies for Adaptation

4.4 Strategic Goals and Targets

Libya's National Adaptation Plan articulates a set of three interdependent strategic goals that form the foundation of the country's long-term resilience pathway. These goals operationalize the adaptation vision (Section 4.1) and align with Article 7 of the Paris Agreement, the Global Goal on Adaptation (GGA), the Sustainable Development Goals (SDGs), the Sendai Framework for Disaster Risk Reduction, and the Kunming-Montreal Global Biodiversity Framework.

Each strategic goal is accompanied by measurable targets and outcome indicators, which will guide implementation across national and subnational levels during the three-phase implementation cycle (2025–2035): Start-up, Scale-up, and Consolidation. These goals not only respond to Libya's systemic vulnerabilities but also enable the integration of adaptation into core governance, infrastructure, and development systems.

Strategic Goal 1: Strengthen Climate Governance and Institutional Capacity

Objective: Institutionalize climate adaptation across governance levels, reduce fragmentation, and ensure inclusive, data-driven decision-making.
Key Targets (by 2030):

- All priority sectors (water, agriculture, biodiversity, infrastructure) with climate-responsive policy frameworks.
- 6 operational SACCCs with trained focal points and sectoral coordination protocols.
- National MEL system operational across all five climate risk regions (C-RRRs).
- 40% female representation in local and national adaptation committees.

Alignment: Paris Agreement (Art. 7), GGA Pillar 1, SDG 6 & 13, Sendai Target D, GBF Target 2.

Strategic Goal 2: Secure Water, Energy, Food, and Ecosystems (WEFE)

Objective: Enhance the climate resilience of foundational systems through integrated resource management and ecosystem protection.
Key Targets (by 2030):

- 6 WEFE Resilience Hubs fully operational in high-risk regions.
- 25,000 hectares of land restored under regenerative practices.
- 60% increase in water-use efficiency in agriculture through smart irrigation.
- 100% of coastal zones with early warning systems and ecosystem restoration plans.

Alignment: Paris Agreement (GGA – food & health), SDG 2, 6, 15, Sendai Priority 4, GBF Target 10.

Strategic Goal 3: Integrate Adaptation into Infrastructure and Investment Planning

Objective: Mainstream climate adaptation in public investment, infrastructure development, and urban planning, including the promotion of nature-based solutions and co-financing mechanisms.

Key Targets (by 2030):

- Climate risk screening applied to 100% of new infrastructure projects.
- 20% increase in green infrastructure in urban areas (flood-prone zones).
- Climate-smart public investment pilots implemented with blended finance.
- National budget tagging and MRV systems integrated into planning and treasury functions.

Alignment: Paris Agreement (Art. 7.5), SDG 11, 13, Sendai Priority 2, GBF Target 1.

Phase	Timeline	Focus
Start-up	2025–2027	Institutional setup, pilot implementation, MEL design
Scale-up	2028–2030	Territorial expansion, full system integration
Consolidation	2031–2035	Refinement, sustainability, and long-term impact tracking

Table 6: Implementation Phases

This strategic architecture ensures that Libya's adaptation agenda moves beyond project-based interventions toward a systemic transformation that strengthens resilience, restores ecosystems, and empowers communities.

4.5 Priority Sectors and Systems

Libya's national adaptation strategy identifies three interdependent sectors, water resources, agriculture, and biodiversity/ecosystems, as strategic entry points for building climate resilience. These sectors were selected based on a comprehensive climate risk assessment, stakeholder consultations, and the systemic vulnerabilities exposed through the Water-Energy-Food-Ecosystem (WEFE) nexus. The selection reflects both the scale of climate-induced disruptions and the potential for high-impact, cross-cutting adaptation actions.

- Water Resources. Water is Libya's most critically vulnerable sector. Over 90% of freshwater comes from fossil aquifers, primarily the Great Man-Made River (GMMR), with negligible natural recharge. Climate projections point to further reductions in rainfall (–5% to –10%) and rising evapotranspiration, intensifying aquifer depletion and saltwater intrusion in coastal zones. Infrastructure inefficiencies, such as leakage rates up to 50% in urban systems and poor agricultural water-use efficiency, exacerbate stress. Adaptation priorities include integrated water governance, nature-based aquifer recharge, demand-side management, and decentralized reuse systems.

- **Agriculture and Food Security.** Despite its small share in GDP, agriculture sustains a large share of rural livelihoods and food stability. Climate change impacts, particularly heatwaves, droughts, and soil salinization, have already caused 20–30% yield reductions in key crops such as wheat, barley, and olives. The sector suffers from low productivity, degraded rangelands, and high dependency on imports (over 70% of food consumed). Climate-smart agriculture, drought-tolerant crop diversification, and sustainable land management are critical priorities.

- **Biodiversity and Ecosystem Services.** Libya's ecosystems, including oases, wetlands, marine habitats, and rangelands, serve vital regulatory, productive, and cultural functions. Yet they are collapsing under combined pressures from land degradation, overextraction, and climate extremes. Ecosystem degradation reduces groundwater recharge, erodes coastal defences, and increases flood and erosion risks. Priority actions include scaling up nature-based solutions (NbS), restoring ecological corridors, and integrating biodiversity into water and agricultural planning.

- **Interlinkages and the WEFE Nexus.** These three sectors are not isolated. The WEFE nexus assessment demonstrates systemic feedback: e.g., degraded ecosystems reduce water availability, which constrains agriculture and increases energy demand for pumping. Failure in one domain cascades across others, exacerbating systemic risks. Therefore, Libya's adaptation planning embeds WEFE principles to ensure integrated resource management and policy coherence.

- **Territorial Hotspots**. Adaptation priorities also respond to region-specific vulnerabilities:

1. **Coastal Regions (R1 & R2):** Threatened by sea-level rise, flash floods, and salinization.
2. **Interior Arid Regions (R3 & R4)**: Facing extreme drought, aquifer depletion, and desertification.
3. **Semi-Arid Agricultural Belt:** At risk from heatwaves, declining productivity, and water stress.
4. **Marine and Coastal Waters (R5):** Subject to biodiversity loss, overfishing, and habitat degradation.

These spatial vulnerabilities inform the geographical targeting of interventions and resource allocation, ensuring territorial equity and system-wide impact.

Cross-Cutting Systems. In addition to the core sectors, the following systems are recognized as enabling pillars:

- **Energy:** Affects water pumping and cold storage for food; vulnerable to dust storms and heat-waves.
- **Urban Infrastructure:** Faces increasing climate shocks, especially in informal settlements.
- **Public Health and Livelihoods:** Interlinked with ecosystem stability and water/food security.

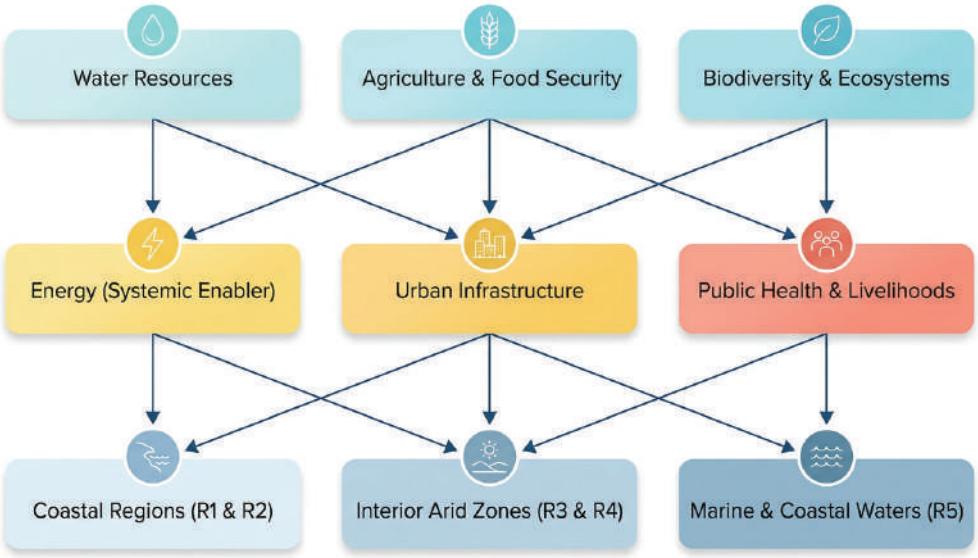


Figure 20: Priority Sectors and Systems for adaptation in Libya

Part V. Priority Adaptation Measures

The identification and prioritization of climate change adaptation measures in Libya followed a transparent, participatory, and scientifically grounded process, aligned with Article 7 of the Paris Agreement, the Global Goal on Adaptation (GGA), the Sendai Framework for Disaster Risk Reduction, and the Sustainable Development Goals. This section outlines the methodology used to select high-priority adaptation actions, ensuring they are contextually relevant, technically feasible, socially inclusive, and responsive to national and subnational vulnerabilities.

5.1 Methodological Framework.

The prioritization process was built upon a hybrid analytical model combining:

- IPCC SREX Framework: Risk was conceptualized as a function of hazard, exposure, and vulnerability.
- PAR Model (Pressure and Release): Enabled systemic analysis of structural drivers of risk (root causes, dynamic pressures, unsafe conditions).
- Impact Chains Approach: Mapped causal pathways linking climate hazards to cascading impacts across ecosystems, infrastructure, and livelihoods.
- Multi-Criteria Decision Analysis (MCDA): A weighted scoring methodology was employed to rank measures.
- Stakeholder Validation: Results were validated through technical workshops, decision-making forums, and intersectoral consultation.

This integrated approach ensured both scientific robustness and contextual legitimacy.



Photo credit: Malek Elmaghrebi

Participatory Stages. The prioritization process engaged a wide range of stakeholders through successive deliberative steps:

- **Sectoral Technical Workshops (April 2025):** Experts identified and evaluated potential adaptation options by sector.
- **Multi-Stakeholder Consultations (May–June 2025):** Ministries, civil society, academia, and development partners reviewed preliminary results.
- **Final Decision-Making Forum (June 23 and July 1, 2025):** Measures were validated using the MCDA scoring system and regional filters.

This participatory architecture was designed to reinforce country ownership and institutional coherence, while anchoring the process in local realities and national priorities.

MCDA Prioritization Criteria and Weights. The following weighted criteria were applied to each proposed Climate Change Adaptation Measure (CCAM):

Criterion	Description	Weight
Climate Risk Relevance	Alignment with CRA-identified priority hazards and regions	**25%**
Transformative Potential	Capacity to drive systemic change across scales and sectors	**25%**
Feasibility	Institutional, technical, and financial practicality in the Libyan context	**20%**
Social Equity and Inclusion	Contribution to women and social roles fairness, youth engagement, and vulnerable populations	**15%**
Co-benefits and Synergies	Links to mitigation, biodiversity, economic development, and health outcomes	**10%**
Alignment with National Plans	Consistency with Libya Vision 2030, NDC, SDGs, and WEFE Nexus	Qualitative
Resource Mobilization Potential	Eligibility for GCF, GEF, AF, and bilateral support mechanisms	Qualitative

Table 7: Climate Change Adaptation Measure Criteria

These criteria were scored on a 0–1 normalized scale and aggregated into a composite prioritization index for each measure.

Results and Outcome. The application of this prioritization process led to the selection of fourteen high-priority adaptation measures, each validated for sectoral relevance, spatial equity, and alignment with national development goals. These measures are presented in detail in Section 5.2 and include system-level interventions in water governance, climate-smart agriculture, biodiversity protection, and risk-informed urban planning.

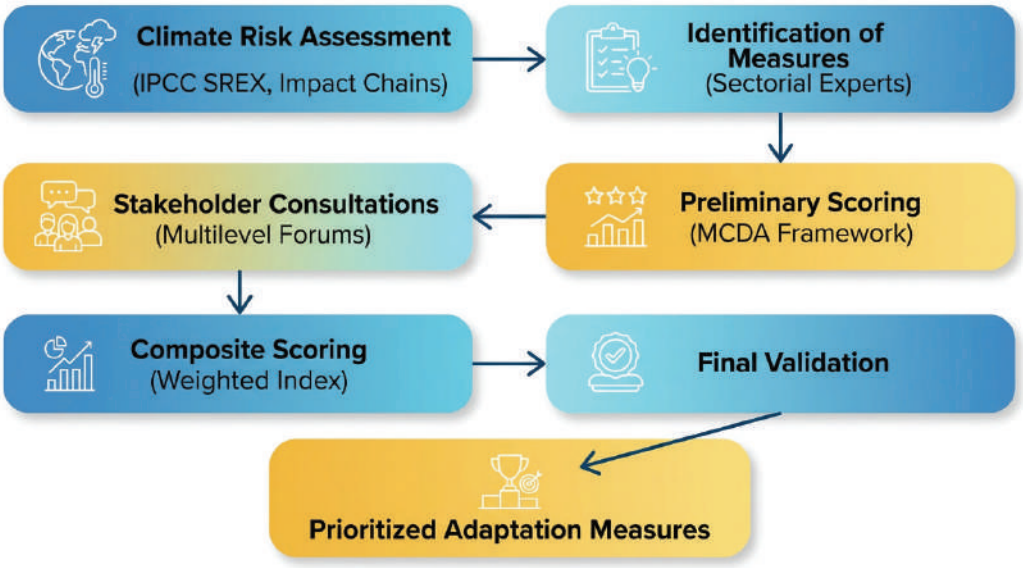


Figure 21: Climate Change Adaptation Measure

5.2 Detailed Adaptation Measures

Libya's climate adaptation strategy is articulated around a portfolio of fourteen priority adaptation measures (CCAMs), selected through a rigorous, participatory, and evidence-based process. These measures reflect the country's climate risk profile, institutional capacity, development aspirations, and cross-sectoral vulnerabilities identified through the Climate Risk Assessment (CRA) and national consultations.

Each Climate Change Adaptation Measure (CCAM) is structured to achieve multiple objectives: reducing climate risk, addressing systemic vulnerabilities, empowering vulnerable populations, and enabling structural transformation in key sectors. The following summary presents the selected CCAMs by sector, highlighting their objectives, expected outcomes, implementation timeframes, institutional anchors, and cross-cutting contributions.

Libya's Priority Adaptation Measures by Sector and Timeframe.

Measure Name	Sector	Objective	Geographic Focus	Time frame	Responsible Institutions	Est. Cost (USD)	Implement Modalities	Expected Outputs	Co-benefits	Risks Assumptions	Inclusiveness	Policy Alignment	MEL Linkage
Community-Led Water Resilience Monitoring Program	Water	Decentralized water monitoring for adaptive governance	National with local emphasis	2025–2035	MOWR, Municipalities	$0.5M	Community-led monitoring systems	Enhanced data availability, improved local governance	Empowerment of local users, early detection of risks	Institutional fragility, technical capacity	Includes women/youth focal points	SDG6, GGA, Paris Agreement	Integrated into MEL via community monitoring
Ecosystem-Based Groundwater Recharge and Protection Initiative	Water & Environment	Aquifer recharge through NbS	East, South	2025–2032	MOWR, MOF	$210-260M	Nature-based infrastructure, buffer zones	Increased aquifer stability	Drought buffer buffer, biodiversity co-benefits	Land access, ecosystem fragility	Women-sensitive distribution	SDG6, SDG15, GGA	Groundwater recharge and quality
National Integrated Water Governance for Climate Resilience (NIWG-CR)	Water Governance	Policy coherence and adaptive basin management	National	2025–2030	EO-NCCC, MOWR	$170-220M	Regulatory reform, basin monitoring	Reduced water stress, institutional clarity	Efficiency, conflict sensitivity	Low inter-agency coordination	Empowers women in water councils	SDG6/13, GGA	MEL audits on decisions with CBA
Climate-Responsive Agricultural Finance for Smallholders (CRA-FISS)	Agriculture	Tailored finance mechanisms for resilience	Rural zones	2025–2032	MOA, MOF	$15-25M	Guarantee funds, inclusive finance	Access to finance, resilient	Livelihoods, credit access	Financial literacy gaps	Targets women and youth farmers	SDG2/13, GCF-aligned	Finance disbursement + impact KPIs
Climate-Smart Crop Diversification and Risk Reduction Program	Agriculture	Introduce drought resilient crops	North-central, southern	2026–2033	MOA	$160-210M	Pilot programs, seeds & inputs	Stabilized yields, food security	Reduced drought losses	Supply chain risks	CS crops for women-led cooperatives	SDG2, GBF, GGA	Hectares under CSA, yield metrics
Secure Land Rights and Regenerative Soil Management Initiative	Agriculture	Land tenure & soil regeneration	South, drylands	2025–2030	MOA, MOLG	$130-180M	Land titling, soil projects	Reduced erosion, improved tenure	Tenure security & soil fertility	institutional bottlenecks	Secure tities for female farmers	SDG1/5/15, GEF	Soil index + titie distribution
Resilience Corridors for Sustainable Dryland Restoration (DERR-C)	Environment	Restore connectivity in drylands	Fezzan & interier	2026–2035	MOF	$180-230M	Corridor planting, NbS	Reduced desertification	Ecological services	Degraded iands	Youth-led reforestation	SDG15, Sendal	Vegetation index, km² restored
Strategic Green Infrastructure for Urban and Environmental Resilience (SGI-Res)	Urban	NbS for heat & flood risk	Coastal urban areas	2025–2030	MOLG	$75-100M	Green corridors, park systems	Urban cooling, water retention	Health, biodiversity, urban liveability	Maintenance costs	inclusive design for public spaces	SDG11, Paris	Green space ratio, flood reduction
Building a Resilient Blue Economy for Coastal Communities and Ecosystems (ReBECLE)	Coastal	Marine livelihood & protection	Marine-coastal zones	2026–2031	MOE, MoFish	$50-70M	Coastal NbS, fisheries	Ecosystem recovery, jobs	Food, equity, biodiversity	Overfishing, pollution	Women-led cooperatives	SDG14, GBF	Habitat index, jobs created
Libya National Adaptation Intelligence and Coordination Platform	Cross-Sectoral	Data integration & risk analysis	National	2025–2030	EO-NCCC	$45-60M	Platform development	Better risk-informed planning	Informed decisions	Data fragmentation	Disaggregated data systems	SDG13, ETF	Data access & use metrics
Climate Risk Intelligence and Decision-Support System (CIDSS)	Planning	Early warning and DSS	National	2025–2032	LNMC, EO-NCCC	$40-55M	Forecasting & alerts	Improved early action	Disaster readiness	ICT gaps	Alert access for remote communities	Sendai Priority 1	Warning coverage & response rate
WEFE Resilience Hubs	Nexus	Integrated WEPE management	Transitional/ dryiands	2025–2034	SACCCs	$140-180M	Pilot hubs	Reduced cress-sector tensions	Nexus outcomes	Coordination gaps	WEFE access for youth/women	SDG2/6/13/15	WEFE indicators, hub performance
Resilierd Food Supply Corridors (RSFSC)	Food Systems	Secure food supply chains	Agro-corridors	2026–2035	MOA, MOT	$120-160M	Coid chains, logistics	Stable supply, job creation	Food security,	Transport reliability	Women/youth inclusion in value chains	SDG12, GGA	Supply stability index
Agroclimatic Decision-Support Platform (Agro-DSP)	Agriculture	Forecasts & extension services	Farming cones	2025–2032	MOA	$12-18M	Digital platform	Farm-level decisions improved	Productivity, climate risk reduction	Connectivity barriers	Youth-led innovation	SDG2, ETF	Platform access & use stats

Table 8: Libya's Priority Adaptation Measures by Sector and Timeframe.

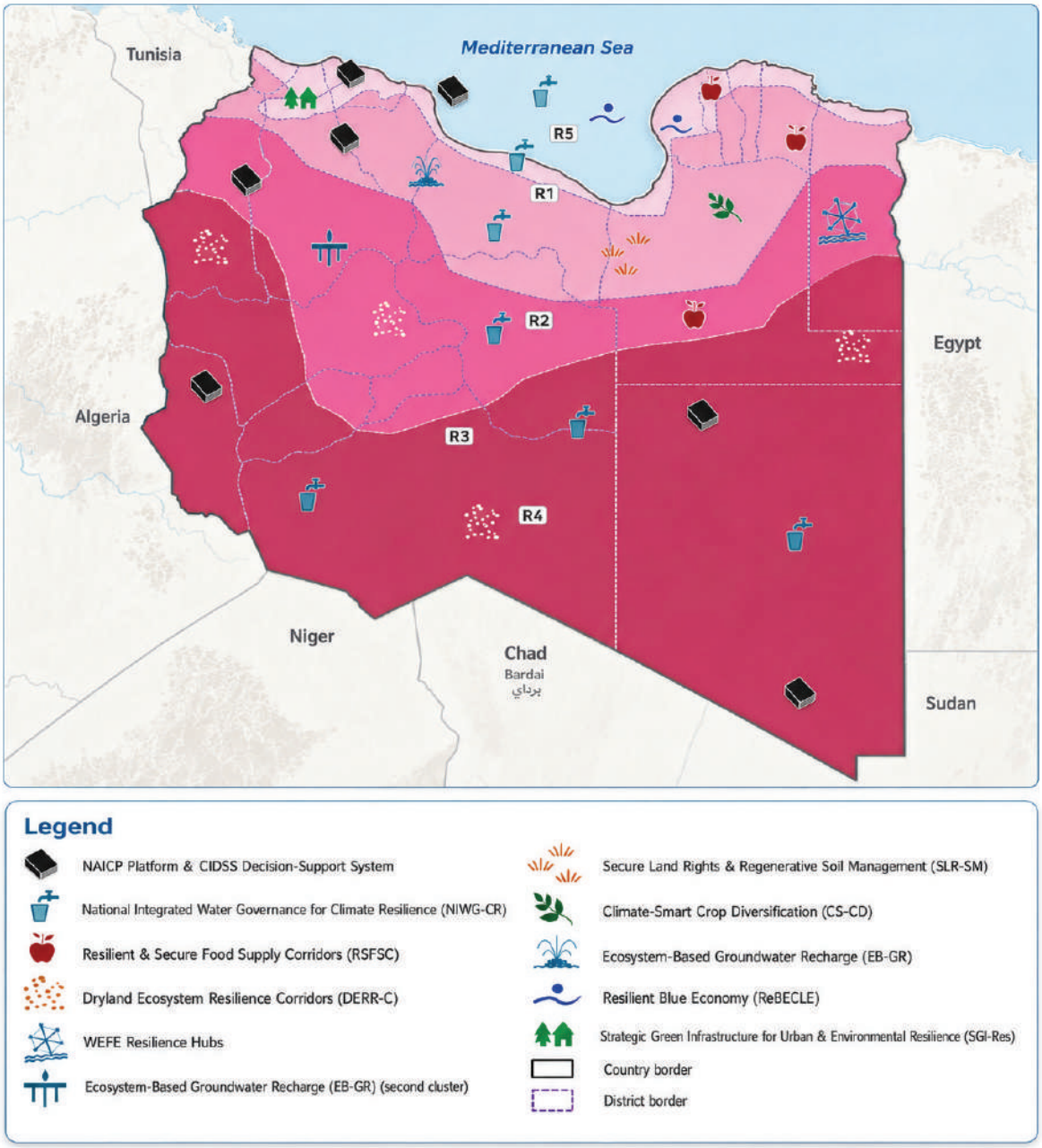


Figure 22: Climate Risk Zonation Map for Adaptation Planning in Libya

5.3 Conditionality, Synergies, and Co-benefits

Libya's climate adaptation strategy explicitly distinguishes between conditional and unconditional measures to enhance transparency, promote strategic coherence, and align with Articles 7 and 9 of the Paris Agreement. This classification acknowledges both the political commitment to adaptation and the differentiated capacity to implement it, depending on the availability of financial, technical, and institutional support.

Conditional and Unconditional Measures. Adaptation measures have been categorized based on a multi-criteria analysis conducted during the National Decision-Making Seminar (May 2025), considering factors such as cost, technical complexity, institutional readiness, and enabling legal frameworks.

Unconditional measures are those Libya commits to implement using national resources, such as the state budget, the Resilience Reserve Fund (funded by 1% of annual oil revenues), and existing institutional capabilities. The National Integrated Water Governance for Climate Resilience (NIWG-CR) is the flagship unconditional measure, reflecting Libya's strong institutional and legal readiness in this domain.

Conditional measures constitute the majority (91%) of Libya's priority adaptation actions. These include complex or capital-intensive interventions, such as the WEFE Resilience Hubs, Resilient Food Supply Corridors, and Dryland Ecosystem Restoration Corridors, which require sustained support from international climate finance (e.g., GCF, GEF, Adaptation Fund), technology transfer, and technical cooperation.
This distinction provides a clear framework for resource mobilization, international engagement, and reporting under the Enhanced Transparency Framework (ETF).

- Enhance systemic resilience across water, agriculture, biodiversity, infrastructure, and urban systems.
- Stimulate economic diversification and job creation, especially for youth and women;
- Strengthen governance and institutional capacity, including digitalization and decision-support systems.
- Support decentralization and local service delivery, through subnational adaptation financing and inclusive planning.

A detailed matrix of co-benefits (Table 5.3) highlights how each adaptation measure contributes to these objectives.

Measure	Sector	Mitigation	Social Equity	Ecosystem Benefits	Institutional Strengthening	Resilience Co-benefits
Community-Led Water Monitoring	Water	✓	✓		✓	✓
Ecosystem-Based Groundwater Recharge	Water/Env	✓		✓	✓	✓
NIWG-CR Water Governance	Water		✓		✓	✓
CRA-FiSS Smallholder Finance	Agriculture		✓		✓	
Climate-Smart Crop Diversification	Agriculture	✓		✓		✓
Land Rights & Soil Regeneration	Agriculture	✓	✓	✓		✓
Dryland Restoration Corridors	Environment	✓		✓	✓	✓
Urban Green Infrastructure (SGI-Res)	Urban	✓			✓	
Blue Economy Coastal Program	Coastal	✓		✓		✓
Adaptation Intelligence Platform (NAICP)	Cross-sectoral		✓		✓	
Early Warning & DSS (CIDSS)	Planning		✓		✓	
WEFE Resilience Hubs	Nexus	✓	✓	✓		✓
Food Supply Corridors	Food Systems		✓			
Agroclimatic DSP	Agriculture					✓

Table 9: Co-benefits and Development Synergies Matrix

Co-benefits for Mitigation, Equity, and Sustainability. Beyond climate resilience, Libya's adaptation measures offer multiple co-benefits, notably:

- **Climate mitigation.** Several adaptation interventions, such as ecosystem-based groundwater recharge, urban greening (SGI-Res), and climate-smart agriculture, contribute to carbon sequestration, reduced emissions from land degradation, and enhanced energy efficiency. These align with Libya's long-term low-emission development strategy.

- **Social and women fairness.** Measures explicitly mainstream the empowerment of women, youth, displaced populations, and vulnerable groups through targeted benefits (e.g., land tenure reforms, inclusive job programs, participatory planning). Women-responsive budgeting and indicators are being developed as part of the MEL system.

- **Environmental sustainability.** Nature-based solutions (NbS) such as dryland restoration, wetland protection, and coastal zone rehabilitation enhance ecosystem services including water purification, pollination, and erosion control, contributing to Libya's commitments under the Kunming-Montreal Biodiversity Framework.

- **Peacebuilding and stabilization.** By investing in services and livelihoods in fragile regions, such as the southern and coastal belts, the adaptation strategy supports conflict-sensitive development, regional integration, and climate-security co-benefits.

The distinction between conditional and unconditional measures reinforces Libya's dual adaptation pathway: national ownership and ambition on one side, and structured international cooperation on the other. It provides a compelling case for targeted support through climate finance mechanisms and bilateral partnerships. Importantly, the embedded synergies and co-benefits ensure that adaptation is not treated as a standalone technical agenda, but as a transformative engine for Libya's sustainable development, peace, and institutional modernization.

Part VI. Implementation Strategy and Enabling Conditions

The successful implementation of Libya's National Adaptation Plan (NAP) hinges on a coherent, inclusive, and functionally integrated institutional framework capable of responding to the country's multi-dimensional climate risks and governance challenges. In line with Article 7 of the Paris Agreement and decisions under the Cancun Adaptation Framework, Libya has undertaken deliberate steps to establish a participatory architecture that promotes vertical and horizontal coordination, sectoral ownership, and territorial responsiveness.

6.1 Core Coordination Structure.

At the apex of Libya's adaptation governance structure stands the National Climate Change Committee (NCCC), restructured under Cabinet Decree No. 336/2021. Chaired by the Minister of Environment, the NCCC provides strategic oversight, interministerial alignment, and guidance on climate-related matters. It supervises national reporting obligations and serves as the official platform for Libya's engagement in international climate processes.
The operational and technical nucleus of this architecture is the Executive Office of the NCCC (EO-NCCC), formalized by Ministerial Decision in 2023. The EO-NCCC leads the coordination of the NAP, facilitates integration of climate risk into national planning and budgeting systems, and manages climate communications, including Biennial Transparency Reports (BTRs). It convenes focal points from key ministries, such as Water Resources, Agriculture, Energy, Transport, Local Government, Health, and Planning, and acts as the national interface with international cooperation agencies.

To deepen sectoral engagement and ensure policy coherence, Sectoral Adaptation Climate Change Committees (SACCCs) are being established within line ministries. These platforms enable technical coordination, integrate sector-specific adaptation plans (SAPs) into the NAP, and ensure that adaptation priorities are embedded in sectoral strategies and investment frameworks. To make such integration operational and sustainable, it is essential to establish a solid system for shared data and information management, as well as a robust monitoring, evaluation, and learning (MEL) framework that supports iterative planning, transparency, and adaptive governance across all levels. platforms enable



Photo credit: Malek Elmaghrebi

6.2 Subnational Governance and Local Implementation

Libya's decentralization framework, rooted in Law No. 59 (2012) and Decree No. 1500 (2021), empowers municipalities with mandates over climate-relevant domains such as water, sanitation, solid waste, and public health. However, the full realization of these roles is constrained by disparities in technical capacity, financial resources, and institutional legitimacy across municipalities, particularly in the South (Region 4) and remote hinterlands (Region 3).

To operationalize vertical integration, the EO-NCCC is supporting the development of Territorial Adaptation Action Plans (TAAPs), participatory risk assessments, and capacity-building programs. These efforts aim to enhance local adaptation readiness and bridge the gap between national strategy and community-level action. Municipalities are also recognized as platforms for social dialogue, local knowledge integration, and inclusive governance.

6.3 Multi-Stakeholder Participation and Technical Coordination

A promising institutional innovation is the creation of a National Technical Coordination Mechanism (NTCM) to link the EO-NCCC with academia, civil society, private sector actors, and development partners. This body will facilitate knowledge exchange, ensure transparency, and strengthen co-production of adaptation solutions, especially in regions affected by fragility or conflict.
The EO-NCCC also hosts thematic working groups on social roles and inclusion, MEL (Monitoring, Evaluation, and Learning), and adaptation finance. These technical platforms provide cross-cutting support to NAP implementation and ensure that adaptation actions align with the Global Goal on Adaptation (GGA), the Sustainable Development Goals (SDGs), and the Kunming-Montreal Global Biodiversity Framework.

Strategic Imperatives for Institutional Resilience. Despite these structural advancements, Libya's adaptation governance system remains transitional and context-sensitive. Key priorities to enhance institutional functionality include:

- Legal consolidation of climate and adaptation mandates through a dedicated Climate Change Law.
- Institutional capacity building targeting municipalities and SACCCs.
- Interoperable data systems to support MEL and early warning mechanisms.
- Coordinated financing mechanisms linking adaptation finance to budget planning and investment decisions.

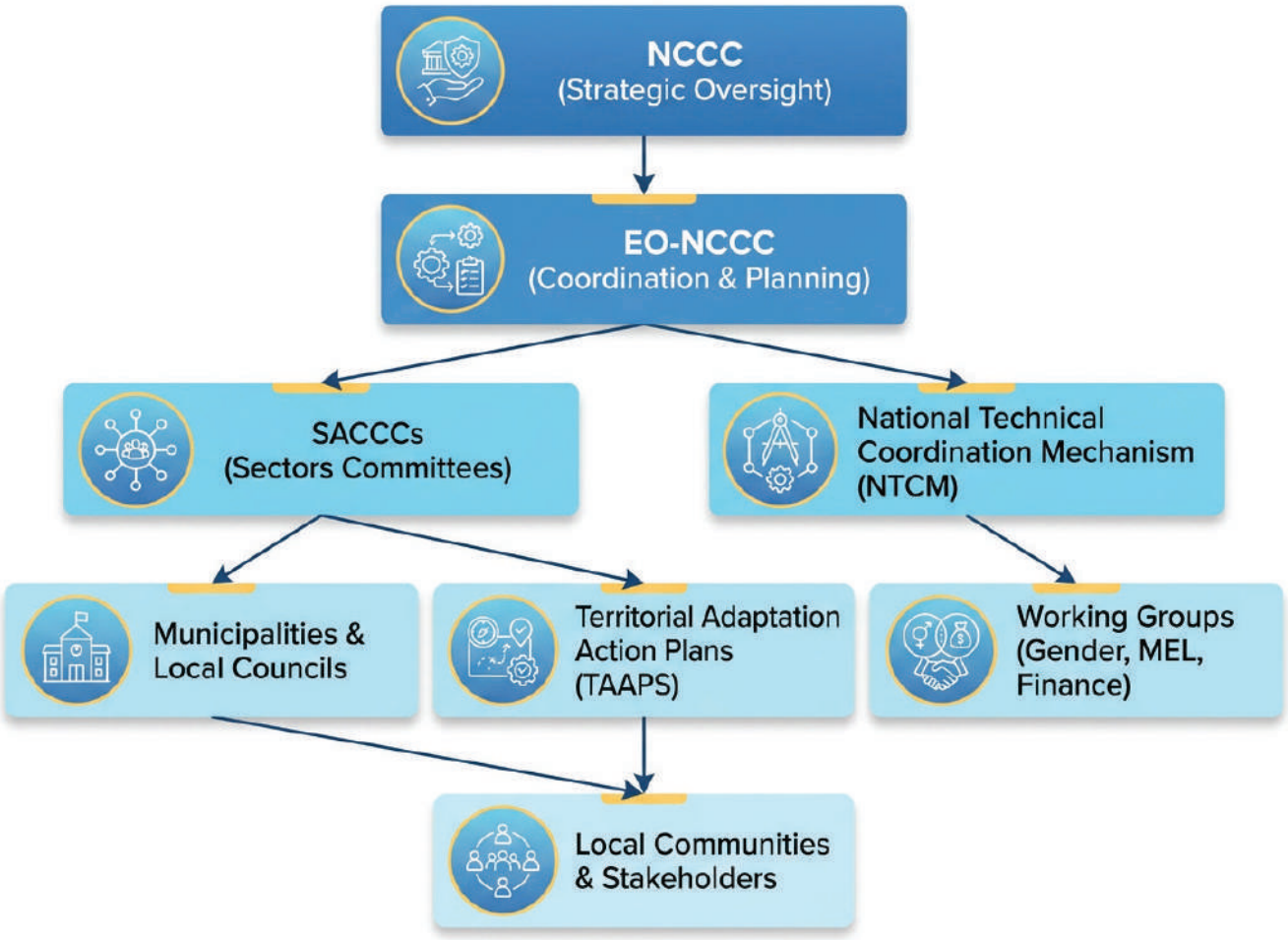


Figure 23: Institutional Architecture for Climate Adaptation in Libya

6.4 Legal, Policy, and Regulatory Instruments

A robust legal and policy framework is foundational to the implementation of the National Adaptation Plan (NAP) and to the operationalization of Libya's climate resilience agenda. The current legislative architecture provides initial entry points for mainstreaming adaptation, particularly through environmental governance, water and land use regulation, biodiversity conservation, spatial planning, and decentralization. However, this framework remains incomplete, outdated, and inadequately aligned with contemporary climate risks, institutional realities, and Libya's international commitments under the Paris Agreement.

Current Legal Landscape. Libya's legal system features several sectoral laws relevant to adaptation, but most predate global climate conventions and lack explicit provisions on climate risk, adaptation planning, or disaster risk reduction. Key instruments include:

Environmental Protection. Law No. 7 (1982) and Law No. 15 (2003) set foundational norms for environmental governance but omit climate-specific mandates.

Water Resources. Law No. 3 (1982) and the Water Law of 1965 regulate water extraction and usage but lack provisions on climate resilience, groundwater sustainability, or drought management. Agriculture and Land Use. Laws such as No. 5 (1982) on rangeland protection and No. 15 (1992) on land conservation promote resource preservation but are disconnected from ecosystem-based adaptation or climate-smart agriculture.

Biodiversity and Marine Systems. Laws from 1950 to 1989 address wildlife and marine biodiversity

but do not integrate nature-based solutions or modern ecosystem resilience approaches.
Urban Planning. The National Spatial Policy (2006–2030) offers an opportunity for climate-sensitive urban development but does not currently mandate hazard zoning or resilient infrastructure standards.

Local Governance. Law No. 59 (2012) on decentralization assigns important climate-relevant responsibilities to municipalities, yet lacks the regulatory tools, decrees, and fiscal provisions to enable their effective implementation.
The matrix below (figure 17) highlights the partial coverage and limited integration of climate risk across Libya's legal corpus, underscoring the need for comprehensive reform.

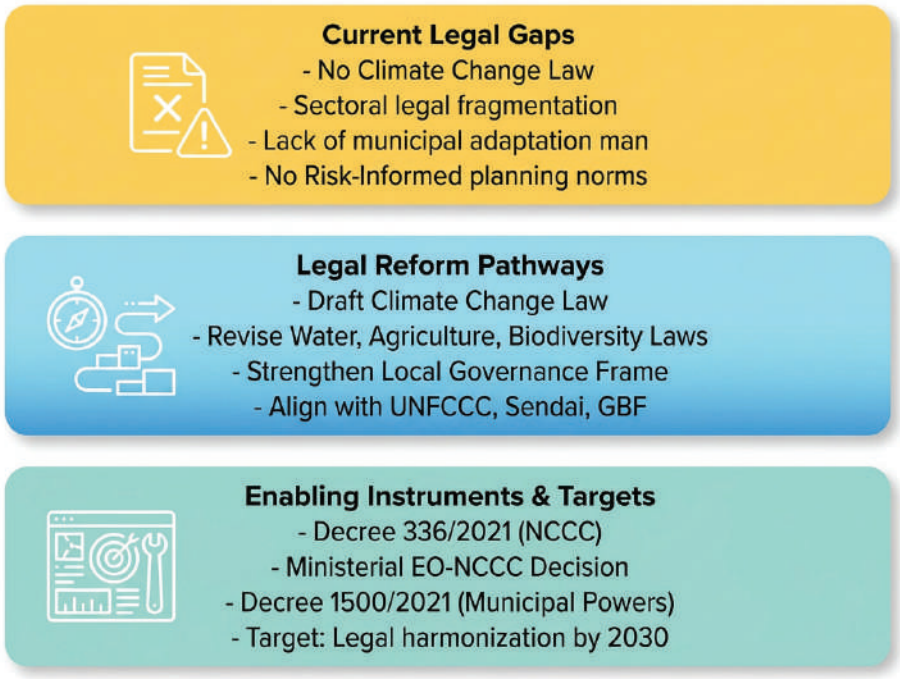


Figure 24: Legal Coherence and Reform Roadmap for Adaptation in Libya

6.5 Identified Gaps and Challenges

Despite the presence of relevant legal instruments, Libya's adaptation framework is undermined by:

Absence of a Dedicated Climate Change Law. There is no legal mandate for cross-sectoral integration of adaptation or the institutionalization of climate risk assessments.

- Legal Fragmentation. Sectoral laws operate in isolation, hindering systemic approaches such as the Water-Energy-Food-Ecosystems (WEFE) nexus.
- Vertical Incoherence. Local entities lack enforceable authority, financial instruments, and regulatory autonomy, despite being key implementation actors.
- East–West Institutional Divergence. Parallel systems and conflicting mandates constrain the development of a unified national adaptation framework.

6.6 Legal Reform Priorities

To create an enabling environment for adaptation, Libya will pursue five strategic legal reform pathways:

1. Codify Climate Risk into National Law. Develop and adopt a comprehensive Climate Change Law that institutionalizes adaptation planning, defines mandates, and establishes enforcement mechanisms.

2. Revise Sectoral Legislation for Coherence and Resilience. Update laws in water, agriculture, biodiversity, and land use to reflect climate threats, enable ecosystem-based adaptation, and promote multisectoral planning.

3. Strengthen Legal Foundations for Local Adaptation. Enact decrees that empower municipalities with clear roles, budgetary autonomy, and technical authority to implement adaptation measures.

4. Align with International Commitments. Harmonize national laws with Libya's obligations under the UNFCCC, Paris Agreement, Sendai Framework, and Biodiversity Framework.

5. Integrate Disaster Risk Governance. Establish a legal basis for disaster risk reduction, early warning systems, and risk-informed development planning in line with Sendai Framework Targets E and G.

These reforms will support legal convergence, policy continuity, and rights-based adaptation across Libya's governance spectrum.

Strategic Instruments Under Implementation. In the interim, the following executive instruments provide operational direction for adaptation:

- Cabinet Decree No. 336/2021: Establishes the National Climate Change Committee (NCCC) and its mandate.

- Ministerial Decision (2023): Formalizes the Executive Office of the NCCC (EO-NCCC) as the coordination and technical body for adaptation planning.

- Decree No. 1500/2021: Empowers municipalities with climate-relevant functions, pending further enabling regulations.

6.7 Capacity Development and Technology Needs.

Building adaptive capacity and closing technology gaps are foundational pillars for effective, equitable, and sustainable climate adaptation in Libya.

Given the country's prolonged institutional fragility, uneven human capital distribution, and limited technological infrastructure, a robust and inclusive capacity development strategy is critical to ensuring that national, sectoral, and local actors can collectively plan for, implement, and sustain adaptive measures over time.
Institutional Capacity Development. The National Climate Change Committee (NCCC), through its Executive Office (EO-NCCC), is central to climate governance. However, its effective functioning is hindered by weak coordination mechanisms, insufficient staffing, and limited operational resources. The formalization and empowerment of the Sectoral Adaptation Climate Change Committees (SACCCs) is an urgent need, enabling sector-specific planning, policy development, and monitoring at national and subnational levels.

Key actions include:

- Expanding operational budgets and staff for the EO-NCCC and SACCCs.
- Clarifying institutional mandates and coordination protocols.
- Embedding climate adaptation functions in line ministries and local councils.
- Strengthening the role of the Libyan National Meteorological Centre (LNMC) in early warning, data services, and climate modelling.

Human Resource Development. There is a significant skills deficit in Libya across critical areas of adaptation planning and implementation. Training is particularly needed in:

- Climate risk and vulnerability assessments.
- Climate finance access and proposal development.
- Women-responsive and participatory adaptation planning.
- Nature-based and ecosystem-based adaptation approaches.
- Monitoring, Evaluation, and Learning (MEL) systems design and operation.

Partnerships with universities, technical institutes, and regional centers of excellence, such as OSS, ICARDA, and African adaptation networks, can help build long-term professional pathways. Mentorships and youth engagement strategies should be integrated to ensure generational continuity.

Technology Needs for Adaptation. The most urgent technology needs for climate adaptation in Libya lie in the following areas:

Sector	Priority Technology Needs
Climate Monitoring	Automated weather stations, drought/flood early warning systems, satellite imagery interpretation, interoperable GIS dashboards.
Water Resource Management	Renewable energy-powered desalination, smart irrigation, leakage detection systems, aquifer monitoring networks.
Agriculture	Precision agriculture, climate-resilient seed varieties, rainwater harvesting systems, remote sensing for crop monitoring.
Public Health	Vector surveillance tools, early detection of climate-sensitive diseases, mobile health alerts for extreme events.
Ecosystems	Tools for ecosystem service valuation, biodiversity monitoring platforms, restoration tracking using remote sensing.

Table 10: Technology Needs for Adaptation

Access to International Support and Technology Transfer. Libya intends to leverage:

- The Paris Committee on Capacity-Building (PCCB) and UNFCCC Capacity-Building Portal.
- GCF Readiness support, GEF CBIT, and bilateral technical cooperation (EU, GIZ, UNDP, ADB).
- South–South exchange with Maghreb and Sahel countries for practical, regionally relevant innovations.

Technology transfer will emphasize **low-carbon, locally appropriate, and conflict-sensitive solutions,** especially in fragile and underserved regions. Initiatives will be co-designed with community stakeholders to ensure cultural acceptability and ownership.

Capacity Building and MEL. All capacity-building efforts will be integrated into Libya's Monitoring, Evaluation and Learning (MEL) framework, focusing on:

- Institutional performance and mandate execution.
- Technical competencies of staff and partners.
- Inclusiveness (Women, youth, regional representation).
- Knowledge generation, sharing, and application.

Biannual reviews will guide course corrections, ensuring that learning feeds directly into strategic and operational decisions.

Linkages with Climate Finance and Technology Deployment. Capacity development and technology deployment are mutually reinforcing:

- Institutional and fiduciary readiness enhances access to GCF, AF, and GEF funding.
- Locally trained staff ensure long-term sustainability of technologies.
- Women-responsive and inclusive processes improve effectiveness and legitimacy of investments.

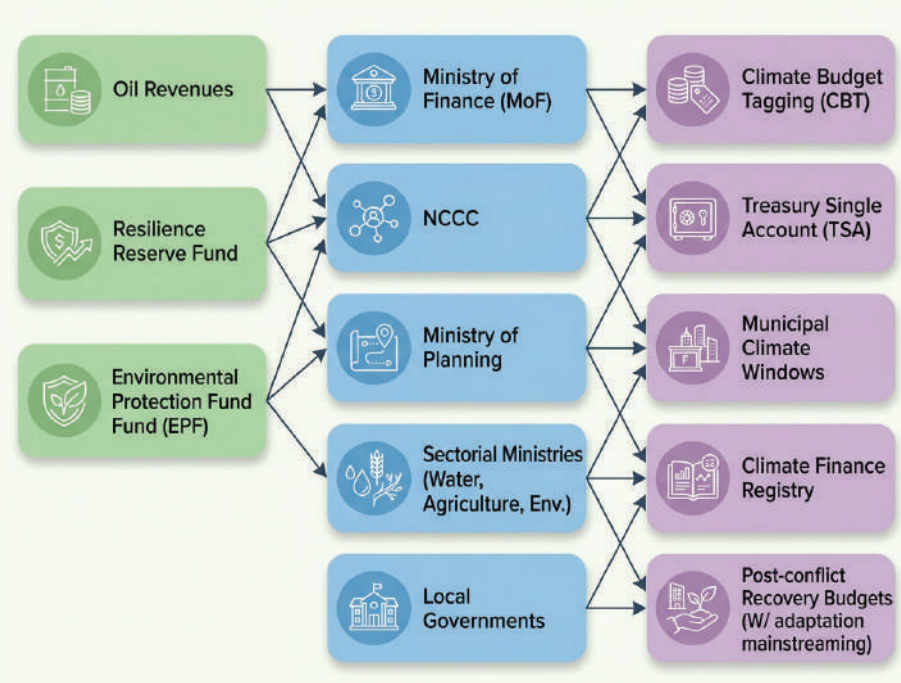


Figure 25: Systems Map: Stakeholders, Capacities, and Technology Flow

Part VII. Adaptation Finance and Investment Strategy

Libya faces an acute and growing need for adaptation finance. With over 95% of its territory classified as arid or hyper-arid, the country is increasingly exposed to climate hazards such as prolonged droughts, desertification, coastal erosion, and flash floods. These climate-related threats intersect with protracted conflict, economic dependency on hydrocarbons, institutional fragmentation, and fragile public service delivery, exacerbating the country's vulnerability and eroding its adaptive capacity.

Against this backdrop, **adaptation finance emerges as a strategic necessity** to ensure the protection of lives, livelihoods, and critical ecosystems. The imperative is not only environmental but developmental: without urgent and sustained investment in climate resilience, Libya's progress toward national recovery and sustainable development goals will remain tenuous and uneven.



Photo credit: Malek Elmaghrebi

7.1 Adaptation Finance in Libya.

Libya's adaptation needs are amplified by its multidimensional vulnerability:
Hydrological and agricultural systems are under extreme stress due to recurring droughts, aquifer depletion, and rising temperatures. Rural livelihoods and food security are particularly threatened.

- Coastal zones, which host most of the population and infrastructure, are increasingly exposed to saline intrusion, sea-level rise, and storm surges.
- Institutional weaknesses, including the absence of a unified treasury, lack of formal adaptation budgeting, and limited access to concessional finance, constrain the capacity to deliver adaptive services at scale.
- Public investment volatility linked to oil revenues makes long-term adaptation planning difficult, reinforcing the urgency of diversifying financial sources.

Given these realities, securing predictable, scalable, and well-targeted adaptation finance is fundamental to safeguarding Libya's development pathways and ensuring inclusive climate resilience.

Alignment with International Commitments. The financing of adaptation measures in Libya is **anchored in multiple international commitments:**

- Article 7 of the Paris Agreement identifies adaptation as a global priority, emphasizing country ownership, women and social roles-responsiveness, and participatory approaches.
- The Global Goal on Adaptation (GGA), established under the Glasgow–Sharm el-Sheikh work programme, guides Libya's national vision through its three pillars: enhancing adaptive capacity, strengthening resilience, and reducing vulnerability.
- The 2030 Agenda for Sustainable Development, particularly SDG 13 (Climate Action), calls for integrated financial mechanisms to support national adaptation responses.
- Sendai Framework for Disaster Risk Reduction (2015–2030) and the Kunming-Montreal Global Biodiversity Framework provide additional policy scaffolding for linking adaptation investments with disaster risk governance and nature-based solutions.

Libya's Nationally Determined Contribution (NDC 3.0) underscores these commitments by identifying sector-specific and cross-cutting adaptation priorities that require both domestic resourcing and international climate finance.

7.2 Current Landscape of Climate Finance in Libya.

The climate finance ecosystem in Libya is still in its nascent stages, with both opportunities and barriers.

Multilateral Access. Libya has initiated readiness engagements with the Green Climate Fund (GCF) and the Global Environment Facility (GEF), but no major project has yet reached full funding approval. While initial concept notes have been discussed and technical assistance mobilized through partners, significant efforts are still needed to generate bankable proposals aligned with national priorities.

Official Development Assistance (ODA) and Bilateral Cooperation. ODA flows remain limited, estimated at approximately USD 200–300 million annually,and have been declining in recent years.

Key bilateral contributors include the European Union, Germany, and the United States. However, most aid flows remain project-based, fragmented, and not explicitly aligned with national climate adaptation priorities.

Domestic Finance. Oil revenue continues to dominate public finance in Libya, accounting for approximately 97% of national income. However, the absence of a unified treasury account and irregular budget cycles limit the traceability, predictability, and consistency of adaptation-related expenditures.

A recent institutional development is the establishment of the **Environmental Protection Fund** under the Ministry of Environment, created by Cabinet Decree No. 574/2023. Its organizational structure was formally approved in March 2024, and its activation was officially mandated by the Prime Minister in October 2024. Although not yet fully operational, the Fund has the potential to serve as a national instrument for mobilizing and channelling climate adaptation finance, especially for decentralized actions, nature-based solutions, and environmental restoration initiatives.

Private Sector Involvement. Private capital participation in adaptation initiatives remains virtually non-existent. Regulatory uncertainty, political risk, and weak financial ecosystems discourage investment in long-term or ecosystem-based projects. That said, promising but isolated initiatives are emerging in sectors such as solar energy, off-grid water treatment, and sustainable construction, especially in partnership with international NGOs or pilot programs.

Innovative Finance. Libya has expressed interest in developing innovative finance instruments such as green bonds, climate sukuk, and performance-based payment schemes. However, these mechanisms are still under conceptual review and lack enabling regulatory frameworks, technical expertise, and pipeline-ready projects.

As identified in recent policy diagnostics, Libya's greatest challenge lies in translating adaptation strategies into financially viable and **bankable interventions** capable of attracting funding at scale, while ensuring geographic and social equity. This will require coordinated investment planning, strengthened fiduciary systems, project preparation facilities, and enabling policies to de-risk climate investments.

7.3 Costing of Priority Adaptation Measures

The costing of Libya's priority adaptation measures reflects both the country's acute vulnerability to climate impacts and its ambition to initiate a transformative resilience trajectory. The cost estimates presented in this section are based on a multi-source costing exercise informed by the Climate Risk Assessment (CRA), stakeholder validation seminars, and the MACC profiles developed during the formulation of the National Adaptation Plan (NAP). These costs are indicative and will be periodically updated during project design, investment planning, and financial tracking cycles.

Aggregate Investment Needs (2025–2035). The total estimated financial requirement for implementing the set of prioritized adaptation measures is projected to range between **USD 1.9 and 2.4 billion** over the 2025–2035 period. This estimation accounts for the variation in institutional readiness, geographic reach, technological complexity, and potential co-financing. The breakdown by sector is as follows:

Sector	Share of Estimated Costs
Water Security & Governance	32%
Agriculture & Food Systems	25%
Ecosystems & Coastal Zones	18%
Critical Infrastructure	15%
Capacity, Data & MEL Systems	10%

Table 11: Aggregate Investment Needs

These allocations are consistent with Libya's identified climate vulnerabilities and strategic development priorities. Notably, over 90% of the costed measures are currently considered conditional, dependent on access to international climate finance, technical cooperation, and capacity-building support.

CapEx and OpEx Classification. The cost structure of adaptation measures has been disaggregated into Capital Expenditures (CapEx) and Operational Expenditures (OpEx) to reflect the dual nature of investment:

- CapEx (approximately 65–70%) includes large-scale infrastructure (e.g., groundwater recharge systems, WEFE Resilience Hubs, coastal defenses), digital platforms (e.g., CIDSS, NAICP), and ecological restoration (e.g., Dryland Ecosystem Corridors).

- OpEx (approximately 30–35%) relates to recurrent programmatic costs such as agricultural extension, monitoring, local governance support, capacity development, and early warning services.

This classification enhances alignment with international climate finance instruments and facilitates integration into national public investment plans.

Temporal Allocation of Costs. The adaptation measures have been classified based on their implementation timeline:

Timeframe	Description
Short-Term (2025–2027)	Foundational investments in water governance, planning systems, and pilot actions.
Medium-Term (2028–2031)	Scale-up of ecosystem-based and agriculture measures.
Long-Term (2032–2035)	Infrastructure consolidation, integrated WEFE systems, institutional expansion.

Table 12: Temporal Allocation of Costs

This temporal stratification ensures logical sequencing of adaptation efforts and facilitates progressive financing mechanisms such as climate bonds, results-based finance, and multi-year budgeting.

Cost of Inaction and Co-Benefit Considerations. Preliminary assessments suggest that the cost of inaction could exceed USD 3.5 billion by 2035 due to losses in agricultural productivity, urban flooding damages, health costs from heatwaves, and groundwater depletion. In contrast, the planned investments generate substantial co-benefits, including:

- Improved water access for over 3 million people.
- Enhanced food security for 2.4 million individuals across vulnerable regions.
- Employment generation through green jobs, particularly for youth and women.
- Biodiversity and ecosystem services protection across 300,000 hectares of land.

These non-monetary returns will be captured through the Monitoring, Evaluation, and Learning (MEL) system, using integrated cost-benefit analysis and vulnerability reduction indicators.

Next Steps for Costing Validation. A detailed Adaptation Investment Plan (AIP) will be developed during the early implementation phase of the NAP to:

- Refine cost envelopes at the project level.
- Define financing modalities and risk-sharing mechanisms.
- Establish co-financing targets with bilateral, multilateral, and private actors.

This costing exercise represents a critical building block toward mobilizing predictable, transparent, and social roles-responsive climate finance, in accordance with Article 9 of the Paris Agreement and Decision 18/CMA.1 on finance transparency.

Costing Tables – Adaptation Measures

Sector	Estimated Cost	Share	Cost Type	Conditionality	Timeframe
Water Security & Governance	USD 620–780 million	**32%**	High CapEx	High	Short to Long
Agriculture & Food Systems	USD 475–600 million	**25%**	Mixed CapEx/OpEx	Medium	Medium to Long
Ecosystems & Coastal Zones	USD 340–430 million	**18%**	Medium CapEx	High	Medium to Long
Critical Infrastructure	USD 285–360 million	**15%**	High CapEx	Medium	Long
Capacity, Data & MEL Systems	USD 190–230 million	**10%**	Mostly OpEx	High	Short to Medium

Table 13: Estimated Costs by Sector

Timeframe	Estimated Cost	Key Investments
Short-Term (2025–2027)	USD 450–580 million	Foundational systems, pilots, water governance
Medium-Term (2028–2031)	USD 750–950 million	Scale-up of NbS, agriculture, ecosystem actions
Long-Term (2032–2035)	USD 700–870 million	Infrastructure, coastal protection, institutional scale-up

Table 14: Estimated Costs by Timeframe

7.4 Domestic Resource Mobilization

Mobilizing national resources for climate adaptation is a foundational step toward enhancing Libya's sovereignty, resilience, and long-term sustainability. While Libya remains structurally dependent on oil revenues, which account for approximately 97% of national income, the government has taken initial steps to integrate climate finance considerations into its evolving public financial management systems. This section outlines the opportunities and constraints shaping Libya's capacity to allocate domestic resources toward priority adaptation measures and systems.

Current Fiscal Landscape and Challenges.
Despite expanded development spending since 2021, totalling over LYD 17.5 billion annually in capital expenditures, the allocation of funds toward climate-sensitive sectors such as water, agriculture, biodiversity, and public health has remained inconsistent and marginal. Budget execution remains skewed toward post-conflict reconstruction of energy and housing infrastructure, with climate adaptation rarely featured as an explicit budget line in national or municipal accounts.

The underlying constraints include:

- Lack of institutionalized adaptation budgeting, as climate actions are not yet integrated into Chapter 3 (Development Expenditures) of the national budget.
- Fragmented budgeting authority, with parallel institutions and ad hoc monthly allocations by the Central Bank hindering long-term financial planning.
- Weak fiduciary systems, marked by the absence of a Treasury Single Account (TSA) and real-time expenditure tracking.
- Limited subnational fiscal autonomy, with municipalities highly dependent on central transfers and lacking own-source revenue to fund local adaptation actions.

Reform Pathways and Institutional Commitments. To overcome these challenges, Libya has initiated a progressive reform agenda centred around the following pillars:

1. Climate Budget Tagging and Integration. The Ministry of Finance, in coordination with the EO-NCCC and Ministry of Planning, will institutionalize climate budget tagging (CBT) across national and local public financial systems. This will enable systematic tracking, evaluation, and reporting of adaptation expenditures across ministries and sectors.
2. Operationalizing a Treasury Single Account (TSA). A TSA is being gradually implemented to enhance disbursement transparency and reduce fiduciary risk in climate finance flows.
3. Municipal Climate Finance Windows. Dedicated funding streams will be created to support climate action by municipalities, especially in underserved regions such as the South and coastal zones.

4. Resilience Reserve Fund. A fixed percentage of oil revenues will be earmarked annually to establish a “Resilience Reserve Fund,” supporting both national priorities and community-based adaptation initiatives.

5. Environmental Protection Fund (EPF). The EPF, established under Decree No. 574 (2023), is being reformed to become a credible domestic recipient of both public allocations and international co-financing and is partly financed through penalty and fine payments collected for environmental violations.A Climate Finance Unit within the EPF will coordinate project appraisal and fiduciary management in line with international standards.

Roles of Key National Institutions

- **Ministry of Finance (MoF):** Leads budget reform, climate tagging, and integration of adaptation into development expenditures.

- **Executive Office of the NCCC (EO-NCCC):** Oversees coordination, MEL alignment, and the Climate Finance Registry.

- **Ministry of Planning:** Anchors adaptation priorities in public investment plans and Medium-Term Expenditure Frameworks (MTEFs).

- **Sectoral Ministries (Water, Agriculture, Environment):** Responsible for developing climate-resilient sector strategies and proposing climate-tagged budget lines.

- **Local Governments**: Act as implementing partners through climate finance windows, participatory planning, and local monitoring.

Integration with Development and Recovery Agendas. Climate adaptation is being mainstreamed into Libya’s broader post-conflict reconstruction and recovery strategy. Budget windows supporting urban rehabilitation, infrastructure expansion, and job creation are increasingly being reviewed through a climate-resilience lens. For example:

- Infrastructure development funds may incorporate resilience criteria (e.g., flood-proofing, solarization).
- Agricultural subsidies are being aligned with climate-smart practices through pilot initiatives.
- Recovery programming, such as the “Reviving Life” initiative, is expanding investments in water and land governance with adaptation co-benefits.

Way Forward. To ensure financial sustainability and maximize co-benefits, Libya will:

- Develop a National Climate Finance Strategy (cross-referenced in Section VII.6).
- Establish climate-relevant performance indicators to track spending effectiveness.
- Convene annual budget hearings and consultations to promote transparency and participatory oversight.
- Pursue legal reform to formalize adaptation finance provisions within national budgeting laws and regulations.

These efforts aim not only to consolidate domestic climate finance readiness, but also to increase Libya’s attractiveness to international partners and climate funds by demonstrating national ownership, fiscal discipline, and strategic alignment.

Figure 26 – Domestic Adaptation Finance Architecture in Libya, which illustrates the flow of domestic resources from national revenue sources through public financial institutions and mechanisms supporting climate adaptation:

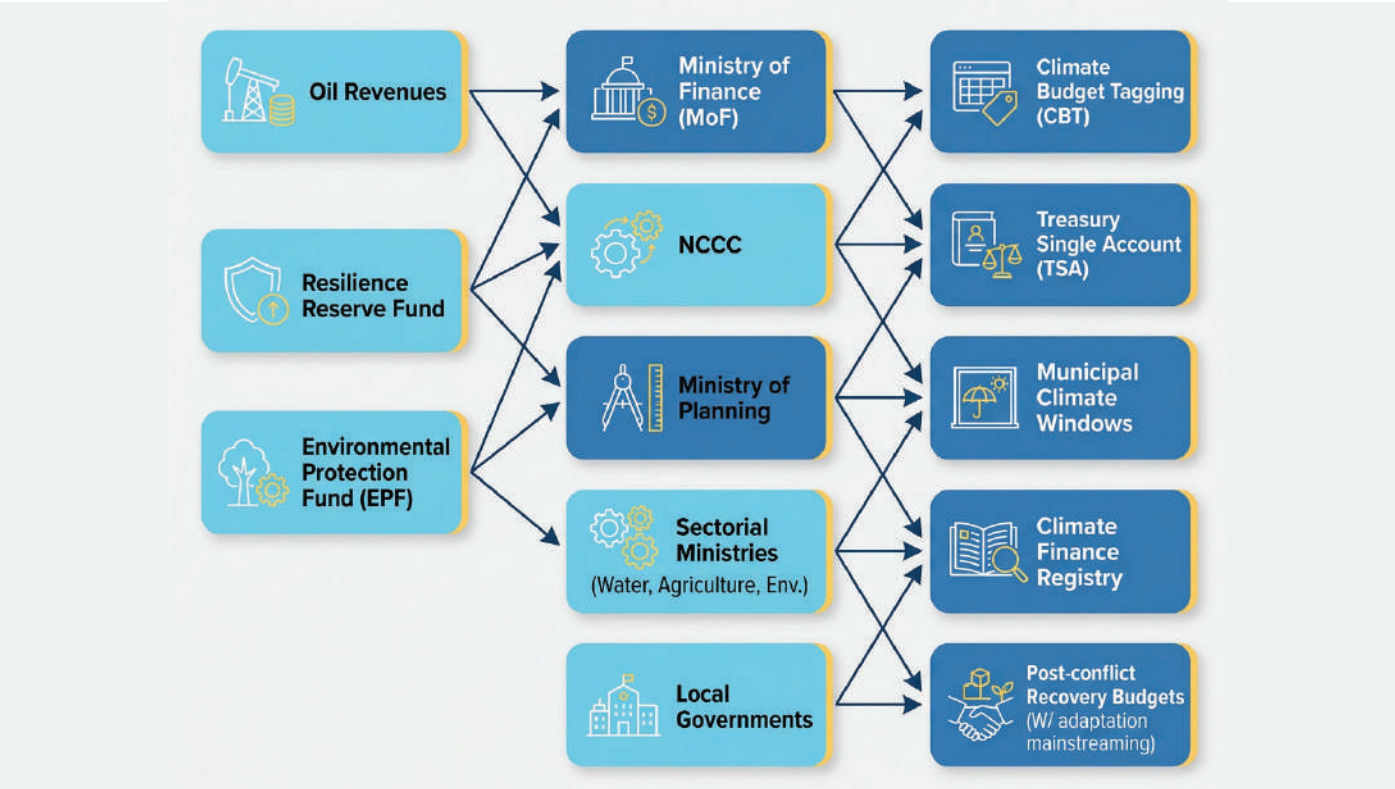


Figure 26: Domestic Adaptation Finance Architecture in Libya

7.5 International Climate Finance

Libya recognizes that the scale, complexity, and urgency of climate risks it faces, particularly in the water, agriculture, and ecosystem sectors, require substantial and predictable financial support from international sources. In alignment with Articles 9 and 11 of the Paris Agreement and Decisions 1/CP.21 and 18/CMA.1, Libya's strategy for international climate finance mobilization is based on a multi-pronged approach combining access to multilateral and bilateral funds, innovative financing mechanisms, and strengthened institutional readiness for fiduciary management and transparency.

Priority Multilateral Mechanisms. Libya is actively engaging with major climate finance mechanisms to resource its 14 priority adaptation measures:

Green Climate Fund (GCF). Libya has received readiness support to build institutional capacity and operationalize the National Designated Authority (NDA). Strategic priorities include submission of proposals under the Simplified Approval Process (SAP) and the Project Preparation Facility (PPF), with a focus on WEFE Resilience Hubs, dryland restoration corridors (DERR-C), and integrated water governance systems (NIWG-CR).

Adaptation Fund (AF). Targeted for high-impact, community-centred actions, including the NAICP platform, food corridor pilots focused on women, and early warning systems in climate-vulnerable zones.

Global Environment Facility (GEF). Engagement is focused on land degradation, biodiversity-linked adaptation (e.g., ReBECLE), and transparency systems via the CBIT initiative. Priority projects include soil rehabilitation and integrated monitoring systems.

Climate Investment Funds (CIFs), AfDB, and World Bank: Libya seeks to leverage concessional resources and technical assistance to enhance ecosystem-based adaptation, resilient infrastructure, and public service continuity through regional programs and partnerships.
Bilateral and Regional Partnerships. Libya is deepening bilateral collaboration with countries and platforms such as:

Bilateral and Regional Partnerships. Libya is deepening bilateral collaboration with countries and platforms such as:

1. Germany (GIZ-STEP), the EU (Green Deal, NDICI), France, and Italy for urban resilience, coastal protection, and capacity-building.

2. Triangular cooperation with Tunisia and Egypt for coastal zone management.

3. South-South cooperation within the MENA region to facilitate knowledge exchange and regional integration.

Readiness, Access, and Investment Strategy. To enhance access to international finance and improve fiduciary readiness, Libya has undertaken the following strategic actions:

- **Institutional Readiness.** The Executive Office of the National Climate Change Committee (EO-NCCC) has formalized the NDA and operationalized a No-Objection Procedure (NOP). The EO-NCCC, with the Ministry of Planning, oversees a Climate Finance Project Registry to track proposals and ensure alignment with national priorities and GCF standards.

- **Accreditation and Partnerships.** Libya is advancing accreditation of national entities for direct access to climate finance. International support from the Sahara and Sahel Observatory (OSS) under GCF Readiness I & II has enabled foundational steps toward accreditation and stakeholder capacity-building.

- **Investment Pipeline:** Libya has prepared multiple concept notes for funding, emphasizing integrated, men-women social roles-responsive, and cost-effective adaptation measures. Table 34 of the NDC maps 11 adaptation measures to funding sources, identifying synergies with GCF, AF, GEF, bilateral donors, and PPPs.

Transparency, Tracking, and Reporting. In line with the Enhanced Transparency Framework (ETF) under Article 13 of the Paris Agreement, Libya is developing a robust MRV system for adaptation finance. This system will:

- Track financial flows from international sources through the Climate Finance Project Registry.

- Monitor outcomes linked to adaptation performance indicators.

- Facilitate transparent reporting via Biennial Transparency Reports (BTRs) and National Communications.

Strategic Vision. Libya aims to mobilize at least USD 1 billion in international climate finance by 2030, thereby closing the identified 65% conditional financing gap in its adaptation costing framework. This mobilization will be guided by principles of country ownership, inclusion, and alignment with global climate and development frameworks, including the GGA, Agenda 2030, and the Sendai Framework.

Figure 27 – Strategic Access Roadmap to International Climate Finance for Libya, illustrating how Libya engages with major international finance sources through national coordination mechanisms, readiness partners, and output systems for proposal development and MRV:

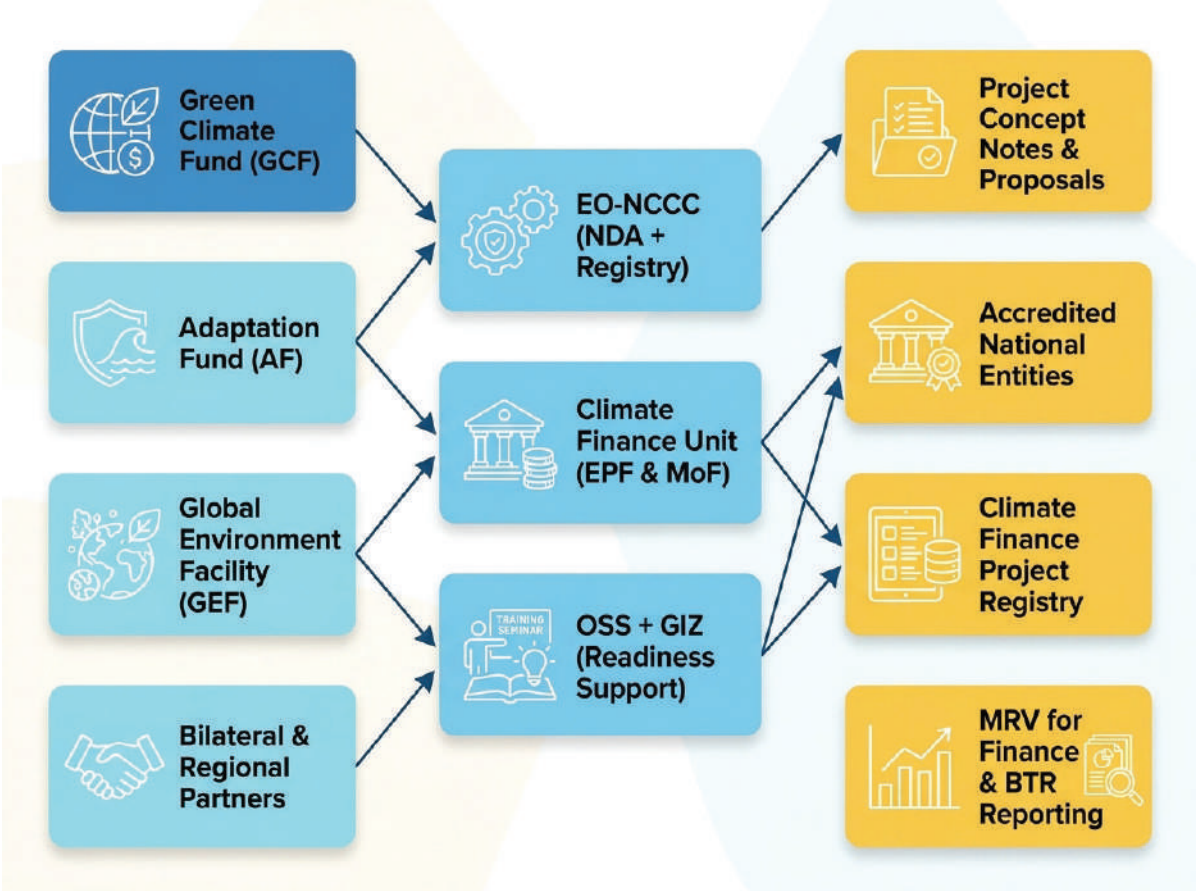


Figure 27: Strategic Access Roadmap to International Climate Finance for Libya

7.6 Enabling Environment for Adaptation Finance

An effective enabling environment is essential to attract, manage, and utilize climate finance in a transparent, equitable, and impactful manner. In Libya, where institutional fragility, protracted conflict, and uneven governance structures intersect with acute climate vulnerabilities, strengthening the enabling environment for adaptation finance is both a foundational requirement and a strategic priority.

Libya's adaptation finance landscape is shaped by multiple systemic constraints:

- The Executive Office of the National Climate Change Committee (EO-NCCC) has emerged as a central coordination body, supported by emerging structures such as the SACCCs and a Climate Finance Sub-Committee. However, inter-ministerial fragmentation and overlapping mandates persist.
- A Treasury Single Account (TSA) is not yet operational, and the absence of real-time financial tracking systems undermines the country's fiduciary readiness. Budget execution remains fragmented, reducing trust among international donors.
- While Decree 574 (2023) establishes the Environmental Protection Fund (EPF) as a domestic finance vehicle, climate finance regulations remain underdeveloped. The legal environment does not yet provide codified standards for transparency, men-women social roles-responsiveness, or environmental-social safeguards.
- A national Climate Finance Project Registry is under development. However, cost-benefit assessments, environmental and social safeguards, and women-targeted budgeting protocols are still in early stages.

Despite these challenges, Libya has made measurable progress. Two GCF Readiness projects laid the foundation for establishing the NDA, formalizing a no-objection procedure, and identifying prospective national implementing entities (NIEs) for future accreditation.

Required Institutional, Regulatory, and Policy Reforms. To create a robust climate finance ecosystem, the following reforms are proposed:

- **Legal Codification of Climate Finance Functions.** A new legal framework is required to formally define institutional roles and responsibilities for climate finance management, including provisions for adaptation budget tagging, public-private partnerships (PPPs), and decentralized finance flows to municipalities.

- **Regulatory Modernization for Fiduciary Integrity.** Key reforms include adopting international fiduciary standards (aligned with GCF/AF requirements), digitizing budget execution systems, and consolidating parallel financial structures.

- **Policy Integration and Budget Reform.** The institutionalization of climate adaptation budgeting into Chapter 3 of national and subnational development expenditures is a priority. This will require revisions to the Public Financial Management Law and national planning guidelines.

Legal Frameworks for Innovative Financing Instruments. The deployment of innovative financial instruments is constrained by legal uncertainty. Reforms should enable:

Climate Bonds and Green Sukuk. Draft legislation should establish regulatory definitions, eligibility criteria, and fiduciary controls for sovereign and subnational green bond issuance, including Sharia-compliant sukuk linked to adaptation priorities (e.g., water and food security).

Public-Private Partnerships (PPPs). A modern PPP law must include climate resilience clauses, risk-sharing mechanisms, men-women social roles-inclusive design provisions, and dispute resolution protocols to enhance investor confidence.

Environmental Protection Fund (EPF). The EPF should be legally empowered to receive and disburse both public and international finance, act as a trust fund for adaptation initiatives, and serve as an executing entity for international funds like the GCF.

Institutional and Technical Capacity for Project Delivery. Effective climate finance absorption depends on institutional and human resource capacities. Key recommendations include:

Accreditation and Pre-Accreditation Support. Sectoral institutions such as the Libyan National Meteorological Centre and Ministry of Water Resources should be supported through technical assistance to initiate GCF or AF accreditation processes.

Capacity-Building at Subnational Levels. Municipalities must be capacitated to plan, execute, and monitor adaptation projects. This includes training on climate risk assessments, fiduciary standards, and participatory planning.

Technical Expertise and Data Systems. Investments in national data systems (e.g., CIDSS), cost-benefit appraisal tools, and safeguards mechanisms are essential to support the development of high-quality project pipelines.

Libya's enabling environment for adaptation finance is evolving but remains in need of systemic strengthening. The combination of legal, institutional, and financial reforms proposed in this section forms the cornerstone of a transformative climate finance ecosystem, one that aligns with the principles of transparency, accountability, and equity under the Paris Agreement, and supports Libya's pathway to climate-resilient development.

Private Sector Engagement. In Libya's evolving adaptation finance landscape, engaging the private sector is essential for scaling resilient investments, promoting innovation, and reducing the fiscal burden on public institutions. The private sector is not only a source of capital but also a key actor in the implementation of climate-smart technologies and solutions, particularly in agriculture, energy, and water sectors. However, participation remains constrained by structural bottlenecks, including weak regulatory incentives, underdeveloped financial markets, and political uncertainty.

Priority Sectors for Private Investment. Libya's National Adaptation Plan identifies three core sectors with high potential for private sector engagement.

Agriculture and Food Security: Investment in drought-resilient seeds, digital extension services, drip irrigation, and agro-processing.

Water and Sanitation: Opportunities include desalination, water reuse technologies, leak detection, and decentralized purification systems.

Renewable Energy: Rooftop solar PV, hybrid off-grid systems, and solar-powered water pumps are emerging areas of investment with mitigation and adaptation co-benefits.

Enabling Instruments and Incentives. To enhance private sector participation in adaptation, Libya will pursue a package of enabling measures.

Fiscal Incentives: Tax deductions for climate-smart investments, accelerated depreciation of green technologies, and customs exemptions on adaptation-related equipment.

Regulatory Reforms: Simplification of permitting procedures for adaptation infrastructure (e.g., solar irrigation systems), legal recognition of climate-resilient certification schemes, and land-use rights for sustainable projects.

Blended Finance Structures: Use of public funds or international grants to de-risk investments through concessional co-financing, guarantees, or first-loss mechanisms.

Financial Innovation for Resilience. New financial instruments will be promoted to align private capital with adaptation objectives:

Instrument	Description	Target Sector(s)
Green Sukuk	Sharia-compliant bonds to finance climate-resilient infrastructure	Water, solar energy, transport
Agricultural Insurance	Index-based crop insurance linked to rainfall or temperature thresholds	Smallholder farming
Shared-Risk Facilities	Co-investment mechanisms for climate start-ups and agribusinesses	Agro-processing, agri-tech
Diaspora Investment Vehicles	Platforms to direct remittances into rooftop solar or resilient housing	Housing, local energy access
Climate MSME Credit Lines	Dedicated microcredit for women- and youth-led businesses in adaptation sectors	Informal economy, rural enterprises

Table 15: Financial Innovation for Resilience

Institutional Partnerships and Platforms

- Agricultural Bank of Libya (ABL) and Environmental Protection Fund (EPF) will serve as financial intermediaries to channel concessional loans and grants to SMEs in rural and vulnerable areas.
- A proposed Climate Entrepreneurship Hub, in collaboration with UNDP and the Ministry of Economy, will incubate adaptation start-ups and enable technology transfer.
- The Climate Finance Advisory Committee will include private sector representatives to guide investment strategy and ensure alignment with national priorities.

Women fairness and Inclusion Considerations. Libya will promote inclusive finance mechanisms targeting:

- Women farmers and entrepreneurs through dedicated credit lines and training.
- Youth-led start-ups through seed funding and mentorship.
- Regionally underserved areas, including Fezzan, through targeted incentives and risk-pooling schemes.

Outlook and Strategic Priorities. To scale up private sector engagement in adaptation, Libya will:

1. Finalize a regulatory roadmap for adaptation-aligned investment incentives.
2. Pilot blended finance projects in climate-smart agriculture and decentralized energy.
3. Foster public-private dialogues through the Climate Finance Platform and sectoral chambers of commerce.
4. Collaborate with international partners to build investment-readiness of SMEs and cooperatives.

7.7 Monitoring, Reporting, and Verification (MRV) of Adaptation Finance

A robust MRV system is critical to ensuring that climate adaptation finance is managed transparently, equitably, and effectively. In the Libyan context, characterized by institutional fragility, financial fragmentation, and heightened vulnerability, adaptation finance MRV plays a dual role: enhancing international credibility and strengthening national ownership. This section outlines the core components of Libya's emerging MRV architecture for adaptation finance and its integration within the broader Monitoring, Evaluation, and Learning (MEL) framework.

National Climate Finance Tracking System. Libya is progressively institutionalizing a financial tracking and transparency system for adaptation finance. This system includes:

- **Climate Budget Tagging (CBT).** All adaptation-related expenditures across national and subnational budgets are tagged with climate-relevant codes. This enables tracking of disbursements by sector, region, implementing body, and population group (e.g. women, IDPs).
- **Project-Finance Audit Trail.** A digital tagging mechanism links every climate finance transaction to its corresponding adaptation measure, output, and MEL indicator. This allows real-time tracking of financial flows across the 11 priority adaptation measures.
- **Annual Climate Finance Reports.** These reports, publicly accessible, will compile disaggregated data on domestic and international adaptation finance, by measure, region, and stakeholder group, and feed into national BTRs.
- **Geospatial Finance Mapping (CIDSS).** Libya's Climate Intelligence and Decision-Support System overlays financial data with geospatial risk and vulnerability indicators, facilitating evidence-based prioritization and real-time visualization of adaptation investments.

Integration with MEL and the Enhanced Transparency Framework (ETF). Libya's adaptation finance MRV is fully embedded within the MEL system, ensuring alignment with Article 13 of the Paris Agreement and Decision 18/CMA.1. This convergence enables:

- **Streamlined Reporting into BTRs.** All MRV-tagged adaptation finance is reported in Libya's Biennial Transparency Reports, using ETF-compliant metadata and disaggregation standards.

- **Joint MEL–MRV Indicator Architecture.** An integrated indicator set measures not only financial inputs but also outputs, outcomes, and equity impact of adaptation finance. Indicators are disaggregated by sex, age, region, and vulnerability group, as mandated under ETF §74 and §85–87.

- **Learning-Based Verification.** Adaptation finance verification departs from mitigation's audit-heavy approach. Instead, Libya applies adaptive verification tools such as:

    1. Community scorecards and field validation,
    2. Multi-stakeholder learning reviews,
    3. Women-led monitoring initiatives in high-risk zones.

Indicators for Efficiency, Equity, and Effectiveness. To ensure accountability and enable adaptive improvements, Libya tracks performance through a multi-dimensional indicator framework:

Category	Examples of Indicators
Efficiency	% of adaptation funds disbursed vs. planned; Cost per unit of resilience gained
Effectiveness	% of measures achieving target outcomes; Reduction in risk exposure index
Equity	% of finance reaching women-led actions, IDPs, and underserved regions
Transparency	% of tracked expenditures reported in BTRs; % of stakeholders accessing finance registry

Table 16: Indicators for Efficiency, Equity, and Effectiveness

These indicators are compiled quarterly and validated annually via MEL stakeholder forums, enabling course correction and improved targeting.

Institutional Roles and Data Flow. The MRV–MEL convergence architecture is coordinated by the Executive Office of the NCCC (EO-NCCC), in collaboration with:

- **Ministry of Finance (MoF).** Leads climate budget tagging and expenditure audits.

- **Ministry of Planning (MoP).** Oversees the Climate Finance Project Registry and links MRV outputs to national development frameworks.

- **Sectoral Ministries and SACCCs.** Provide data on project implementation and impact.

- **Local Governments and CSOs.** Ground-truth financial flows and implementation quality at the community level.

A centralized National Climate Finance Platform (NCFP), under development, will house financial and MEL data, serving as a digital interface for public access, donor coordination, and UNFCCC reporting.

Strategic Outcomes and BTR Integration. By 2030, Libya aims to:

1. Ensure 100% of adaptation finance is MRV-tagged and traceable.
2. Report comprehensively through BTRs, with disaggregated financial and performance data.
3. Institutionalize annual **Climate Finance Scorecards**, combining expenditure tracking, implementation metrics, and equity indicators.
4. Demonstrate to international partners its capacity to manage adaptation finance transparently and equitably, reinforcing trust and unlocking access to concessional resources.

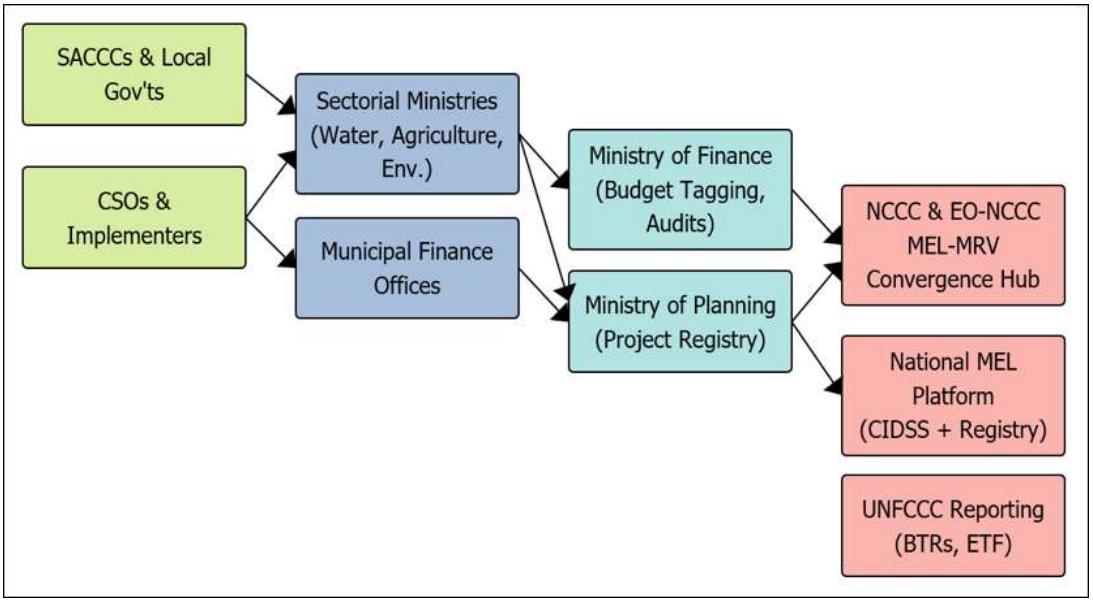


Figure 28: MEL-MRV Data Flow for Adaptation Finance

7.8 Investment Readiness Roadmap

Libya's capacity to attract, absorb, and effectively utilize climate finance is intrinsically linked to the strength of its institutional, fiduciary, legal, and technical systems. Considering its high vulnerability, transitional governance context, and fragmented public finance management, enhancing investment readiness is not only a prerequisite for successful NAP implementation but also a strategic lever for long-term development and resilience. This roadmap outlines the actions required to strengthen Libya's investment climate for adaptation over the short, medium, and long term.

Strategic Objective. To establish a coherent, transparent, and nationally owned investment environment that enables the full mobilization and efficient use of domestic and international climate finance, especially for adaptation priorities aligned with the NDC, the GGA, and the Sustainable Development Goals (SDGs).

Readiness Pillar	Key Challenges	Strategic Actions	Timeframe
Institutional Coordination	Parallel structures, overlapping mandates, limited inter-ministerial coordination	Operationalize SACCCs in all priority sectors Establish a Climate Finance Advisory Committee within NCCC Strengthen the authority of the Ministry of Planning for project screening	Short-Medium Term
Fiduciary and Legal Capacity	Absence of TSA, weak PFM systems, lack of fiduciary safeguards	Implement Treasury Single Account (TSA) Introduce climate budget tagging Codify climate finance roles in fiscal law	Medium Term
Project Preparation and Appraisal	Weak pipeline quality, no standardized screening or ESS procedures	Develop national project preparation guidelines aligned with GCF/GEF Operationalize a Climate Finance Registry and pipeline management system	Medium-Long Term
Accreditation and Access Modalities	No Direct Access Entity (DAE), limited capacity to manage international funds	Support NDA and candidate DAEs in accreditation process (e.g., EPF, Agricultural Bank) Develop standard No Objection Procedures	Short-Medium Term
Data, Transparency and MEL	Absence of real-time tracking, weak integration with MEL	Link finance flows to MEL indicators Use CIDSS to monitor finance inputs and adaptation outcomes	Medium Term
Private Sector and Innovative Instruments	Low private engagement, no de-risking instruments, regulatory gaps	Develop enabling frameworks for green sukuk and resilience bonds Pilot PPP models in water and agriculture	Medium-Long Term
Subnational Access and Equity	Limited fiscal autonomy, centralization of fund management	Create municipal climate finance windows Provide technical support for proposal development in underserved regions	Short-Medium Term

Table 17: Readiness Priorities and Actions

Implementation Phases

Phase 1 (2025–2027): Foundational Readiness

- Legal codification of climate finance roles and fiduciary protocols
- TSA and budget tagging pilot in key ministries
- Establishment of Climate Finance Advisory Committee

Phase 2 (2027–2030): Access and Absorption Scaling

- Operationalization of Climate Finance Registry and screening criteria
- Support to DAEs and project developers for pipeline development
- Expansion of municipal access instruments and green public investment

Phase 3 (2030–2035): Consolidation and Innovation

- Launch of green sukuk and resilience bonds
- Full integration of MEL-finance systems
- Institutionalization of adaptive feedback loops for readiness improvement

Phase 3 (2030–2035): Consolidation and Innovation

– Launch of green sukuk and resilience bonds
– Full integration of MEL-finance systems
– Institutionalization of adaptive feedback loops for readiness improvement

Risk Mitigation and Assumptions

- **Risks:** Political instability, institutional turnover, low execution capacity
- **Assumptions:** Continued international technical support, political will for reform, and sufficient fiscal space for co-financing

Alignment with International Frameworks. This roadmap is designed to fulfill readiness conditions under:

- Green Climate Fund (GCF) Readiness and Preparatory Support Programme
- UNFCCC Enhanced Transparency Framework (ETF) under Article 13
- Decision 18/CMA.1 on adaptation finance tracking and reporting
- SDG 13 (Climate Action) and SDG 17 (Partnerships for the Goals)

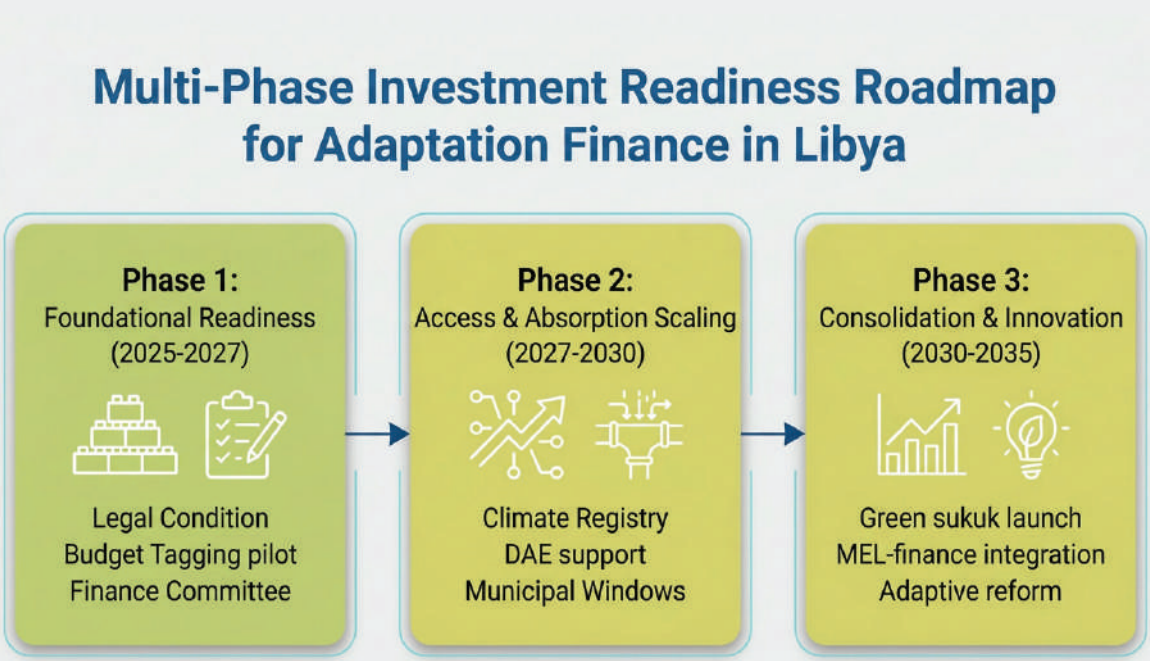


Figure 29: Investment Readiness Roadmap for Adaptation Finance in Libya

Part VIII. Monitoring, Evaluation, and Learning (MEL)

A robust Monitoring, Evaluation, and Learning (MEL) system is fundamental to the integrity and effectiveness of Libya's National Adaptation Plan (NAP). It ensures that adaptation actions are guided by evidence, contribute to national development goals, and remain aligned with evolving climate risks and priorities. In Libya's context, characterized by institutional fragmentation, resource constraints, and growing vulnerability, the MEL system is not merely a reporting mechanism; it is a strategic instrument for adaptive governance, resource allocation, and trust-building among stakeholders.



The MEL framework for the Libyan NAP serves four interconnected purposes:

1. **Tracking Progress:** To assess whether adaptation measures are being implemented as planned and achieving the intended results, particularly in priority sectors such as water, agriculture, and biodiversity.

2. **Enabling Learning:** To facilitate continuous reflection, knowledge sharing, and course correction across institutions and levels of government. Learning loops will allow the NAP to evolve based on what works, for whom, and under what conditions.

3. **Ensuring Accountability and Transparency:** To demonstrate results to national stakeholders, international partners, and the Libyan public, and to build trust in climate finance flows and adaptation governance.

4. **Informing Decision-Making:** To provide timely, disaggregated, and relevant information that feeds into planning, budgeting, and investment decisions, especially in high-risk and vulnerable regions.

Libya's MEL system is directly aligned with **Article 13** of the Paris Agreement, which establishes the **Enhanced Transparency Framework (ETF),** requiring countries to track adaptation efforts and report on support received and needed. The MEL system will provide the backbone for Libya's adaptation-related inputs to **Biennial Transparency Reports (BTRs)** and its participation in the **Global Stocktake process.**

Furthermore, the MEL design is guided by the Global Goal on Adaptation (GGA) established at COP28 (CMA.4), which calls for measuring progress in enhancing adaptive capacity, strengthening resilience, and reducing vulnerability. The NAP's MEL framework reflects these pillars and will help track progress toward Libya's contribution to the GGA.

To serve these functions, Libya's MEL system will adopt a **phased approach**, combining institutional development, indicator selection, baseline setting, data system strengthening, and stakeholder engagement. It will be grounded in the best available science and local knowledge, promote social roles equity and social inclusion, and integrate financial and non-financial indicators to capture adaptation co-benefits and effectiveness.

8.1 Objectives of the MEL System

The Monitoring, Evaluation, and Learning (MEL) system established under Libya's National Adaptation Plan (NAP) is designed as a dynamic, integrative framework that transcends mere compliance and supports transformative adaptation. Its objectives are firmly anchored in the country's need to manage uncertainty, optimize limited resources, and align adaptation efforts with national and international priorities. The MEL system pursues the following four core objectives:

Track Progress in the Implementation of Adaptation Measures. The MEL system provides a structured mechanism to monitor the implementation status of priority adaptation measures across sectors and regions. This includes:

- Monitoring financial disbursement, activity delivery, and output generation against targets.
- Disaggregating progress by sector (e.g., water, agriculture, biodiversity), institution, region, and population group (e.g., women, youth, IDPs).
- Highlighting implementation delays, budget deviations, and coordination bottlenecks for corrective action.

Tracking ensures that the NAP remains operationally on course and provides early warning of underperformance or changing conditions.

Assess Outcomes and Impacts of Adaptation Actions. Evaluation is essential for determining whether adaptation interventions produce tangible improvements in resilience, risk reduction, and vulnerability alleviation. The MEL system will:

- Measure results against predefined outcome and impact indicators, aligned with the Global Goal on Adaptation (GGA).
- Use both quantitative (e.g., reduction in water insecurity index) and qualitative (e.g., community perceptions of climate resilience) metrics.
- Apply comparative and longitudinal approaches to assess effectiveness over time and across interventions.

Impact evaluation will feed into learning and prioritization for future planning cycles, funding proposals, and policy refinement.

Enable Continuous Learning and Adaptive Management. Adaptation is inherently iterative. The MEL system functions as a feedback mechanism to identify what works, under what conditions, and for whom. It supports:

- Periodic review cycles embedded in NAP implementation.
- Knowledge-sharing among sectoral institutions, local governments, CSOs, and development partners.
- Integration of field-level observations, traditional knowledge, and lived experiences into planning.

This objective reinforces a culture of adaptive management, where evidence informs flexible planning, budget reallocation, and scaling of successful pilots.

Strengthen Accountability to National and International Stakeholders. Transparent reporting builds trust and legitimacy, both domestically and globally. The MEL system supports accountability through:

- Structured and inclusive stakeholder review processes at national and subnational levels.
- Timely reporting to the NCCC, Ministry of Finance, and planning institutions.
- Provision of standardized data to fulfil Libya's obligations under the Enhanced Transparency Framework (ETF), including inputs to Biennial Transparency Reports (BTRs).

Accountability also serves as a political and social safeguard, ensuring that adaptation resources reach the most vulnerable and are managed efficiently. Together, these four objectives define Libya's MEL system as a governance tool that fosters transparency, learning, and results-driven adaptation, aligned with the country's development goals, the Paris Agreement, and the Sustainable Development Goals (SDGs).

8.2 Guiding Principles

The MEL system for Libya's NAP is grounded in a set of guiding principles that ensure its legitimacy, relevance, and effectiveness within the national context. These principles are designed to promote inclusivity, strengthen governance, and ensure alignment with the Enhanced Transparency Framework (ETF) and the Global Goal on Adaptation (GGA).

1. Transparency and Accountability. All MEL processes will be implemented in a transparent manner, including open access to progress reports, stakeholder reviews, and financial tracking data. The MEL system is a key tool to hold institutions accountable for results, both vertically (to central and local governments) and horizontally (to the public and international partners).

2. Inclusiveness and Equity. The Monitoring, Evaluation, and Learning (MEL) system will engage women, youth, internally displaced persons (IDPs), persons with disabilities, and vulnerable groups. Data will be disaggregated and analysed to assess equity in access to adaptation benefits and resources.

3. Local Participation and Contextual Relevance. Monitoring and evaluation processes will be sensitive to Libya's geographical, cultural, and socio-political diversity. Local knowledge systems and experiences will be valued and integrated, particularly in regions facing hyper-aridity, desertification, or coastal vulnerability.

4. Institutional Coherence. The MEL framework will foster cross-sectoral collaboration and data integration across all relevant entities. It will ensure that adaptation results are embedded in national development frameworks and contribute to coherent implementation of the NDC, SDGs, and national recovery strategies.

5. Learning Orientation. The MEL system will not be punitive but developmental focused on learning, reflection, and continuous improvement. Evidence from MEL will inform adaptation prioritization, budget adjustments, and redesign of measures over time.

8.3 MEL Framework Structure

The Libyan MEL framework is structured to enable systemic, intersectoral, and multi-level monitoring and learning across the full adaptation cycle. It ensures that progress in each priority sector, water, agriculture, and biodiversity, is captured in a coherent and institutionally integrated manner.

Systemic and Intersectoral Approach. The MEL system applies a nexus-based logic consistent with Libya's WEFE (Water-Energy-Food-Ecosystems) interlinkages. Monitoring tools, indicators, and data flows will be designed to:

1. Capture synergies and trade-offs across sectors.
2. Assess cross-cutting adaptation co-benefits (e.g., water for agriculture, biodiversity and food security).
3. Evaluate system-wide resilience instead of isolated project outputs.

Each sectoral ministry will contribute sector-specific indicators to a shared MEL platform coordinated by the EO-NCCC.

8.4 Institutional Architecture for MEL

Entity	MEL Role and Function
EO-NCCC	Overall coordination of MEL system; synthesis reporting to UNFCCC; MEL guidelines and capacity-building.
SACCCs	Subnational coordination; local data collection; validation of results with stakeholders.
Ministry of Planning	Integration of MEL outputs into public investment planning, policy evaluation.
Ministry of Finance	Climate budget tagging and expenditure tracking linked to MEL indicators.
Sectoral Ministries (Water, Agriculture, Environment)	Data collection, outcome evaluation, feedback loops into program design.
Academia and National Institutes	Indicator development, research collaboration, baseline setting.
Civil Society and Local Actors	Ground-truthing, participatory monitoring, scorecards, and social audits.

Table 18: Institutional Architecture for MEL

All entities will contribute to a National MEL Platform, linked to the CIDSS (Climate Intelligence and Decision-Support System), and supported by standardized reporting formats.

Linkages with Planning and Public Finance Systems. MEL results will directly inform national planning and budgetary processes.
Annual Planning Cycles: Adaptation progress and lessons will inform sectoral work plans, programmatic budgets, and Mid-Term Expenditure Frameworks (MTEFs).

Budget Hearings and Policy Reviews: Evidence from MEL will feed into policy dialogues and budget negotiations.

Investment Appraisal: MEL outcomes will guide resource reallocation and prioritization of adaptation investment proposals.

By institutionalizing these linkages, the MEL system ensures that adaptation is not a parallel process but fully embedded in Libya's development and fiscal architecture. **Figure 8.4 – MEL Institutional Architecture Diagram,** illustrating how key national, subnational, sectoral, and societal actors interact within Libya's MEL system for adaptation:

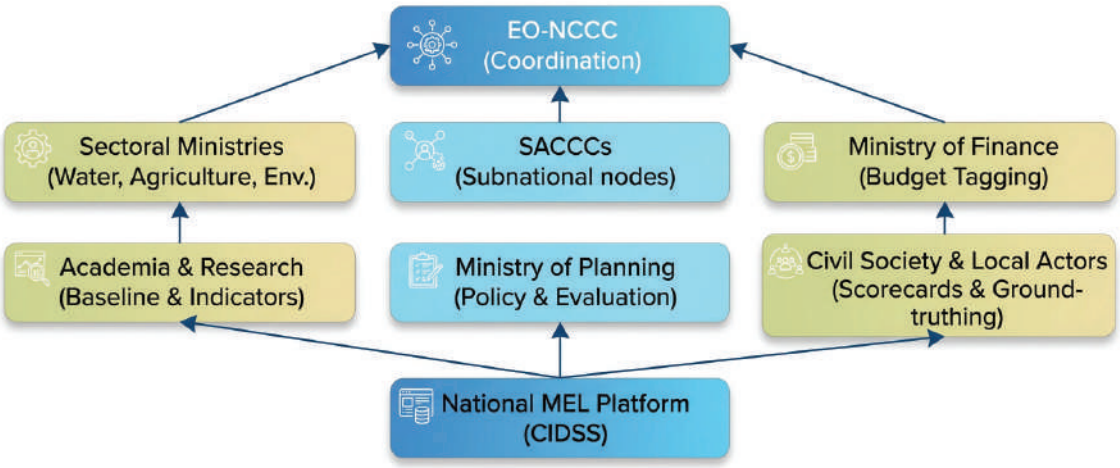


Figure 30: MEL Institutional Architecture Diagram

8.5 MEL Indicators and Metrics

The Monitoring, Evaluation, and Learning (MEL) system in Libya is designed to support evidence-based adaptation planning and implementation. A central pillar of this system is the development and application of robust, relevant, and inclusive indicators that can assess adaptation progress, foster accountability, and facilitate continuous learning. This section outlines the typology of indicators used, principles guiding their formulation, and examples applied to Libya's priority adaptation measures.

Types of Indicators in the MEL Framework. To comprehensively capture adaptation dynamics, Libya's MEL system integrates four types of indicators:

Process Indicators: Track the implementation of inputs and activities, such as completion of training sessions, infrastructure built, or budget disbursed.
Example: Number of climate-smart agriculture training sessions conducted for women smallholders.

Outcome Indicators: Assess short- to medium-term changes in behaviour, capacities, or systems that result from the adaptation interventions.
Example: % reduction in seasonal water stress in WEFE Resilience Hub areas.

Impact Indicators: Evaluate long-term changes in vulnerability, resilience, and well-being.
Example: Reduction in economic losses from climate-related events in drought-prone regions.

Learning Indicators: Measure the extent to which adaptation efforts generate new knowledge, improve practices, and inform policy decisions.
Example: Number of MEL-derived policy adjustments integrated into national adaptation plans.
These indicators align with the Theory of Change developed for the NAP and correspond to each stage of the adaptation results chain.

Cross-Cutting and Inclusion Indicators.

Equity, justice, and social inclusion are not isolated dimensions of adaptation, they are structural features of successful climate governance. As such, Libya's MEL system incorporates transversal indicators that address:

- **Women Fairness:** % of adaptation budget allocated to women-led initiatives
- **Youth engagement:** # of youth-led innovation pilots supported in adaptation sectors
- **Social vulnerability:** Proportion of displaced households accessing climate-resilient livelihoods support
- **Climate justice:** Evidence of decision-making platforms including vulnerable communities (qualitative and quantitative)

All indicators are disaggregated, at minimum, by sex, age, and region, ensuring attention to the differentiated effects of climate risks and responses.

SMART Criteria for Indicator Selection.

To be effective and operational, all indicators must meet the SMART criteria:

Criterion	Description
Specific	Clearly defines what is being measured and why
Measurable	Quantifiable using reliable data sources
Attainable	Realistic given existing capacities and resources
Relevant	Directly connected to adaptation objectives and climate risk context
Time-bound	Includes a specific timeframe for achievement and review

UNDP/GIZ CLIMATE INITIATIVE

Table 19: SMART criteria

Example of a SMART indicator: "Number of female-headed households adopting drip irrigation systems in semi-arid zones by 2027."

Illustrative Table: Indicators by Priority Adaptation Measure. The table below offers examples of indicators mapped to selected priority adaptation measures as defined in the MACC profile:

Adaptation Measure	Process Indicator	Outcome Indicator	Impact Indicator	Equity/Learning Indicator
Groundwater Recharge & Protection (EB-GR)	# recharge sites operational	% increase in aquifer recharge volume	% reduction in groundwater overdraft	% of women-led water cooperatives established
Climate-Smart Agriculture (CSA)	# farmers trained in CSA practices	% increase in climate-resilient crop yields	Reduction in drought-induced food insecurity	# youth agro-entrepreneurs supported
Strategic Green Infrastructure (SGI-Res)	km² of green zones established	% reduction in urban heat island effect	% decrease in urban flood damage	% green spaces accessible to vulnerable communities
WEFE Resilience Hubs	# hubs operational	% increase in water use efficiency across sectors	% improvement in food security index in serviced areas	% of local women/youth in hub management
Secure Land & Soil Rights	# land titles issued with women parity	% of land under regenerative practices	% increase in land productivity in arid zones	# of women accessing secure tenure and climate finance

(A full indicator matrix covering all 14 measures is included in Annex 8.)

Table 20: Indicators by Priority Adaptation Measure

8.6 Data Management and Information Systems

Effective climate adaptation planning in Libya relies on the generation, management, and dissemination of reliable, timely, and spatially disaggregated data. This section outlines the architecture and operations of the data ecosystem underpinning the Monitoring, Evaluation, and Learning (MEL) system. It reflects national efforts to modernize observation networks, enhance data interoperability, and align with global reporting mechanisms, particularly under the Enhanced Transparency Framework (ETF) and Article 13 of the Paris Agreement.

Primary and Secondary Data Sources. Libya's MEL system is supported by a combination of primary and secondary data sources:

1. **Primary Sources include data collected directly through:**

- Surface, marine, climate, and agricultural monitoring stations managed by the Libyan National Meteorological Centre (LNMC).
- Community-based monitoring platforms engaging local actors and CSOs to gather real-time environmental and socio-economic information.
- Sectoral agencies such as the Ministry of Agriculture, Ministry of Water Resources, and urban planning bodies through localized infrastructure inventories, biodiversity tracking, and land-use datasets.

2. **Secondary Sources include:**

- International climate data archives (e.g., CMIP6 from IPCC, WMO's Global Climate Observing System).
- Satellite-derived datasets and open-access portals such as the World Bank's Climate Change Knowledge Portal and Earth.gov for sea-level rise projections.
- Academic and research outputs, especially from institutions like the University of Tripoli and the Libyan Centre for Remote Sensing and Space Science.

Despite this wealth of data sources, key challenges remain in terms of fragmentation, outdated infrastructure, and uneven spatial coverage, especially in southern and remote regions.

National Climate Information Infrastructure.
At the core of Libya's data management system lies a growing network of interoperable platforms coordinated by the **Libyan National Meteorological Center (LNMC)** in close collaboration with the **National Climate Change Committee (NCCC)** and its **Executive Office (EO-NCCC).** The primary components include:

- Climate Intelligence and Decision-Support System (CIDSS). This central repository integrates meteorological time series, vulnerability maps, and adaptation performance metrics. It is equipped with dashboards for real-time monitoring and scenario analysis.

- National Adaptation Intelligence and Coordination Platform (NAICP. Focused on multi-sectoral data flows, this platform hosts project logs, learning records, and progress reports from priority adaptation measures, including the 14 flagship interventions defined in the MACC Profile.

- Central Adaptation Data Hub. Serving as the backbone of the MEL architecture, this hub consolidates data from municipal climate nodes, sectoral monitoring systems, and community science initiatives. It adheres to metadata standards compatible with BTR reporting under the ETF.

- Municipal and Sectoral Climate Nodes. These local data collection points ensure disaggregated and regionally relevant information feeds into the national system, particularly from high-risk zones identified in the Climate Risk Assessment (CRA).

Linkages with Global Platforms and Transparency Commitments. Libya's data systems are designed to support international climate reporting and transparency requirements:

- Enhanced Transparency Framework (ETF). All MEL data pipelines are calibrated to meet ETF criteria of accuracy, completeness, consistency, comparability, and transparency. CIDSS integrates metadata compliance protocols for direct export to BTR templates.
- UNFCCC Adaptation Communication. Libya's adaptation data architecture is structured to feed into future Adaptation Communications (AdComs), facilitating global learning and comparability

of national efforts toward the Global Goal on Adaptation (GGA).

- Sendai Framework and SDG Monitoring. Geospatial hazard datasets, disaster loss estimates, and development co-benefit indicators are aligned with reporting under the Sendai Framework and the Sustainable Development Goals, particularly SDG 13 and SDG 11.

Strengthening the Data Ecosystem. To further enhance its climate data ecosystem, Libya must:

- Modernize observation networks. Upgrade manual stations and expand automated systems for real-time data collection, especially for hydrology and marine environments.
- Enhance data governance. Establish a national council on climate data governance to harmonize standards and protocols across agencies.
- Invest in institutional capacity. Provide technical training in data analytics, remote sensing, and geospatial intelligence, targeting key line ministries and municipalities.
- Promote citizen science and participatory data. Scale up mobile applications and grassroots monitoring to enrich datasets and ensure local ownership.
- Ensure redundancy and data security. Back up critical data systems, integrate with regional observatories, and adopt cloud-based platforms to safeguard long-term information integrity.

8.7 Evaluation Methodology.

Evaluation is a core pillar of the MEL system, enabling Libya to generate evidence about the effectiveness, relevance, efficiency, and equity of its adaptation actions. A structured evaluation methodology supports adaptive management, learning, accountability, and the refinement of future planning cycles. Libya's evaluation framework is designed to be inclusive, context-sensitive, and fit-for-purpose, ensuring that it meets both national policy needs and international transparency requirements under the Enhanced Transparency Framework (ETF).
Libya will implement four main types of evaluations throughout the NAP implementation period:

1. Baseline Evaluations. Conducted at the outset of each major adaptation measure or program to establish reference values for key indicators, including socio-economic vulnerability, environmental stress, and institutional capacity. These are essential for attributing change and impact over time.

2. Mid-Term Evaluations. Scheduled at the mid-point of implementation (typically every 3–4 years), these evaluations assess progress toward objectives, identify implementation bottlenecks, and inform necessary course corrections. They are also critical for updating MEL indicators and assumptions.

3. Final Evaluations. Conducted at the conclusion of major interventions or NAP cycles, final evaluations assess overall results and draw lessons for scale-up, replication, or redesign. They also provide inputs to the NAP stocktaking process, GGA alignment assessments, and BTR reporting.

4. Thematic Evaluations. These are issue-specific assessments that explore cross-cutting themes such as men-women social roles-fairness, ecosystem-based adaptation, private sector engagement, or the WEFE nexus. Thematic evaluations offer deep dives that inform sectoral strategies and policy coherence.

Participatory and Context-Sensitive Approaches

Recognizing Libya's regional diversity, post-conflict sensitivities, and socio-cultural heterogeneity, all evaluations will apply a contextually grounded and inclusive approach.

- **Stakeholder Co-design:** Evaluation terms of reference, criteria, and questions will be developed in consultation with affected communities, civil society, and implementing agencies.

- **Mixed Methods:** Quantitative methods (e.g., household surveys, cost-benefit analysis) will be complemented by qualitative approaches (e.g., focus groups, narrative capture, participatory mapping).

- **Inclusion and Safeguards:** Special emphasis will be placed on collecting disaggregated data, ensuring men-women social roles sensitivity, and protecting the voices and data of vulnerable populations.

Community feedback tools such as scorecards, social audits, and beneficiary reflection sessions will be embedded in the evaluation process to empower local learning and accountability.

Evaluation Type	Frequency	Purpose
Baseline	At inception of each measure	Establish reference values and targets
Mid-Term	Every 3–4 years	Enable corrective action and mid-course learning
Final	At end of each NAP cycle	Assess impact, effectiveness, and sustainability
Thematic	Every 2 years (rotational)	Deep dive on equity, sectoral synergies, governance

Table 21: Evaluation Frequency and Timing

Evaluations will be scheduled to coincide with national planning and budgetary cycles and to feed into Biennial **Transparency Reports (BTRs)** and the **National Stocktake** process.

8.8 Learning and Knowledge Management.

Learning is not a by-product but a strategic pillar of Libya's MEL system. In a context of climate uncertainty, political transition, and social vulnerability, adaptive capacity must be strengthened not only through projects, but through institutionalized learning. This section outlines how Libya will generate, systematize, and apply knowledge from its adaptation actions, transforming data into insight, and insight into improved planning, policy, and implementation.

Institutional Feedback Mechanisms.

The MEL system embeds structured feedback loops at multiple institutional levels to ensure that monitoring and evaluation insights influence decision-making:

- NAP Learning Cycles. These will be scheduled every three years, aligned with mid-term evaluations. Findings from MEL processes will inform NAP updates, resource allocation decisions, and sectoral strategy adjustments.

- Annual Adaptation Performance Reviews. Led by the Executive Office of the NCCC (EO-NCCC), these reviews will synthesize results from all priority measures, producing a "State of Adaptation" report and issuing guidance to sectoral bodies.

- Learning-Driven Budgeting. Ministry of Finance and Ministry of Planning will integrate MEL-based evidence into Medium-Term Expenditure Frameworks (MTEFs) and national investment prioritization.

Spaces for Intersectoral and Multi-Level Learning.

To ensure broad-based institutional learning, the NAP will establish dedicated platforms and dialogues, including:

- MEL Roundtables (biannual). Bringing together sectoral ministries, municipalities, SACCCs, academia, and CSOs to review adaptation outcomes, share lessons, and co-develop improvements.
- Municipal Learning Labs. Pilots in selected governorates will facilitate participatory evaluations and localized adaptation planning with iterative learning cycles.
- Thematic Learning Networks. Focused on cross-cutting themes such as men-women social roles, migration, or dryland resilience, enabling sector-specific exchange and replication of best practices.
- Digital Learning Repository. Hosted on the National Adaptation Intelligence and Coordination Platform (NAICP), this repository will collect case studies, technical briefs, policy notes, and success stories.

Knowledge Documentation and Dissemination.

Libya will ensure that learning is not only internalized but also widely shared through diverse formats and channels:

- Annual Adaptation Knowledge Reports. Synthesizing lessons learned, challenges, and innovations from across the NAP measures.
- Community Knowledge Exchanges. Forums and dialogues between regions facing similar challenges (e.g., coastal vs. desert ecosystems).
- Technical Guidelines and Toolkits. Developed based on field experience and made available to practitioners, municipalities, and training centres.
- Women-Responsive and Inclusive Learning Products. Materials will be tailored to reach women, youth, and vulnerable groups, using appropriate languages and modalities.

Regional and Global Learning Integration.

Libya will engage actively in regional knowledge-sharing platforms to strengthen South-South cooperation and co-develop solutions to shared climate challenges:

- MedECC (Mediterranean Experts on Climate and Environmental Change). To contribute data and insights from Libya's arid and coastal zones and align with regional early warning and risk analysis.
- AfriAdapt. Participation in this pan-African platform will enable Libya to exchange experiences on community-based adaptation, food systems resilience, and finance readiness.
- UNFCCC Adaptation Knowledge Portal (AKP) and NAP Global Network. Libya will contribute lessons learned and draw upon global knowledge for capacity-building and peer learning.

In consolidating institutional learning, Libya's NAP MEL system goes beyond measuring success, it becomes a dynamic engine for adaptive governance, continuous improvement, and transformational resilience.

8.9 Reporting and Use of MEL Results.

The utility of a MEL system lies not only in data collection, but in the strategic use of its results to guide planning, inform policies, improve accountability, and foster trust. Libya's MEL system is designed to support both internal and external reporting needs, and to embed adaptation learning and performance data into the national planning and budgeting cycle.

Integration into National Planning Processes.

Results from the MEL system will be systematically integrated into Libya's strategic and operational planning instruments:

- National Development Planning. Adaptation progress and bottlenecks identified through MEL reviews will inform updates to national development plans, recovery strategies, and mid-term planning cycles (e.g., MTEFs).
- Sectoral Strategies. MEL outcomes will support line ministries (Water, Agriculture, Environment, etc.) in revising targets, reallocating resources, and scaling successful pilots.
- Subnational Planning. Governorates and municipalities will use localized MEL data to align local adaptation plans and investment decisions with national goals, supported by SACCCs and the EO-NCCC.

National and International Reporting.

Libya's MEL results will directly support transparency under the **UNFCCC**, particularly:

- Biennial Transparency Reports (BTRs). MEL outputs, especially outcome and impact indicators, will populate adaptation chapters of the BTR, including sections on adaptation actions, progress, effectiveness, and support received.
- National Communications (NCs). Longitudinal MEL data will support narrative and quantitative assessments of climate trends, vulnerability, adaptation priorities, and capacity needs.
- Adaptation Communications (AdComs). The MEL system will help ensure that Libya's AdComs reflect evidence-based insights from ground-level implementation and learning cycles.
- Global Goal on Adaptation (GGA). MEL indicators and lessons learned will contribute to global stocktake processes by demonstrating Libya's contributions to enhancing adaptive capacity and reducing vulnerability.

Sectoral and Territorial Reporting.

To ensure the relevance of MEL results to implementation partners and local governments, Libya will produce:

- Sectoral Performance Dashboards. Digital dashboards, managed by sectoral ministries and populated through CIDSS and NAICP, will visualize progress against key indicators.
- Regional Scorecards. Adaptation scorecards tailored to each region (e.g., Jabal al Akhdar, Fezzan, coastal zones) will present localized results and support evidence-based territorial planning.
- Thematic Briefs. Periodic briefs will analyze cross-sectoral themes such as men-women social roles-responsiveness mainstreaming, food system resilience, or water security, using MEL findings to support sectoral decision-making.

Communication with Non-Governmental Stakeholders.

A core principle of the MEL system is accessibility and inclusiveness. Libya will ensure that results are communicated to a broad range of stakeholders beyond government:

- Civil Society. Through annual State of Adaptation Reports and citizen scorecards, CSOs will be engaged in monitoring and validation processes.
- Private Sector. Sector-specific data on investment performance, risk reduction, and co-benefits will support climate finance mobilization and partnership development.
- Academia and Research Institutions. Access to disaggregated, open data through NAICP will support academic research, scenario modeling, and innovation.
- Communities and Vulnerable Groups. Results will be disseminated through localized channels, including town halls, mobile-based alerts, and targeted learning materials in appropriate languages and formats.

Figure 31 – MEL Results Reporting Flows, illustrating the vertical and horizontal flow of adaptation MEL data across local, sectoral, national, and international levels:

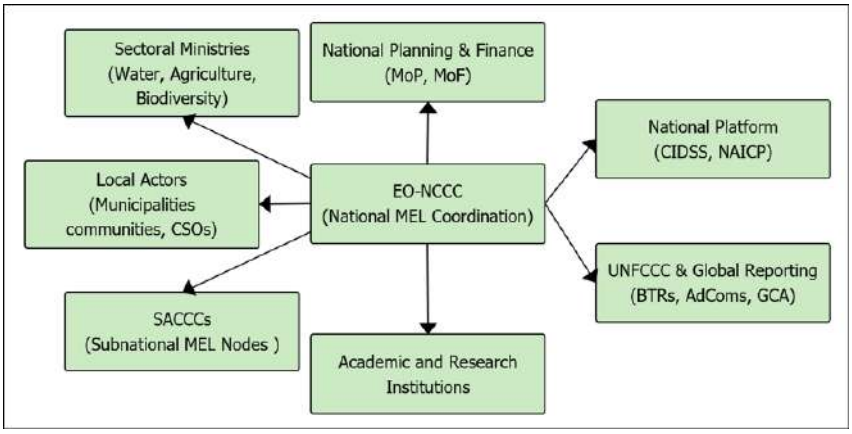


Figure 31: MEL Results Reporting Flows

8.10 Institutional Arrangements and Capacity Needs

Successful implementation of Libya's MEL system depends on the clarity of institutional roles, adequate capacities across levels of government, and strong cooperation with national and international partners. This section outlines the key actors responsible for MEL, the existing capacities and gaps, and the priority needs for institutional strengthening.

Responsible Entities for MEL Implementation.

Libya's MEL system operates through a multi-tiered governance structure embedded in the broader climate adaptation architecture of the country:

Institution	Role in MEL System
Extecutive Office of the NCCC (EO-NCCC)	Overall coordination, MEL protocol development, indicat harmonization, ETF alignment, reporting to UNFCCC
SACCCs (Sectoral and Subnational Committees on Climate Change)	Subnational data collection, participatory evaluation, regional scorecard development
Ministry of Planning (MoP)	Integration of MEL findings into national development plans and investment decisions
Ministry of Finance (MoF)	Budget tagging, public finance tracking, and linkage to climate finance indicators
Sectoral Ministries	Implementation-level M&E, performance tracking of sector-specific adaptation measures
LNMC & Climate Intelligence Systems	Provision of climate data, scenario modeling, CIDSS operation and maintenance
Academic and Research Institutions	Baseline assessments, indicator refinement, impact evaluations, MEL training support
Civil Society Organizations (CSOs)	Participatory monitoring, feedback collection, social accountability functions

Table 22: Libya's MEL system

This structure ensures a flow of information from local adaptation implementation to national synthesis and global reporting.

Existing Capacities and Identified Gaps.

A rapid institutional assessment conducted during the NAP design phase (refer to CRA and NAICP baseline analysis) revealed key strengths and challenges:

Dimension	Strengths Identified	Key Gaps
Technical Expertise	Skilled staff in LNMC, universities, and some sectoral units	Limited M&E professionals in water, agriculture, and biodiversity ministries
Institutional Mandates	Climate change coordination legally established (NCCC Decrees)	Overlapping responsibilities; unclear MEL mandates at local levels
Data Infrastructure	CIDSS platform operational; meteorological network expanding	Incomplete national coverage; weak data validation protocols
Subnational Capabilities	Some SACCCs and municipalities actively piloting MEL tools	Lack of trained MEL focal points and digital infrastructure in most regions
Women G-and Inclusion	Initial integration into MEL indicators and project design	Low capacity to apply disaggregated analysis or equity-based evaluations

Table 23: NAP design - key strengths and challenges

Institutional Strengthening and International Cooperation Needs.

To fully operationalize and sustain the MEL system, Libya requires targeted capacity development and international cooperation in the following areas:

1. Institutional Clarification and Coordination

- Formalize MEL roles across EO-NCCC, SACCCs, MoF, and sectoral agencies through inter-ministerial decrees.
- Develop a national MEL coordination protocol with clear data-sharing agreements.

2. Capacity-Building Programs

- Deliver certified training on MEL for climate adaptation (aligned with ETF) targeting technical staff at national and subnational levels.
- Establish MEL Resource Hubs in key institutions (e.g., MoP, Water Authority, universities).

3. Digital and Data Systems Development

- Expand CIDSS functionalities with interoperable dashboards, evaluation modules, and mobile-based data entry systems.
- Improve data quality assurance procedures and invest in climate-socioeconomic data fusion.

4. International Technical and Financial Partnerships

- Access readiness support from the GCF, UNDP, and GEF for MEL-related institutional development.
- Engage in South-South learning with countries in the AfriAdapt and NAP Global Network on MEL innovations.
- Mobilize bilateral technical cooperation to pilot equity-based MEL approaches and support MEL-linked climate finance reporting.

To addressing these gaps through a structured roadmap, Libya can build a resilient, transparent, and inclusive MEL system that not only supports domestic planning but also fulfils international commitments under the Paris Agreement and the Global Goal on Adaptation.

Figure 32– Institutional MEL Capacity Development Roadmap, which outlines Libya's phased approach to strengthening national and subnational MEL capacities from 2025 to 2030:

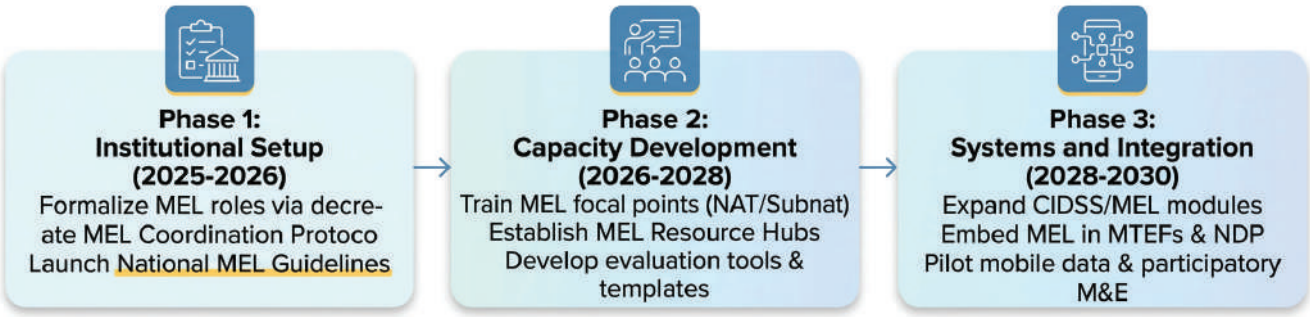


Figure 32: Institutional MEL Capacity Development Roadmap

8.11 Financing MEL Activities

Establishing and sustaining a robust Monitoring, Evaluation, and Learning (MEL) system requires dedicated, predictable, and diversified financial resources. Without such support, data quality, system functionality, and stakeholder participation risk being compromised, undermining transparency, learning, and the effective implementation of Libya's adaptation strategy. This section outlines estimated MEL costs, identifies potential financing sources, and proposes integration strategies into public budgeting frameworks.

Estimated Operational Costs of the MEL System. Based on the scope defined across this MEL framework, including CIDSS expansion, institutional training, platform maintenance, evaluation cycles, and participatory processes, initial estimations suggest:

Component	Annual Estimated Cost (USD)
MEL System Coordination (EO-NCCC)	$300,000
Evaluation Cycles (Midterm, Final, Thematic)	$500,000
CIDSS Platform Operations & Data Hosting	$250,000
MEL Capacity Development (National/Subnational)	$400,000
Participatory MEL Tools (scorecards, audits)	$150,000
MEL Integration in Sectoral Ministries	$250,000
Total Estimated Annual MEL Budget	**~$1.85 million**

Note: *Costs are indicative and subject to refinement through detailed budgeting during implementation planning.*

Table 24: Estimated Operational Costs of the MEL System

Potential Financing Sources.

To finance MEL operations, Libya will adopt a hybrid strategy that blends national budget allocations with international climate finance and technical cooperation:

National Sources

- Integration into Sectoral Budgets. Each line ministry involved in adaptation will be required to allocate a fixed percentage of its adaptation budget (e.g., 5%) to MEL operations.
- Public Investment Planning (MTEF). MEL activities will be included in program-based budgeting frameworks and performance-linked budget lines.
- Local Government Budget Earmarks. Through SACCCs, municipalities will be encouraged to allocate small MEL envelopes tied to community-based adaptation programs.

International Climate Finance

- Green Climate Fund (GCF). Support under Readiness and Preparatory Support Programs (especially for MEL training, CIDSS scaling, and indicator systems).
- Adaptation Fund (AF). Through project-specific MEL financing envelopes embedded in approved adaptation proposals.
- Global Environment Facility (GEF). Financing for innovation in MEL systems, including data digitalization, equity-based indicators, and learning platforms.

- Climate Investment Funds (CIFs). MEL resources linked to resilience-building investments and nature-based solutions.

Bilateral and Multilateral Cooperation. Technical assistance and in-kind support through partners such as UNDP, EU Delegations, GIZ, and FAO, particularly for institutional MEL capacity-building and digital MEL tools.

Strategic Integration of MEL in Planning and Budgeting. To ensure long-term sustainability, Libya's MEL system will be anchored in national financial systems:

- MEL Costing Guidelines. A standard tool will be developed to assist ministries and municipalities in estimating and justifying MEL costs in project proposals and annual budgets.
- Climate Budget Tagging (CBT). MEL expenditures will be tracked as a sub-code under the national CBT system, supporting transparency in adaptation finance.
- Inclusion in Investment Appraisal Frameworks. MEL will be listed as a non-negotiable cost item in the appraisal of public adaptation projects and externally funded proposals.

By combining financial innovation, integration into national systems, and strategic use of international support, Libya will ensure the viability and resilience of its MEL system, turning it into a backbone for adaptation learning, governance, and accountability.

Annex 1. Participatory Process Documentation

Date	Activity	Stakeholder Groups	Objective	Key Outcomes / Decisions
5/5/2025	Technical and Strategic Decision-Making	NCCC and EO-NCCC Technical staff from key ministries Sectoral committees Technical experts	Validate CRA and workshop outputs Apply MCDA to prioritize options Classify NDC measures (conditional/unconditional)	Endorsed list of adaptation measures for NAP and NDC Classification of NDC measures (conditional/unconditional) Establishment adaptation options (who is doing what and when and responsibilities) Institutional alignment for implementation Political support to advance formulation and financing Strengthened donor coordination and visibility for Libya's climate agenda
6/5/2025	High-Level Political Engagement	Minister of Environment and senior officials International partners and donors Head of international cooperation (MoA, MoWR) Ministries representatives (MoLG, MoP, MoF) NCCC and EO-NCCC Directors & sub directors directly working with SACCCs in Climate change Media presence	Present results from 5/5/2025 Endorse NAP and NDC adaptation priorities Signal Libya's commitment to adaptation finance	Endorsed fist of adaptation measures for NAP and NDC Classification of NDC measures (conditional/unconditional) Establishment adaptation options (who is doing what and when and responsibilities) Institutional alignment for implementation Political support to advance formulation and financing Strengthened donor coordination and visibility for Libya's climate agenda
23/06/ 2025	National CCAMs Validation and Technical Review Seminar	Government different sectors: Agriculture, Water resource and Biodiversity) and NGOs	To facilitate institutional and multisectoral ownership of the prioritized Climate Change Adaptation Measures (CCAM) for the NAP and NDC, and to prepare the SACCC members for the technical refinement and budget estimation of each measure.	Vafidated the National CCAMs
1/07/2025	Workshop on Inclusion and Women's Empowerment in Climate Adaptation Planning in Libya	Government different women sectors also the Agriculture, Water resource and Biodiversity) and NGOs	To strengthen the technical and strategic capacity of the National Climate Change Committee (NCCC), its Executive Office (EO-NCCC), and related Sectoral Adaptation Climate Change Committees (SACCCs) to mainstream inclusion and women's empowerment into Libya's climate adaptation planning specifically in the adaptation measures that will be part of the NAP and the adaptation chapter of the NDC	Increased Awareness: Enhanced understanding among participants of the intersection between men-women social roles-inequality and climate vulnerability. Capacity Building: Practical tools and case studies improved participant capacity to apply inclusive principles to real adaptation measures. Policy Alignment: Identified alignment opportunities between national climate policies and men-women social roles-responsiveness frameworks. Recommendations Drafted: Draft inclusive indicators and institutional roles to support integration into NAP and NDC processes. Networking and Partnerships: Strengthened collaboration among ministries, development partners, and civil society organizations.

Annex 2. Stakeholder Mapping

Identification and description of stakeholders and the importance for NAP planning and implementing.

Table 26: Stakeholder Mapping

Stakeholder	Type	Role / Description	Importance for NAP
Prime Minister's Office (PMO)	Central Decision-Maker	Coordinates national institutional and political frameworks, chairs Supreme Climate Change Committee (SCCC).	High (Sets overarching priorities, ensures inter-ministerial alignment, mobilizes political support.)
Ministry of Environment (MoE)	Central Decision-Maker	Oversees climate adaptation policies, leads National Climate Change Committee (NCCC), liaises with UNFCCC/GCF.	High (Technical lead for adaptation planning, international reporting, and donor coordination.)
Ministry of Agriculture (MoA)	Central Decision-Maker	Develops and implements agricultural adaptation strategies, financially autonomous.	High (Agriculture is a vulnerable sector; key to food security and rural resilience.)
Ministry of Water Resources (MoWR)	Central Decision-Maker	Manages water conservation, infrastructure, desalination and wastewater treatment projects.	High (Critical for addressing water scarcity and infrastructure resilience.)
Ministry of Planning (MoP)	Primary	Coordinates sectoral strategies and data management; links adaptation priorities to development plans.	High (Ensures integration of adaptation into development frameworks.)
Ministry of Education and Ministry of Higher Education	Secondary	Regulates curricula and oversees schools, universities, and vocational training centers.	Medium (Supports long-term adaptation capacity by integrating climate change into education systems and training future workforce.)
Ministry of Health	Primary	Oversees national health policy, services, and disease prevention programs	High (Vital for integrating adaptation into public health planning, managing climate-sensitive diseases, and protecting vulnerable populations.)
Ministry of Finance	Primary	Develops fiscal policy, national budgets, and economic strategies.	High (Ensures adaptation priorities are integrated into public investment plans and mobilizes climate finance.)
National Meteorologic Center	Primary	Responsible for weather, climate, and hydrological observation and forecasting.	High (Provide essential climate data, early warning systems, and risk assessments for adaptation planning.)

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Ministry of Planning (MoP)	Primary	Coordinates sectoral strategies and data management; links adaptation priorities to development plans.	High (Ensures integration of adaptation into development frameworks.)
Ministry of Education and Ministry of Higher Education	Secondary	Regulates curricula and oversees schools, universities, and vocational training centers.	Medium (Supports long-term adaptation capacity by integrating climate change into education systems and training future workforce.)
Ministry of Health	Primary	Oversees national health policy, services, and disease prevention programs	High (Vital for integrating adaptation into public health planning, managing climate-sensitive diseases, and protecting vulnerable populations.)
Ministry of Finance	Primary	Develops fiscal policy, national budgets, and economic strategies.	High (Ensures adaptation priorities are integrated into public investment plans and mobilizes climate finance.)
National Meteorologic Center	Primary	Responsible for weather, climate, and hydrological observation and forecasting.	High (Provide essential climate data, early warning systems, and risk assessments for adaptation planning.)

General Electricity Company of Libya (GECOL)	Primary	Energy sector leader; plans grid resilience and renewable integration.	Medium (Energy security and decarbonization intersect with adaptation goals.)
Local Municipalities	Primary	Implement adaptation at community level; liaise with citizens.	High (Direct impact on local resilience; essential for decentralized action.)
National Climate Change Committee (NCCC)	Primary	Multi-ministry body guiding adaptation strategies.	High (Cross-sectoral coordination and policy alignment.)
Supreme Climate Change Committee (SCCC)	Primary	High-level inter-ministerial coordination.	High (Ensures political backing and national coherence.)
Academic Institutions (e.g., Universities, LCRSSS)	Secondary	Provide research, vulnerability assessments, climate data analysis.	Medium (Supply evidence base; potential for innovation.)
NGOs (e.g., Moomken, LECAO, Red Crescent Libya)	Secondary	Implement community-based adaptation projects, raise awareness.	Medium (Key for local engagement and social mobilization.)
International Partners (GIZ, UNDP, EU, GCF)	External / Support	Provide funding, technical assistance, capacity building.	High (Enable access to climate finance and best practices.)
Private Sector	Secondary	Invests in adaptation-related infrastructure and technologies.	Medium (Potential co-financier and innovator for climate solutions.)
Media & Communication Agencies	Secondary	Public and private media outlets, social media platforms, and communication specialists.	Medium (Raise awareness, disseminate adaptation information, and foster public engagement.)



Missing or Underrepresented Stakeholders

- Ministry of Transport & Infrastructure — Important for climate-proofing roads, ports, and other key infrastructure against extreme events.
- Disaster Risk Management Authorities — Should be directly engaged for early warning, preparedness, and rapid response planning

Table 26: Stakeholder Mapping

Annex 3. Risk Maps and C-RRR Profiles

C-RRR – Climate-Related Risk Region: Coherent spatial typology composed of five climate-related risk regions, covering both terrestrial and marine-coastal areas. It is an alignment of physical geography with climatic gradients and socio-economic systems.

Region	Land Cover	Climate	Sensitivity Shared Profile
R1: Mediterranean Coastal–Marine Belt	urban coastal settlements, peri-urban agriculture, natural Mediterranean vegetation	sub-humid to semi-arid, moderate Kerner Index	high exposure to sea-level rise, storm surges, coastal erosion, salinization, and flash floods
R2: Coastal-Semi-Arid Transition Zone	rainfed croplands, fragmented forests, expanding settlements	semi-arid belt with variable rainfall and increasing dryness	land degradation, water stress, wildfire, and peri-urban pressure
R3: Interior Arid Gradient	date-palm oases, degraded pasturelands, desert plains	arid with extreme temperature variation	prolonged droughts, declining aquifers, oasis fragility
R4: Hyper-Arid Continental and Depression Zone	vast bare soils, sandy and rocky desert, isolated pastoral pockets	hyper-arid, highest Kerner Index values, negligible rainfall	ecosystem collapse, groundwater depletion, extreme heatwaves
R5: Marine and Coastal Waters Zone	marine ecosystems, coastal aquaculture, seagrass beds	maritime and semi-enclosed Mediterranean conditions	marine pollution, warming seas, biodiversity loss, port infrastructure vulnerability

Table 27: Climate-Related Risk Regions

The map below, serves as a policy-friendly tool to bridge climate risk assessment with adaptation and resilience planning. Its adoption across tables, figures, and analyses ensures internal coherence and enhances communication with decision-makers. By providing a clear territorial reference, the C-RRR framework helps align climate diagnostics with investment priorities, facilitating the integration of adaptation into sustainable development strategies. The map below illustrates the territorial regionalization used in the Libyan´s Climate Risk Assessment.

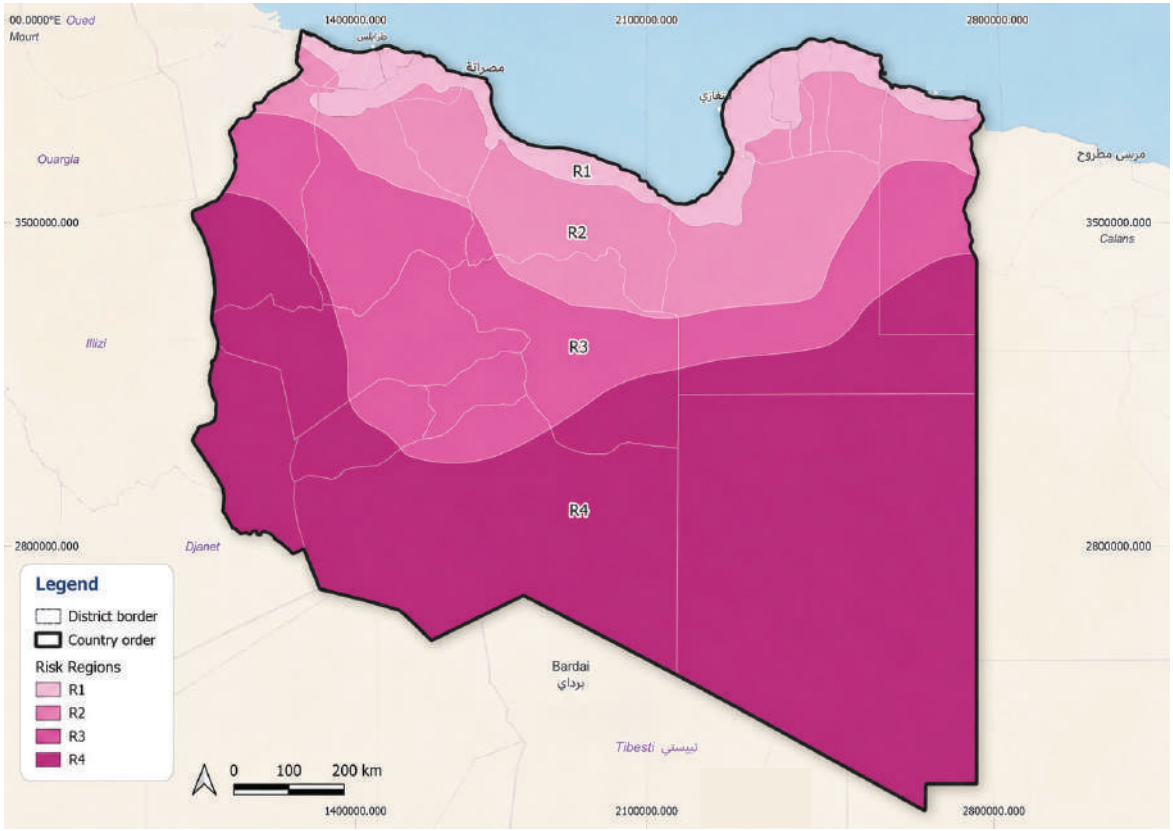


Figure 33: Libya's Climate-Related Risk Regions Map

Regions	Population & Demographics	Economic Activities	Water & Basic Services	Environmental Pressures	Infrastructure
R1: Mediterranean Coastal–Marine Belt	High density; urban centers like Tripoli, Benghazi; majority of population concentrated along coast	Services, public sector, trade, ports, intensive agriculture, fishing; oil export logistics	Municipal water and sanitation networks, GMMR supply; aging infrastructure; best access nationally	Coastal erosion, aquifer salinization, land degradation; urban sprawl; vulnerability to flooding	Dense but aging systems (ports, roads, hospitals); vulnerable to floods and overuse
R2: Semi-Arid Transition Zone	Moderate density; mostly rural with scattered farming villages; connected to coastal cities	Mixed farming, livestock, small trade, subsistence economy; limited non-agricultural employment	Groundwater wells, irrigation, some GMMR supply; declining quality; limited health/education services	Desertification front, soil salinity, groundwater intrusion, drought risk	Basic rural infrastructure; limited roads and irrigation; vulnerable to drought and neglect
R3: Interior Arid Gradient	Sparse; few oasis towns (e.g. Sabha); high out-migration (or relocation) and aging rural population	Oasis agriculture, livestock, oil and gas fields, limited mining; extractive economy	Dependence on wells and GMMR; high water stress; fragile electricity and health systems	Desert advance, oasis degradation, sandstorms, groundwater depletion	Sparse, fragile infrastructure; long-distance roads, pipelines, few clinics or schools
R4: Hyper-Arid Continental and Depression Zone	Minimal; isolated oasis settlements (e.g. Kufra, Ghat); near-zero population in most areas	Date farming, informal trade, smuggling, limited livestock; major oil field operations	Fossil aquifers; water scarcity; minimal services; high isolation; generators and local wells	Extreme aridity, oasis collapse, salinization, zero rainfall, high climate sensitivity	Minimal infrastructure; few roads, power generators, or services; high risk of isolation
R5: Marine and Coastal Water zone	Concentrated along ports and urban coasts; indirect marine population includes fishers, traders, port workers	Fisheries, port logistics, maritime transport, offshore terminals, eco-tourism potential	Port and coastal cities have structured water, sanitation, electricity, coastal aquifers under saline stress	Sea level rise, storm surges, marine pollution, overfishing, aquifer salinization	Strategic maritime assets (ports, oil terminals); fragile coastal defenses; limited marine protection zones

Table 28: Socio-economic and environmental characteristics

Global and regional mean sea level rise trends around the Coast of Libya from 1992-present, provided by NOAA laboratory for satellite altimetry. (a) The inset map shows the location of study area on global sea level trend map. (b) a buffer of 10 km from the shoreline (blue colour) was used to extract the data for Libyan coast.

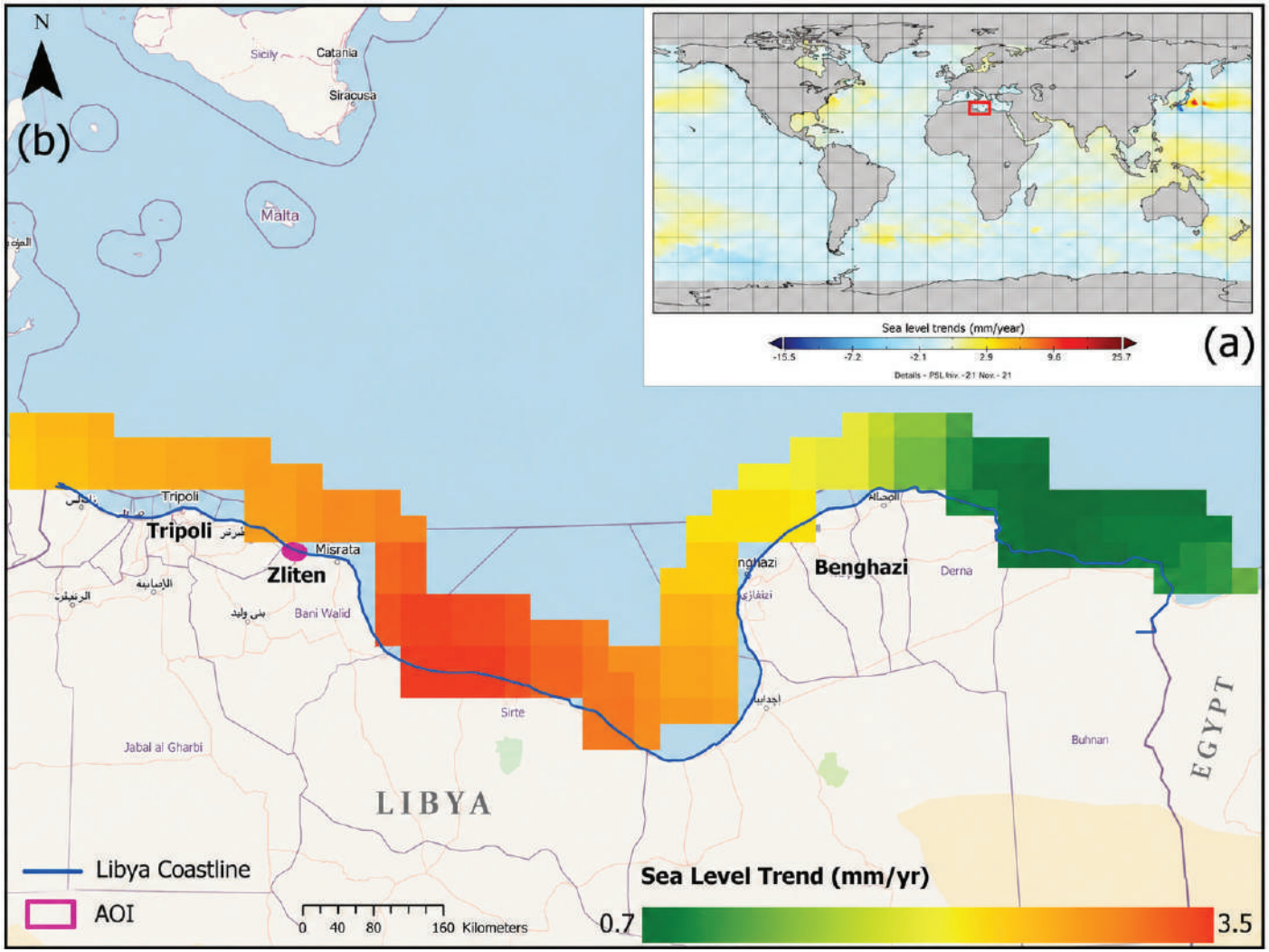


Figure 34: Mean sea level rise trends on the Coast of Libya from 1992-present

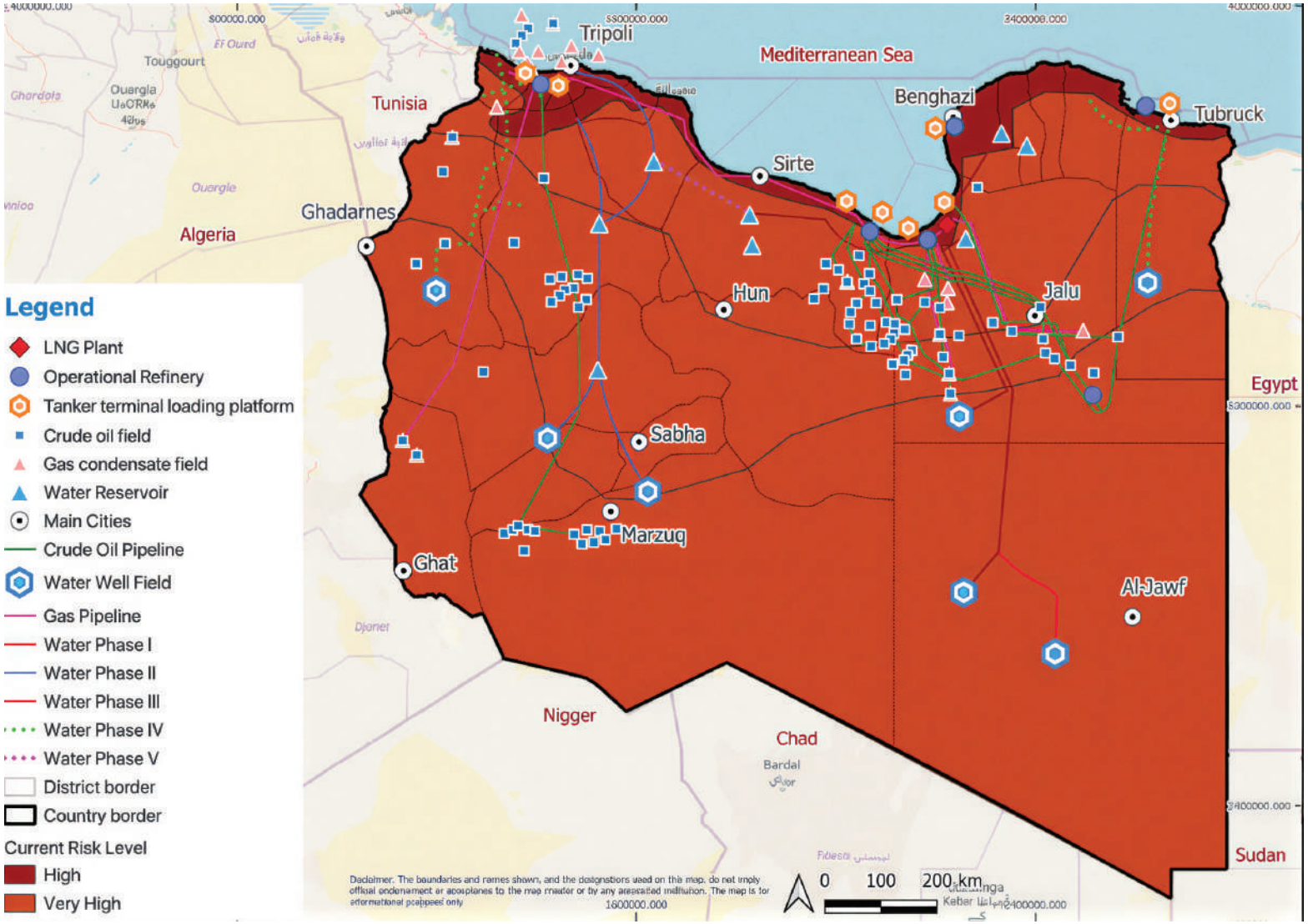


Figure 35: Energy & Water Infrastructure - Current Risk Level

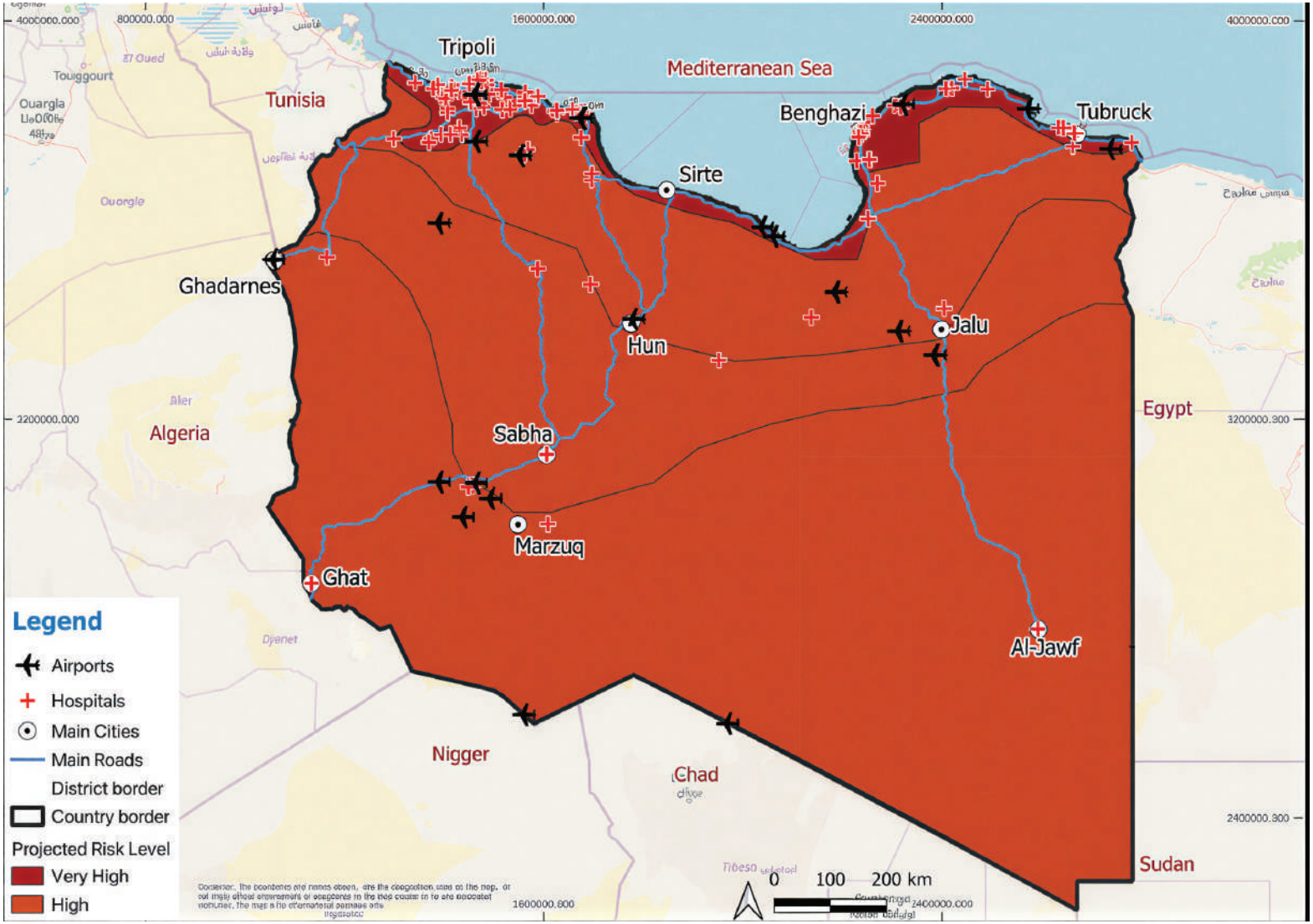


Figure 36: Critical Civil Infrastructure - Current Risk Level

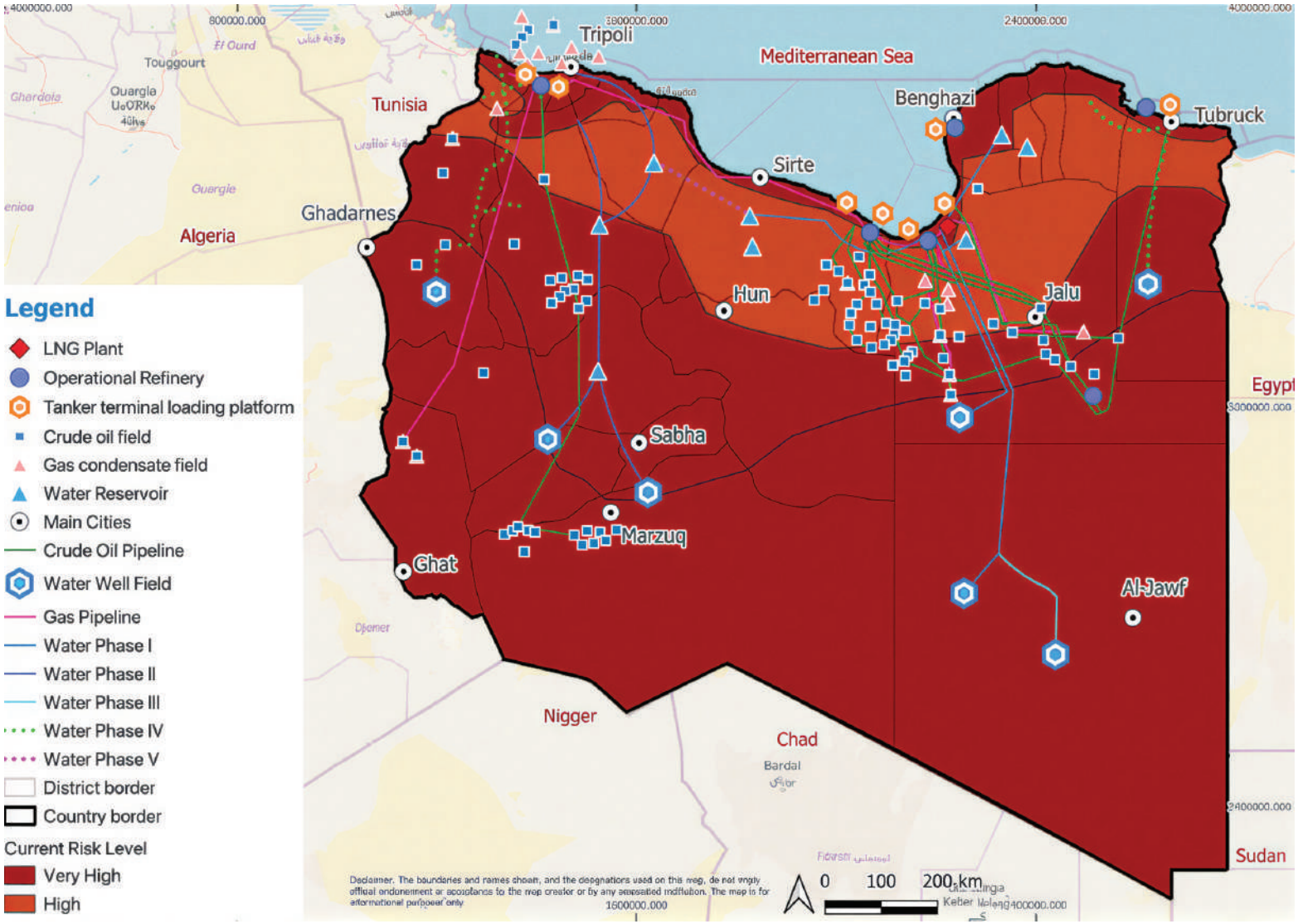


Figure 37: Energy & Water Infrastructure - Projected Risk Levels

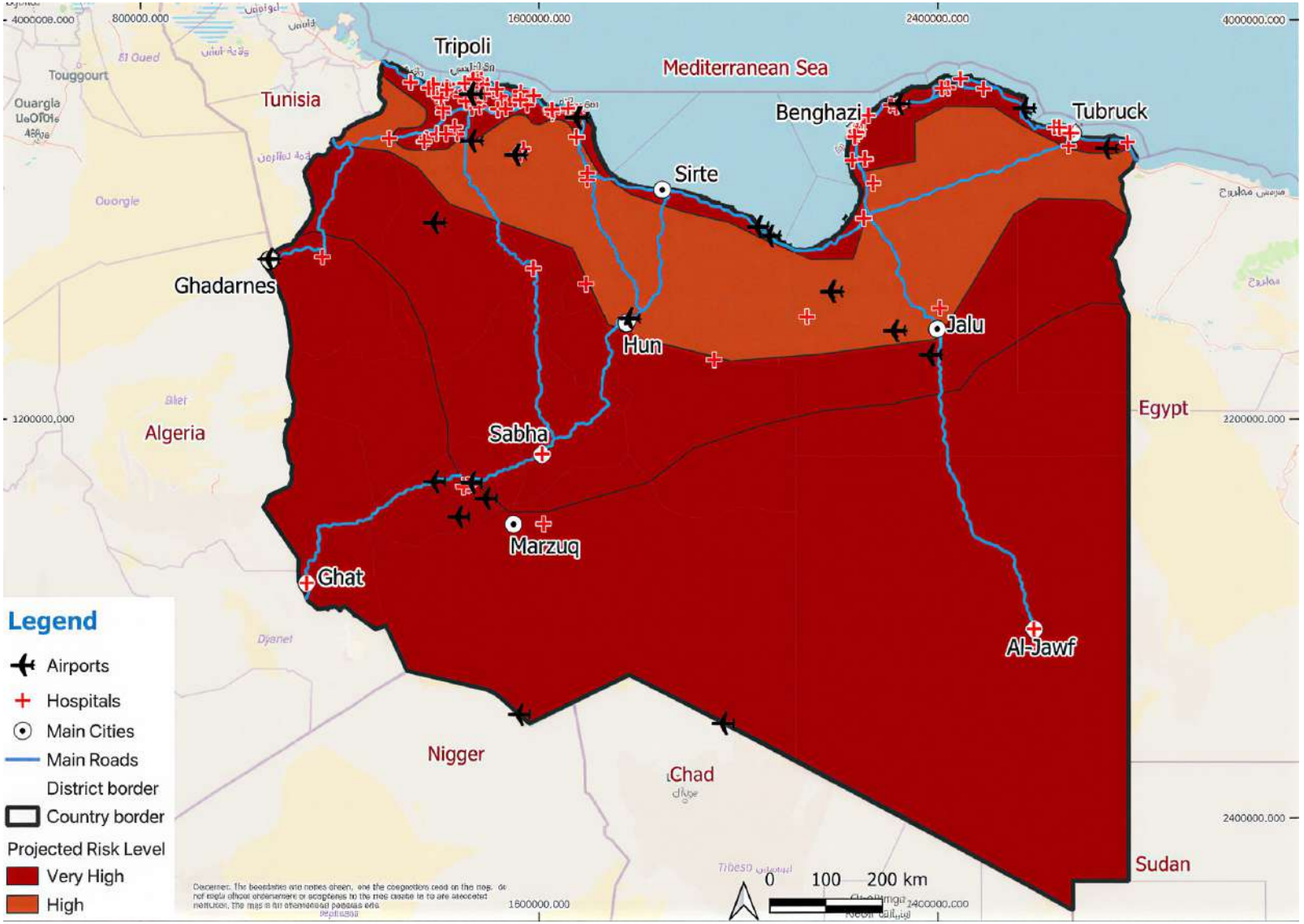


Figure 38: Critical Civil Infrastructure - Projected Risk Level

Annex 4. Adaptation Measures Indicative Planning Profile

CCAM Title	Objective	Lead Institution	Indicative Target Areas	Timeframe	Key Outputs	Planning Tool Focus
Community-Led Water Resilience Monitoring Program	Empower communities to monitor water resources and improve local decision-making	MoWR, MoE, MoLG	Coastal regions	2025–2035	- 50 systems installed - 500 trained (40% women) - Quarterly reports	Participatory monitoring, MEL setup, women inclusion
Ecosystem-Based Groundwater Recharge and Protection Initiative	Restore recharge zones and improve aquifer governance	MoWR, MoE	Jifarah, Benghazi, Jabal Akhdar, South	2026–2036	- 40 MAR systems - 25,000 ha restored - 400 women trained	NbS integration, infrastructure planning, MEL tracking
National Integrated Water Governance for Climate Resilience (NIWG-CR)	Reform water governance and data systems for resilience	MoWR, EO-NCCC	National (R1 & R2 priority)	2026–2030	- 5 policies revised - 3 smart meters - 500 women trained	Policy reform, institutional coordination, MEL dashboard
Climate-Responsive Agricultural Finance for Smallholders (CRA-FiSS)	Enable smallholders to access finance and adopt CSA practices	MoA, EO-NCCC, MoF	Jifara, Coastal zones, drought/flood zones	2026–2033	- 5,000 financed - 25,000 ha CSA - 500 trainings	Finance mechanism design, CSA adoption tracking
Climate-Smart Crop Diversification and Risk Reduction Program	Diversify cropping systems and reduce climate risks	MoA, EO-NCCC	Jifara, Kufra, Marj	2026–2033	- 50,000 ha diversified - 10,000 trained - 10 value chains	CSA planning, men-women social roles-responsiveness-responsive extension, MEL
Agroclimatic Decision-Support Platform (Agro-DSP)	Deliver climate advisories to farmers via digital platform	MoA, LNMC, Remote Sensing Center	Vulnerable smallholder zones	2026–2033	- 100,000 users - 30 tools - 10,000 trained	Climate services, digital MEL, CSA decision support
Secure Land Rights and Regenerative Soil Management Initiative	Improve land tenure and soil health through regenerative practices	MoA, MoJ, MoE	Al Kufra, Fezzan, Wadi lands	2026–2033	- 25,000 titles - 100,000 ha restored - 10,000 trained	Land governance, soil restoration, women fairness
Resilience Corridors for Sustainable Dryland Restoration (DERR-C)	Restore drylands and ecosystems through corridor-based planning	MoE, MoA, MoLG	Fezzan, Kufra, Jabal Akhdar	2026–2031	- 300,000 ha managed - Dust storm reduction - Community NRM groups	Corridor mapping, NbS, community engagement
Strategic Green Infrastructure for Urban and Environmental Resilience (SGI-Res)	Integrate green infrastructure into urban planning	MoLG, MoE, MoA	Tripoli, Benghazi, Sebha, Misrata, Derna	2025–2030	- Green belts - Rooftop gardens - Flood reduction	Urban resilience planning, NbS, MEL indicators

Annex 4. Adaptation Measures Indicative Planning Profile

CCAM Title	Objective	Lead Institution	Indicative Target Areas	Timeframe	Key Outputs	Planning Tool Focus
Building a Resilient Blue Economy (ReBECLE)	Strengthen coastal ecosystems and livelihoods	MoBT, MoEnv, MoMarine, MoTo	Coastal cities	2026–2031	- Seagrass restored - Aquaculture - Women/youth enterprises	Coastal NbS, livelihood planning, MEL
National Adaptation Intelligence System (NAIS)	Centralize climate data for decision-making	EO-NCCC	National (R1–R5)	2025–2030	- Risk maps - Dashboards - Trained planners	Data integration, MEL platform, cross-sector coordination
WEFE Resilience Hubs	Integrate water, energy, food, and ecosystem management	EO-NCCC, MoWR, MoA, MoE, GECOL	Coastal, rural, peri-urban zones	2025–2035	- WEFE hubs - Solar irrigation - Women cooperatives	Nexus planning, MEL, NbS, men-women social roles-inclusion
Climate Risk Intelligence and Decision-Support System (CIDSS)	Provide real-time climate risk data and early warning	LNMC, EO-NCCC	National + regional nodes	2025–2032	- Data portal - Observatories - Trained users	Risk mapping, MEL analytics, institutional coordination
Resilient and Secure Food Supply Corridors (RSFSC)	Diversify and secure food supply chains	MoA, MoBT, MoTrans	Agricultural zones, transport routes	2026–2033	- Diversified routes - Infrastructure upgrades - Early warnings	Contingency planning, MEL, coordination platform

Table 29: Adaptation Measures Indicative Planning Profile

Annex 5. Legal and Policy Inventory

No.	Law / Decision
1	Law No. (27) of 1968 on Plant Protection
2	Law No. (46) of 1975 on Dwarf Lands
3	Law No. (5) of 1982 on the Protection of Forests and Rangelands
4	Law No. (14) of 1992 on Amending Certain Provisions of Law No. (5) of 1982 on the Protection of Rangelands and
5	Law No. (7) of 1982 on Environmental Protection
6	Law No. (3) of 1982 on Regulating the Exploitation of Water Resources (Drilling Permits, Use, and Management)
7	Decision No. (790) of 1982 on Issuing the Executive Regulations of Law No. (3) of 1982 on Regulating Water
8	Law No. (1) of 1983 on Establishing the Agricultural Inspection Authority
9	Law No. (15) of 1989 on the Protection of Animals and Trees
10	Law No. (15) of 1992 on the Protection of Agricultural Land
11	Law No. (6) of 1996 on Amending an Article of the Agricultural Land Protection Law (Law No. 16 of 1992)
12	Law No. (109) of 1971 on Establishing the Agricultural Research Centre
13	Decision No. (827) of 1988 on Establishing the General Authority for Scientific Research
14	Decision No. (72) of 1988 on Establishing the Arab Centre for Desert Research and Desert Community Development
15	Decision No. (127) of 1990 on the Protection of Animals and Trees
16	Law No. (14) of 1989 on the Exploitation of Marine Resources

Table 30: Legal and Policy Inventory

Annex 6. Financing Pipeline and Opportunities Matrix.

Sector	Adaptation Measure Title	Geographic Scope	Timeline (S/M/L)	Estimated Cost (USD)	Potential Source(s) of Funding	Implementing Agency	Co-benefits	Readiness / Feasibility Status	Notes / Comments
Water Resources	Community-Led Water Resilience Monitoring Program	Tripoli.Benghazi. Al Jabal Akhdar, Mesrata,Sebha and Al Kufrah	Long-term (L)	USD 500,000 (2025–2027 pilot); further costs to be determined based on full rollout and equipment needs	International Fund	Ministry of Water Resources (MoWR)	**Social:** Strengthens community participation in decision-making. **Economic:** Reduces water loss, improving agricultural productivity; minimiaes costs from inefficient water use. **Environmental:** Enhances sustainable water resource management; supports ecosystem health by monitoring springs and wadis.	concept	
Water Resources	Ecosystem-Based Groundwater Recharge and Protection Initiative	Jifarah plain , Benghazi, Al Jabal Al Akhdar and the southern region	Long-term (L)	USD 40 million	National budget + International fund	Ministry of Water Resources (MoWR)	**Social:** Builds community capacity in water govemance; promotes women-inclusive leadership in resource management. **Economic:** Secures water for agriculture, reducing losses in crop yield; creates jobs in restoration works. **Environmental:** Restores degraded recharge zones; increases groundwater levels; reduces land degradation and desertification.	concept	
Water Resources	National Integrated Water Governance for Climate Resilience (NIWG-CR)	Jifarah plain , Benghazi, Al Jabal Al Akhdar and Sabha	Medium-term (M)	USD 20 million	National budget + International fund	Ministry of Water Resources (MoWR)	**Social:** Improves equitable access to water; reduces conflicts over resources; strengthens institutional cooperation. **Economic:** Boosts agricultural water use efficiency; lowers costs from water scarcity and infrastructure degradation. **Environmental:** Reduces groundwater over-extraction; supports aquifer recharge; prevents saitwater intrusion.	concept	
Biodiversity	Resilience Corridors for Sustainable Dryland Restoration (DERR-C)	Fezzan region (southwest Libya), Kufra basin (southeast), Jabal al Akhdar uplands (northeast)	Long-term (L)	USD 30 million	National budget + International fund	Ministry of Environment, Ministry of Agriculture and Livestock, Local Ministry	150,000 people more resilient; 300,000 ha managed sustainably; long-term risk mitigation	concept	

Biodiversity	Strategic Green Infrastructure for Urban and Environmental Resilience (SGI-Res)	Tripoli, Benghazi, Sebha, Misrata, Derna	Long-term (L)	USD 75 million	National budget + International fund	Ministry of Local Government, Ministry of Environment, Ministry of Agriculture	1 million people with improved resilience; 30% reduction in flood losses	concept	
Biodiversity	Building a Resilient Blue Economy for Coastal Communities and Ecosystems (ReBECLE)	Libyan coastal regions including Benghazi, Tripoli, Misrata, Derna, Zwara(h)	Long term	USD 50 million	National budget + International fund	Ministry of Economy and Trade	200,000+ people reached, 5,000+ ha restored, enhanced coastal food security	concept	
Agriculture (crop, livestock, horticulture, extension)	Agroclimatic Decision-Support Platform for Resilient Farming (Agro-DSP)	Jabal al Akhdar, Fezzan oases, Jifara	Long-term (2025–2032)	USD 12–18 million	Climate finance (NAP/NDC-linked), bilateral donors, public-private partnerships	Ministry of Agriculture and Livestock, National Meteorological Centre, Ministry of Environment	- Improved food security - Extension effectiveness - Soil and water productivity - Women's digital inclusion	High readiness; platform design and MEL framework outlined, stakeholder coordination planned	Targets 100,000 farmers; includes mobile tools, CSA guidance, and inclusive formats

Table 31: Financing Pipeline and Opportunities Matrix

Annex 7. MEL Indicator Catalogue

Adaptation Measure	Process Indicator	Outcome/Impact Indicator	Equity / Inclusion Indicator
1. Community-Led Water Resilience Monitoring Program	Number of community-based monitoring units established	% of monitored sites showing improved water quality	% of participating women in water governance bodies
2. Ecosystem-Based Groundwater Recharge and Protection Initiative	Hectares of land under recharge protection schemes	Increase in groundwater table levels	% of protected aquifers near vulnerable communities
3. National Integrated Water Governance for Climate Resilience (NIWG-CR)	Water policies revised to include climate criteria	% of basins with functioning multi-stakeholder governance	% of women/youth in water governance councils
4. Climate-Responsive Agricultural Finance for Smallholders (CRA-FiSS)	Number of climate-adaptive loans disbursed	% of borrowers reporting productivity increase	% of loans to women and youth
5. Climate-Smart Crop Diversification and Risk Reduction Program	Hectares under diversified cropping systems	Crop failure rate during climate shocks	% of households with food security during lean season
6. Agroclimatic Decision-Support Platform for Resilient Farming (Agro-DSP)	Operational agroclimatic services established	User adoption rate of advisories	% of female farmers using platform services
7. Secure Land Rights and Regenerative Soil Management Initiative	Land parcels with tenure documentation	Soil organic content improvement in target areas	% of land titles issued to women/IDPs

Table 32: MEL Indicator Catalogue

8. Resilience Corridors for Sustainable Dryland Restoration (DERR-C)	Km^2 of drylands restored	Vegetation cover index in restored areas	Participation rate of vulnerable communities
9. Strategic Green Infrastructure for Urban and Environmental Resilience (SGI-Res)	Urban zones with green infrastructure projects	Reduction in urban flood events	% of projects with inclusive design consultations
10. ReBECLE	Number of coastal livelihood pilots launched	Increase in household income from blue economy	% of women-led coastal enterprises supported
11. NAICP	Number of stakeholders using coordination platform	Policy changes informed by platform data	% of local authorities with access to NAICP
12. WEFE Resilience Hubs	Hubs operational with integrated WEFE services	Improvement in WEFE security indicators	% of women/youth beneficiaries per hub
13. CIDSS	Number of users accessing risk and climate data	Sectoral plans revised using CIDSS outputs	% of municipalities using CIDSS tools
14. RSFSC	Km of climate-resilient food corridors rehabilitated	Supply chain disruptions during climate events	% of targeted food corridor investments in vulnerable zones


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