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Advancing knowledge for Long-term Benefits and Climate Adaptation through Holistic Climate Services and Nature-based Solutions

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Advancing Climate Resilience in Ghana: Integrating Nature-based Solutions (NbS), Climate Services, Gender, and Indigenous Knowledge

Country Synthesis Report

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Source: This synthesis report is based on ALBATROSS Horizon Europe Deliverable D6.1: *Multi-level policy analysis* (Nyasimi, Almassy, Muhwanga, et al., 2025). For more detailed information and supporting evidence, readers are referred to the full report.

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List of Abbreviations

DRR	Disaster Risk Reduction
DRM	Disaster Risk Management
EbA	Ecosystem-based Adaptation
EIA	Environmental Impact Assessment
GFCS	Global Framework for Climate Services
IKLK	Indigenous Knowledge and Local Knowledge
IWRM	Integrated Water Resources Management
MDTP	Medium Term Development Policy Framework
NAP	National Adaptation Plan
NbS	Nature-based Solutions
NDC	Nationally Determined Contribution
SDG	Sustainable Development Goal
UN	United Nations
UNEA	United Nations Environment Assembly
WMO	World Meteorological Organization

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1. Objectives

This country synthesis report presents key findings from a detailed analysis of Ghana's environmental and climate change policies, focusing on integrating Nature-based Solutions (NbS), climate services, Indigenous knowledge and local knowledge, gender inclusion and related cross-cutting themes.

This brief forms part of a broader multi-level policy analysis under the ALBATROSS Horizon Europe research project. The analysis aims to assess the extent to which, and key challenges and options of integrating Nature-based Solutions (NbS), climate services, Indigenous knowledge and local knowledge, gender inclusion into environmental and climate change policies across five African countries: **Ghana, Kenya, Madagascar, South Africa, and Tanzania**.

Drawing on national and sub-national policy documents, as well as relevant regional frameworks, the analysis mapped the extent and depth of policy integration across the following thematic areas:

- NbS approaches
- Climate services
- Gender-sensitive approaches and
- Indigenous Knowledge and Local Knowledge (IKLK).

The analysis also identified policy gaps, critical needs, and opportunities to scale up NbS and the integration of climate services, gender-sensitive approaches, and IKLK.

This **Ghana country brief** provides an overview of national findings and presents a set of recommendations for advancing the integration of NbS, climate services, gender considerations and IKLK in national and sub-national policy documents.

2. Overview of the studied policy documents

The broader multi-level policy analysis included transnational, national and subnational environmental and climate policy documents. Some additional thematic documents were also included to cover additional thematic areas, such as meteorology services, gender mainstreaming, and IKLK. In total, 252 policies were included in the analysis from the five target countries. For Ghana, 51 documents were analysed, consisting of multi-sectoral and sectoral policy frameworks, regulations, strategies, and plans.

2.1. SDG themes addressed by the documents

SDG 13: Climate Action is covered by 75% of the documents, followed by SDG 15: Life on Land (69%) and SDG 6: Clean Water and Sanitation (57%). Additionally, SDG 14: Life Below Water is also addressed by 18 policy documents (35%), focusing on marine and coastal ecosystem conservation. SDG 11: Sustainable Cities and Communities, and SDG 7: Affordable and Clean Energy were covered only in 39% and 35% of the documents. Given the central importance of sustainable urban development and low-carbon energy production in

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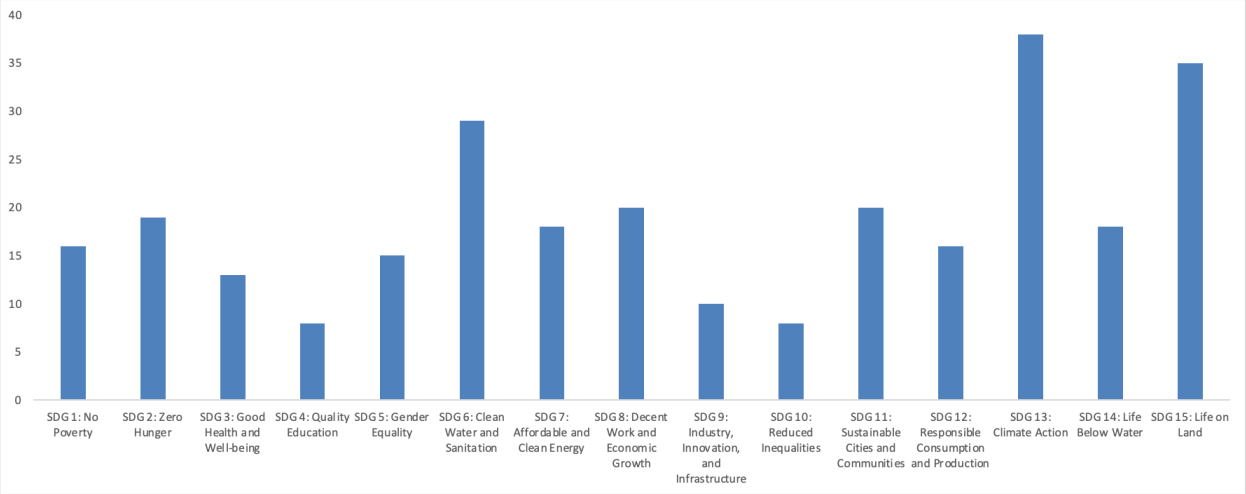
Sub-Saharan Africa, this indicates a potential policy gap. Socio-economic objectives such as SDG 2: Zero Hunger, SDG 1: No Poverty, and SDG 8: Decent Work and Economic Growth are featured in 37%, 31%, and 39% of the reviewed policy documents, respectively. Fewer policy documents, 29% and 16%, respectively, integrated themes relevant to SDG 5: Gender Equality and SDG 4: Quality Education.

Figure 1: Distribution of SDG themes in the studied policy documents of Ghana



Source: Calculation based on the multi-level policy analysis for Deliverable 6.1

2.2. *Climate hazards identified and addressed in environmental and climate policies*

The policy documents reviewed in Ghana identified a broad range of these climate hazards:

- **Drought:** A key climate concern addressed in 55% of the reviewed policies is drought. Concerning water scarcity, policy documents addressed agricultural drought (20%), which results in insufficient soil moisture to sustain crop growth and reduced yields.
- **Flooding:** Among the most frequently addressed hazards, flooding is also a predominant concern, with 55% of the reviewed policies incorporating relevant considerations. Specific types of flooding mentioned include flash floods (14%), coastal flooding (16%), urban (pluvial) floods (4%), and riverine floods (4%).
- **Soil erosion and land degradation:** The third most frequently recognised climate risk is soil erosion, referenced in 33% of the policies. Many policies linked these problems to unsustainable land-use practices and deforestation.
- **Coastal erosion:** Several reviewed policies (31%) highlighted coastal erosion as a significant risk, often linked to sea-level rise and human-induced shoreline changes.
- Other notable hazards include wildfires (18%), forest fires (12%) and landslides (12%). Additionally, some policies also noted vulnerabilities to seawater intrusion (16%), storm surges (18%) and extreme weather events, such as heat waves (20%) and strong wind (10%).

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3. Integration of Nature-based Solutions (NbS) in environmental and climate policies

The following section provides an overview of identified NbS implementation trends, gaps, needs, and integration opportunities across the policy documents studied in Ghana.

According to **internationally accepted definitions**,[1] NbS integrates various approaches such as ecosystem-based management, sustainable forest and water management, agroecology and agrobiodiversity, sustainable agriculture, urban ecosystem regeneration and green and blue infrastructure development. These approaches are implemented through various actions, such as reforestation and forest conservation, coastal and marine protection, freshwater and wetland conservation and restoration, ecosystem-based river basin and floodplain management, erosion control measures, regenerative and climate-resilient agriculture and rangeland management, as well as urban greening measures and hybrid of blue/green/grey infrastructures solutions.

Among the **reviewed policy documents for Ghana**, around **75% contained NbS measures and actions**. The level of NbS integration across these documents was evaluated according to the following categorisation:

- **High:** NbS approaches are prominently embedded throughout the document, with straightforward integration into strategic objectives and implementation mechanisms. The document may also explicitly position NbS as a core component of climate adaptation and environmental management.
- **Medium-high:** NbS approaches are well-integrated into the policy document and supported by specific policy measures, but they have limited cross-sectoral coordination and alignment with broader policy objectives, such as health, education, or economic resilience.
- **Medium:** NBS approaches are referenced in multiple sections of the document. However, these remain fragmented or limited to general principles without detailed implementation actions.
- **Limited:** The policy document includes a few NbS measures, but these are limited in scope and lacking detail.

3.1. High-level, multi-sectoral policies, strategies and plans

NbS approaches were included in the broader national development strategies of all five studied African countries. Almost all the reviewed high-level, multi-sectoral policy documents, such as national development plans, spatial planning frameworks, and other long-term strategic documents guiding sustainable development, included some relevant NbS aspects.

[1] United Nations Environment Assembly of the United Nations Environment Programme (2022). Resolution adopted by the United Nations Environment Assembly on 2 March 2022: 5/5. Nature-based solutions for supporting sustainable development. UNEP/EA.5/Res.5. Nairobi, 22 and 23 February 2021, and 28 February – 2 March 2022. United Nations Environment Programme. https://wedocs.unep.org/handle/20.500.11822/39864

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An overview of the identified high-level, cross-sectoral policy documents that integrate NbS approaches in Ghana is presented below.

Table 1: High-level and cross-sectoral policy documents in Ghana, including NbS approaches and considerations

Name of the policy document	NbS integration	Specific references
Long-term National Development Plan of Ghana (2018-2057)	Medium-high	Ensure sustainable use and management of key natural resources. Protect and conserve river basins and wetlands for water security. Increase carbon sinks through plantation, afforestation, reforestation, and forest restoration. Improved management and resilience of terrestrial, aquatic, and marine ecosystems. Ecosystem-based adaptation (EbA) and community-based natural resource management.
Medium-term National Development Policy Framework (2022-2025) [2]	Medium	Restoration/ rehabilitation of degraded forest, mining area, dry and wetlands within forest reserves (5,000 hectares). Implementing green infrastructure recommendation in the National Spatial Development Framework. Developing climate-responsive infrastructure. Promote alternative livelihoods, including eco-tourism.
National Spatial Development Framework (2015-2035)	Medium-high	Implementing green infrastructure network. Protecting and restoring ecological assets and green corridors. Promoting afforestation for climate change mitigation and flood control. Supporting eco-tourism in high-value rural landscapes.
Ghana Infrastructure Plan 2018-2047	Medium	Increased resilience of built and natural infrastructure: Landscape and green space management; Resilient land use and urban planning; Protection of natural resources and ecosystem services; Control of land degradation and soil loss.

Stemming from national development policies, some NbS measures were also identified in the county-level and local development plans of the studied countries.

Table 2: Sub-national and local development plans including NbS approaches and considerations

Name of the policy document	NbS integration	Specific references
Keta Municipal MDTP (2018-2021), Ghana[3]	Medium	Expand forest conservation areas. Protect existing forest reserves. Communication of the importance of wetlands to communities. Promote tree planting and green landscaping in communities.

3.2. Climate regulations, strategies and plans

The reviewed African countries also explicitly integrated NbS into their **international climate commitment**s under the Paris Agreement. **Ghana's updated first NDC** (2021) highlighted NbS "*for forest conservation and landscape restoration*" and foresees the implementation of

[2] Ghana's preceeding *National Medium Term Development Policy Framework for 2018–2021* demonstrated a somewhat higher level of NbS integration by including measures such as restoring degraded forests and water bodies, protecting natural forests and biodiversity hotspots, fully enforcing the buffer zone policy for water resource protection, mapping and assigning conservation status to sensitive wetlands, involving local communities in wetland management, establishing marine protected areas, replanting mangrove forests and other vegetative cover, and promoting tree planting and urban forestry.

[3] The subsequent Medium-Term Development Plans (MTDPs) of Keta Municipality could not be located and were therefore not included in the review.

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the Green Ghana tree planting initiative, *serving as an adaptation measure against the increasing number of extreme weather events in urban areas".* [4]

Specific NbS considerations were also identified in national climate change strategies and plans. The policies that integrate NbS more comprehensively are presented below.

Table 3: Climate change policies, strategies and plans in Ghana, including NbS approaches and considerations

Name of the policy document	NbS integration	Specific references
National Climate Change Policy (2013), Ghana	High	Soil and water conservation; Storm drainage, riverbank protection, buffer zones, and afforestation to reduce flooding; Flood containment channels, reservoirs, and dams; Carbon sink enhancement through afforestation/reforestation, bio-reserves, and forest buffers; Ecological or biological corridors (e.g., CREMAs); Agroforestry for tree conservation; Biodiversity and ecosystem services for climate adaptation; Equitable sharing of natural resources, minimising forest encroachment.
Ghana National Climate Change Master Plan Action Programmes for Implementation: 2015–2020[5]	High	Climate-resilient agriculture and food security systems; Sustainable land management, conservation agriculture, agroforestry; Climate-resilient infrastructure; Afforestation along embankments, desilt waterways for flood prevention; Coastal infrastructure; Rehabilitation of degraded forest landscapes, agroforestry; Management and resilience of terrestrial, aquatic, and marine ecosystems; Funds for ecosystem-based adaptation projects.
National Climate Change and Green Economy Learning Strategy (2016), Ghana	Medium-high	Ecosystem rehabilitation through planting in reserves; Community forestry, land, and water management education via workshops; Training on sustainable land management; Capacity building in climate-resilient urban planning.
Ghana: Roadmap for resilient infrastructure in a changing climate	High	Natural flood adaptation and natural restoration around dams; Catchment-level water management in the Accra plains; Green and riparian vegetation to protect road and rail; Built and natural coastal defence options for Tema Port; Creation of intertidal habitat at Takoradi; Upstream afforestation of the Volta River reservoir; Sponge City measures for urban adaptation.
Ghana's Adaptation Strategy and Action Plan for the Infrastructure Sector (2020)	Medium	Rehabilitate and re-engineer existing water systems (e.g., dams, irrigation, canals, rivers); Barrier islands and coastal wetlands for seawater prevention; Strengthened IWRM capacity, including transboundary cooperation.

Furthermore, the **National Adaptation Plan Framework** (2018) anticipates the adoption of Ecosystem-based Adaptation (EbA) approaches but does not specify particular NbS measures and methods. The **Climate Change Gender Action Plan** (2021) mentions the promotion of climate-smart agricultural practices.

[4] https://unfccc.int/sites/default/files/NDC/2022-06/Ghana%27s%20Updated%20Nationally%20Determined%20Contribution%20to%20the%20UNFCCC_2021.pdf

[5] The National Climate Change Master Plan Action Programmes for Implementation, developed for the 2015–2020 period has not been updated since its initial publication, despite the evolving climate context. The document was included in the multi-level policy analysis, in the absence of an updated plan.

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3.3. Environmental regulations, strategies and plans

The policy review also assessed sectoral policy documents focusing on biodiversity protection, forest management, water and coastal resource management and agriculture. Focusing on different ecosystems, such as forests, freshwater and coastal areas, rangelands, and agricultural and urban areas, various types of management, conservation and restoration actions were identified across the reviewed documents.

The table below highlights key environmental policy documents with a higher level of NbS integration in Ghana.

Table 4: Environmental policy documents in Ghana, including NbS approaches and considerations

Name of Policy	NbS Integration	Specific references
National Environmental Policy, 2012, Ghana	Medium-high	Sustainable land use in agriculture; Conservation of landscapes, ecosystems, and biodiversity; Integration of biodiversity into land use plans; Coastal wetland and watershed protection; Support for IWRM and river basin approach.
Forest and Wildlife Policy, 2012, Ghana	High	Ecological integrity of forests and savannah ecosystems; Establishment of national parks and biological corridors; Sustainable mangrove management; Incentives for public-private-community investment in reforestation; Strategic plan for tackling illegal logging.
Tree Crops Policy, 2012, Ghana	Medium	Conservation and reforestation program; Promotion of agroforestry; Conservation of indigenous tree species; Selective land clearing to preserve key trees; Use of leguminous plants and composting to combat erosion.
Forestry Development Master Plan (2016-2036), Ghana	High	Sustainable management of forests, wetlands and savannah ecosystems; Protected area management; Urban forestry development; Forest plantation development; Climate-smart agriculture; Development of eco-tourism sites.
Ghana's REDD+ Strategy 2016	High	Reduce emissions from deforestation and degradation; Enhance carbon stocks through sustainable forest management and restoration; Preserve forests for ecosystem services, biodiversity, and cultural heritage; Transform agriculture into climate-smart systems.
Ghana Forest Plantation Strategy (2016-2040)	Medium	Trees-on-Farms initiative; Rehabilitation of degraded land; Watershed and mangrove restoration; Biodiversity conservation.
Ghana National Biodiversity Strategy and Action Plan, 2016	High	Enhance ecosystem resilience; Restore 15% of degraded ecosystems; Minimise pressures on coral reefs; Protect wetlands and watersheds; Promote sustainable agriculture, aquaculture, and forestry.
Wildlife Resources Management Act, 2023, Ghana	Medium	Establish protected areas network; Conserve biodiversity and natural landscapes; Protect endangered species; Maintain ecological processes; Integrate conservation into rural development.
National Water Policy, 2024, Ghana	High	Promote NbS in water resource management; Protect freshwater-seawater interactions and wetlands; Ensure water planning considers environmental flows; Establish buffer zones along water bodies; Rainwater harvesting enforcement; Safeguard ecosystems from mining and infrastructure impacts.
Riparian Buffer Zone Policy, 2011, Ghana	High	Protection, restoration, and sustainable management of buffer zones; Research on buffer zones for water conservation; Establish riparian buffer zones; Reduce pollutant loads and promote green spaces in urban areas.

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National Implementation Plan for the Water Convention[6] (2021)	Medium-high	Improve IWRM at the basin level for water security and climate resilience; Implement Water Convention in shared basins and aquifers; Protect and restore degraded riverbanks through buffer zones;
National Integrated Water Resources Management (IWRM) Plan, 2012 and Action Plan for Ghana 2019	Medium	Ensure the protection and conservation of river basins and wetlands for water security, as well as enhance resilience and adaptation to climate change (including tree planting)
Climate-Smart Agriculture and Food Security Action Plan of Ghana (2016-2020)	Medium-High	Develop climate-resilient cropping and livestock systems; Promote agroforestry, dry-land farming, and urban agriculture; Implement soil and water conservation; Strengthen irrigation and watershed management; Promote afforestation along waterway banks.
Keta Lagoon Complex Ramsar Site Management Plan 2023-2032, Ghana	High	Conservation of natural habitats and biodiversity; Protect 121 km² Special Biodiversity Zones; Maintain water circulation between Keta Lagoon, Avu Lagoon, and Volta River; Restore natural habitats.

3.4. Identified trends in NbS approaches and actions

The quantitative analysis of the NbS integration patterns identified in the policy documents reveals varying priorities across ecosystems and thematic areas. Regarding the policy documents reviewed in Ghana, the following trends can be identified:

- **Ecosystems covered:** The studied policy documents placed a more significant focus on freshwater resources (61%), forests (57%), coastal and marine ecosystems (45%), and agricultural areas (39%). Urban areas and grasslands were considered in fewer documents.
- **Identified trends in NbS approaches and actions:** The policy documents have integrated multiple NbS actions, including the protection of natural areas (41%), reforestation and sustainable forest management activities (43%), freshwater resource protection (37%), coastal and marine conservation (35%). Urban green and blue infrastructure development (20%) and anti-desertification, land degradation and soil erosion measures were less frequently included (29%).
- **Level of NbS integration**: 36% of policies integrated NbS approaches more comprehensively. Another 37% integrated NbS at a medium level by including some relevant measures but mainly focusing on specific ecosystems and activities.

3.5. Recommendations for NbS integration

Integrate NbS in high-level and multi-sectoral policies: While NbS is referenced in various national policies, its integration across different sectors could be strengthened. For example, while the Long-Term National Development Plan of Ghana and the National Medium-Term Development Policy Framework (2022-2025) both already include references to some relevant activities, these policies are well placed to more systematically integrate NbS across all relevant sectors, including agriculture, urban planning, and climate-resilient infrastructure development. Updates to local-level development plans, such as for the Keta Municipality, should similarly reflect contemporary NbS priorities and ensure alignment with national strategies and plans.

[6] Convention on the Protection and Use of Transboundary Watercourses and International Lakes

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Strengthen NbS and EbA integration in key environmental and sectoral policy documents: NbS is recognised in various policies, but often not considered as a central approach. Key policies could be revised to explicitly and comprehensively align with NbS principles. The **National Climate Change Policy** (2013) has limited coordination across existing NbS initiatives, such as reforestation, agroforestry, and wetland restoration and could also integrate NbS into urban planning, infrastructure development, climate-resilient agricultural practices and sustainable rangeland management. While the **National Adaptation Plan** has not yet been published, its development offers a timely opportunity to institutionalise NbS as a central component of Ghana's long-term adaptation strategy. Although the **National Water Policy** (2024) acknowledges the role of natural approaches in water resource management, it is not systematically linked to ecosystem-based watershed management, adaptation and DRR/DRM aspects. In addition, several of Ghana's foundational environmental and climate policy documents remain formally valid but appear due for review and potential revision, and their potential update can offer key opportunities to embed NbS more systematically into policy frameworks. The **National Land Policy (1999),** which is currently under revision, already contains important provisions for forest and wetland protection, agroforestry and soil conservation, but would benefit from a more integrated NbS framework. The **National Wetland Conservation Strategy (1999)** also promotes wise use and restoration, but it has not been updated to reflect contemporary wetland conservation practices.

Strengthen the legislative framework for NbS: The current legal framework could be extended to provide clear mandates for NbS implementation. Legal provisions should be updated to provide regulatory backing for NbS adoption, ensuring its integration into environmental laws and land-use planning. For instance, the Land Use and Spatial Planning Act (2016) includes NbS in zoning laws and urban planning regulations, and the National Disaster Management Organisation Act (2016) could require NbS approaches in flood risk reduction and coastal protection. The Environmental Assessment Regulations could also be updated to include requirements for considering NbS approaches during project development.

Integrate NbS into urban planning: Urban expansion in Ghana is accelerating, and NbS incorporation into city planning could be extended. The National Spatial Development Framework could require urban NbS implementation, including green infrastructures, nature-based stormwater management, flood protection and urban gardens. The **Land Use and Spatial Planning Act** (2016) mandates the inclusion of NbS considerations in zoning for urban developments. The **National Environmental Policy** (2012) could include specific urban NbS targets, such as urban tree planting, green corridors, and ecosystem restoration in cities.

Introducing financing strategies and mechanisms for NbS: Most policies and strategies, even if they include NbS or EbA as strategic measures, do not allocate specific implementation budgets to such activities and lack clear financial mechanisms to support large-scale implementation. Establishing a dedicated funding stream can mobilise resources for large-scale NbS investments. In addition, considerations for innovative financial instruments and mechanisms, such as thematic bonds, biodiversity credits, carbon credits, guarantees or

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payment for ecosystem services, could incentivise private sectors/businesses to invest in NbS.

Monitoring frameworks: Establishing NbS-specific indicators and targets, as well as monitoring and reporting mechanisms, can help track progress, assess multiple co-benefits, support stakeholder involvement, and facilitate evidence-based policy adjustments. Strengthening monitoring, research, and data collection can inform evidence-based decision-making; for example, cost-benefit analysis can demonstrate the effectiveness of NBS.

4. Climate services provisioned in policy

The Global Framework for Climate Services (GFCS) of the WMO defines climate services as the "*provision and use of climate data, information, and knowledge to assist decision-making,*" with key components including observations and monitoring, research, modelling and prediction, climate services information systems, user-provider engagement, and capacity development. As such, climate services can be critical in supporting climate risk management, adaptation planning and evidence-based decision-making in various sectors, including DRR/DRM, agriculture and food security, water management, health and energy. [7]

The analysis found that less than half (45%) of the reviewed policy documents in Ghana consider climate services. The level of climate services integration was evaluated according to the following categorisation:

- **High:** Climate services are prominently embedded throughout the document, with clear integration into strategic objectives and implementation frameworks. The document may also explicitly position climate services as central to climate adaptation and risk management.
- **Medium-high:** Climate services are well-integrated and supported by specific policy measures, but with limited cross-sectoral coordination or alignment with broader policy areas such as health, agriculture, or economic planning.
- **Medium:** Climate services are referenced in multiple sections, but treatment is often fragmented or limited to general principles without detailed implementation strategies.
- **Limited:** Climate services are mentioned occasionally, with minimal scope and lacking detail in terms of operationalisation or institutional support.

4.1. High-level, multi-sectoral policies, strategies and plans

In Ghana's high-level and multi-sectoral frameworks, the integration of climate services remains limited or absent. See the table below.

Table 5: High-level and cross-sectoral policy documents in Ghana, including climate services

[7] **World Meteorological Organization (WMO).** (n.d.). *Components of GFCS*. Global Framework for Climate Services. Retrieved February 25, 2025, from https://gfcs.wmo.int/site/global-framework-climate-services-gfcs/components-of-gfcs

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Name of the policy document	Climate services integration	Specific references
Long-term National Development Plan of Ghana (2018-2057)	Medium	Develop a network of people-centred, multi-hazard, multi-sectoral forecasting and early warning systems, including emergency communications, social technologies and hazard-monitoring telecommunications systems.
Medium-term National Development Policy Framework. 2022-2025.[8]	Limited	Strengthening of early warning and response mechanisms for disasters.
Ghana Infrastructure Plan 2018-2047	Medium	Improved quality and access to climate information; Integration of resilience and disaster risk reduction into key national sectors.

4.2. Climate policies, strategies and plans

The updated Nationally Determined Contributions (2021) of Ghana aims to enhance climate services for weather information management and early warning.

The majority of Ghana's climate policy documents also integrate climate services. Identified goals and measures mainly focused on climate data and monitoring and early warning systems and, in some instances, also to improve evidence-based decision-making.

Table 6: Climate policy documents in Ghana incorporating climate services

Name of the policy document	Climate services integration	Specific references
National Climate Change Policy, 2013	Medium-High	Improve climate data access and coordination; Improve climate projections, information systems; and Integrate traditional knowledge.
National Climate Change Master Plan Action Programmes for Implementation: 2015-2020 [9]	High	Improve institutional coordination for climate data; Establish early warning systems and hazard monitoring; Strengthen technical capacities for climate services-related institutions; Research appropriate infrastructure design standards against extreme weather-related natural hazard events; Strengthen climate observation and water databases.
National Climate Change and Green Economy Learning Strategy, 2016	High	Improve hydrometeorological networks; Provide information for detection and early warning systems for weather-related hazards; Establish Climate Information Centres and develop climate-smart tools; Data collection and modelling for coastal flooding.

[8] The preceding National Medium-Term Development Policy Framework (2018-2021) also included provisions for the improvement of hydrological data for water management and the establishment of early warning systems for disaster risk reduction, although these are not directly linked to climate challenges.

[9] The National Climate Change Master Plan Action Programmes for Implementation, developed for the 2015–2020 period has not been updated since its initial publication, despite the evolving climate context. The document was included in the multi-level policy analysis, in the absence of an updated plan.

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Climate Change Gender Action Plan, 2021	Medium-high	Establish community climate information centres and gender-sensitive early warning systems; Increase the availability and access to climate impact data on women and men.
Ghana's Adaptation Strategy and Action Plan for the Infrastructure Sector, 2020	Medium-high	ICT for climate event monitoring, integrating climate risk in energy planning, improving climate data collection, and improving water resource monitoring.

4.3. Environmental policies, strategies and plans

Relevant activities are also included in some of Ghana's sectoral policies, which mainly focus on water resources management, agriculture and DRR/DRM. See the table below.

Table 7: Environmental policy documents in Ghana incorporating climate services

Name of the policy document	Climate services integration	Specific references
National Water Policy (2024), Ghana	High	Enhance hydrological data collection for urban drainage planning; Strengthen early warning systems for floods and droughts; Integrate climate change projections into decision-making; Develop water resources data management system.
National Implementation Plan for the Water Convention[10], Ghana	Medium-high	Develop a central Sector Information System for transboundary water data; Enhance data sharing among riparian states, Support flood forecasting and early warning.
National Integrated Water Resources Management Plan (2012) and Action Plan (2019), Ghana	Medium-high	Improve access to water resource data for planning; Strengthen hydrometeorological monitoring networks; Promote interdisciplinary water research, develop decision-support models, and establish national forecasts for climate change adaptation.
National Climate-Smart Agriculture and Food Security Action Plan of Ghana (2016-2020)	High	Generate meteorological data and disseminate appropriate information to farmers to support climate-smart agricultural practices. Development of relevant database. Generation of seasonal weather data. Build capacity for community-level weather data collection and analysis. Provide reliable weather information for early warning/action.
Ghana Meteorological Agency Act (2004, amended in 2019)	Medium-high	Provide meteorological information and warnings to support agriculture, aviation, transport, hydrology, and energy and water management; Train and conduct research in meteorology; Collect, process, and disseminate meteorological information; Establish and manage air observation networks; Store meteorological data.
National Disaster Management Organisation Act (2016), Ghana	Medium	Collate and preserve disaster data; Analyse and disseminate relevant disaster information to the public; Ensure adequate facilities for establishing early warning systems.

[10] Convention on the Protection and Use of Transboundary Watercourses and International Lakes

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4.4. Identified trends in climate services integration

The policy analysis identified the following trends concerning the integration of climate services in the reviewed policy documents.

- **Types of climate services integrated:** Climate observations, data collection and monitoring (43%) and establishing climate services information systems (37%) are the most frequently included across the policies. The policies also place somewhat more emphasis on decision support (33%), while references to climate research and modelling activities are less frequently mentioned (24%).
- **Sectors addressed by climate services:** Disaster risk reduction (24%) and water (18%) are the most targeted sectors, followed by agriculture and food security (12%). Overall, the sectoral focus is less emphasised, and many documents provide general provisions only.
- **Level of integration:** One-fifth of the policies (20%) demonstrate a higher level of integration of climate services. A further 20% exhibit a moderate level of integration. Approximately 60% do not consider climate services.

4.5. Recommendations for climate services integration

Enhance the integration of climate services into national policy frameworks: Climate services are referenced in several climate policies, but they are not systematically integrated across key sectors such as DRR/DRM, agriculture, health and infrastructure planning. While the National Climate Change Policy (2013) and its subsequent Action Plan for 2015-2020, as well as the updated NDCs (2021), highlighted the role of climate data, the National Environmental Policy (2012) does not explicitly incorporate climate services. Similarly, cross-sectoral policies, such as the Medium-term National Development Policy Framework (2022-2025) and the National Spatial Development Framework (2015-2035), do not establish linkages between climate risk management and sustainable development. To harmonise efforts across sectors, the government could introduce a comprehensive National Climate Services Strategy and require future policy updates to use climate risk assessments and climate projections to support sectoral planning efforts.

Strengthen the provision of climate services in key environmental sectors: Many sectoral policies only include provisions for general environmental monitoring but do not specifically consider climate-related information. This indicates that many policy documents focus on general environmental protection and do not establish links to climate-related risks or integrate hazard-specific considerations. The National Water Policy (2024) is a good example of the structured integration of climate projections into long-term hydrological planning. Other sectoral policies could be further strengthened. The Forest and Wildlife Policy and the Tree Crops Policy could be updated to integrate forest monitoring activities with climate risk assessment and support evidence-based forest conservation and management. The Ghana Infrastructure Plan (2018-2047) could mandate climate vulnerability mapping for Ghana's urban and rural planning processes and integrate climate risk assessments into all major infrastructure planning. Legal frameworks can also be strengthened to require mandatory climate risk integration into planning. For example, the National Disaster

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Management Organisation Act (2016) or the Land Use and Spatial Planning Act (2016) can require integrating climate data in sectoral planning activities.

Improve climate data availability and accessibility: Multiple inclusió recognise data gaps and fragmented climate information. For example, the National Water Policy (2024) and the previous National Medium-Term Development Policy Framework (2018-2021) highlight the lack of inclus to reliable climate projections and data for informed inclusió-making. A centralised inclusió climate data repository could strengthen coordination and data-sharing between agencies such as the Ghana Meteorological Agency, the Water Resources Commission, and the National Disaster Management Organisation. Downscaling of climate models to regional and local levels could be crucial to support municipal adaptation planning, particularly for flood and drought forecasting.

Expand early warning systems: Early warning systems are referenced in multiple policy documents but often focus on specific disasters (e.g. droughts) and do not consider broader climate risks such as heatwaves, landslides or coastal flooding. The NADMO Act (2016) provides early warning systems, but integration with climate projections for anticipatory risk management is limited. The National Medium-Term Development Policy Framework, the Climate Change Policy (2013) or the NADMO Act (2016) could require the introduction of a people-centred, multi-hazard early warning system that covers all major climate risks and also integrates scientific climate forecasts with inclusión16 knowledge and practices. Policies should also support localised early warning systems, particularly for smallholder farmers, inclusión fishers, and informal urban settlements.

5. Gender-sensitive approaches in policies

Gender-sensitive and equity-based approaches are increasingly recognised as essential to effective climate adaptation strategies. Such approaches can significantly reduce vulnerability across critical African sectors, such as inclu, health, food systems, and livelihoods. [11]

The majority of the policy documents studied in Ghana inclusión16e social inclusión considerations, although many of the reviewed documents do not cover all relevant needs.

Regarding **gender mainstreaming**, around 30% of the reviewed policy documents included specific gender-responsive measures. An additional 40% of the documents acknowledged the need to address gender inequality without listing specific actions to address these challenges. The remaining one-third of the reviewed policy documents included limited or no consideration of gender inclusión.

[11] IPCC, 2023: Annex I: Glossary [Reisinger, A., D. Cammarano, A. Fischlin, J.S. Fuglestvedt, G. Hansen, Y. Jung, C. Ludden, V. Masson-Delmotte, R. Matthews, J.B.K Mintenbeck, D.J. Orendain, A. Pirani, E. Poloczanskaa, and J. Romero (eds.)]. In: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, pp. 119-130, doi: 10.59327/IPCC/AR6-9789291691647.002

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Many reviewed documents that integrated gender-responsive measures were cross-sectoral policies, strategies and plans, including the Long-term National Development Plan of Ghana (2018-2057), Medium-term National Development Policy Framework (2022-2025) and the Ghana Infrastructure Plan 2018-2047. Integration is also relatively strong in climate policies, but more limited in sectoral environmental policy documents. The table below provides an overview of identified climate and environmental policies with more comprehensive gender inclusion measures in Ghana.

Table 8: Gender-responsive approaches in the climate and environmental policy documents of Ghana

Title of Policy	Specific references
National Climate Change Policy (2013), Ghana	Promote equal opportunities and affirmative action for women in climate change adaptation and mitigation. Gender-responsive climate change research, budget allocation, and disaster risk reduction.
Ghana's Adaptation Strategy and Action Plan for the Infrastructure Sector (2020)	Gender-responsive adaptation strategies to address climate change threats. Women, the elderly, and the disabled should be involved in planning.
National Climate Change and Green Economy Learning Strategy (2016), Ghana	Generate gender-specific data. Mainstream gender into climate change policy formulation. Promote effective and equal participation of men and women in decision-making.
Climate Change Gender Action Plan (2021), Ghana	Facilitate integrating gender considerations into policies, programmes, and strategies related to climate change.
National Water Policy, 2024, Ghana	Improving equity, gender, and social inclusiveness. Ensuring equitable access to water resources for women and other vulnerable groups.
National Energy Policy (2021)	Policy Objective: To promote gender equality and equity across the energy sector.

5.1. Recommendations for improving the inclusion of gender considerations

Update sectoral environmental policies to strengthen gender considerations: Several sectoral environmental policies and strategies could be revised to incorporate gender-responsive policy goals, targets, and measures. These include, for instance, the Environmental Policy (2012), Forest and Wildlife Policy (2012), Environmental Sanitation Policy (2010), as well as key strategic frameworks such as the REDD+ Strategy (2016), the National Biodiversity Strategy and Action Plan (2016) and the Forestry Development Master Plan (2016–2036). A comprehensive gender-environment framework can also support policy efforts to systematically link women's empowerment to biodiversity conservation, ecosystem restoration, and sustainable land management.

Strengthen gender mainstreaming in climate policies: The National Climate Change Policy (2013) and the National Climate Change Master Plan Action Programmes (2015–2020) incorporate gender-sensitive approaches in climate action. However, they could be strengthened by including detailed sector-specific measures and targets. The National Adaptation Plan (NAP) Framework, currently under development, also presents an opportunity to introduce concrete measures and clearly defined targets for gender-responsive adaptation. The Climate Change Gender Action Plan, which was designed to support the integration of gender considerations into climate-related policies, programmes, and strategies, may serve

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as a foundational instrument for updating other climate policy documents with gender-specific components.

Enhance gender inclusion in climate services: While Ghana's climate policies generally integrate gender-sensitive approaches, documents specifically addressing climate services lack gender integration. For example, gender-sensitive early warning systems could be tailored to the needs of women in rural areas or informal settlements. Including climate advisory services or capacity-building for women in agriculture, forestry, and water management policies can also improve climate resilience. Additionally, increasing women's participation in climate sciences, disaster preparedness, response, and recovery will be important. For instance, the National Disaster Management Organisation Act (2016) could also integrate gender-sensitive DRR/DRM measures.

Link economic opportunities and livelihoods to NbS approaches: Policies could promote green job opportunities in climate-resilience agriculture and nature conservation. For example, the National Climate-Smart Agriculture and Food Security Action Plan (2016-2020) could be updated to prioritise women's access to training, finance, and markets. The REDD+ Strategy (2016) could be revised to establish gender-responsive measures promoting women's participation in agroforestry, conservation incentives, and eco-tourism enterprises.

Expanding the national climate and environment policy framework with subnational gender inclusion components: The Climate Change Gender Action Plan could be updated to support subnational policy integration. Subnational environmental and climate strategies should also align with national gender mainstreaming goals and could develop gender-sensitive implementation plans for climate resilience, biodiversity conservation, and natural resources management.

6. Indigenous knowledge and local knowledge in policies

Around 55% of reviewed policy documents from Ghana include specific provisions for integrating IKLK, either comprehensively or partially. The remaining documents include limited considerations or do not mention IKLK.

Some high-level, multi-sectoral policy documents, such as the Long-term National Development Plan (2018-2057) and the Agenda for Jobs II (2022-2025), acknowledge the importance of IKLK, but lack detailed implementation measures. Sectoral policies refer to IKLK primarily in the context of climate change adaptation, sustainable agriculture, natural resource management, and disaster risk reduction. Promoted approaches include the documentation of IKLK, its integration with scientific knowledge, and, to a lesser extent, the enhancement of capacity-building and inclusion in formal governance structures.

6.1. Recommendations for IKLK integration

Strengthen implementation mechanisms for IKLK: Although references to IKLK are present in key policies related to climate adaptation, biodiversity, forestry, and water resource

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management, these documents often lack actionable provisions and clear implementation pathways. To address this, policies such as the National Environmental Policy (2012), the Forest and Wildlife Policy (2012), and the National Biodiversity Strategy and Action Plan (2016) could be revised to include specific mechanisms for operationalising IKLK considerations. Establishing a national repository of indigenous practices could also support cross-sectoral integration.

Broaden the application of IKLK beyond current domains: Existing forest and water management strategies, including the Forestry Development Master Plan (2016–2036), the REDD+ Strategy (2016), and the Riparian Buffer Zone Policy (2011), or the National Integrated Water Resources Management (IWRM) Plans (2012 and 2019), offer opportunities to incorporate or expand IKLK integration.

Embed IKLK within legal and regulatory frameworks: Legislative instruments such as the Meteorological Act (2004, amended in 2019) and the National Disaster Management Organisation Act (2016) could be updated to integrate traditional weather forecasting methods, indigenous risk indicators, and local hazard response mechanisms into formal early warning systems. Similarly, the Water Resources Commission Act (1996) and the Forest Protection Decree (2002) could include formal provisions to recognise, safeguard, and utilise IKLK in water and forest management.

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