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Ghana Climate Change Policy Brief

COASTAL SYSTEMS

Introduction

Ghana's long (550 kilometers) and densely populated coastline is home to 25 percent of the country's population and several of its most prominent cities and tourist areas, including the capital, Accra, as well as Cape Coast and Takoradi. Though smaller in population than these urban areas, several small villages along the coast constitute a significant proportion of the coastal population. Much of the country's critical infrastructure is situated along the coast as well, including harbors, thermal plants, roads, and oil and gas facilities, as well as cultural heritage sites and state monuments, such as forts and castles. Coastal ecosystems, meanwhile, support the livelihoods of millions of inhabitants principally through fishing and fish processing activities, which contribute at least 4.5 percent to Ghana's GDP.[1] In addition, coastal wetlands and vegetation, including mangrove forests, serve habitats for important biodiversity and sequester large amounts of greenhouse gas emissions.

Ghana's coast is already experiencing the impacts of climate change, which threaten to erode the social, economic, and environmental benefits that coastal systems[2] deliver. While tidal floods and coastal erosion have been a challenge for several decades, climate-induced sea-level rise has increased their frequency, intensity, and impact over the past 10 years. For example, the eastern part of the coast, considered to be the most vulnerable to climatic changes, has experienced two devastating tidal floods in the past year alone (Nov. 2021, Apr. 2022). The floods left more than 3,000 people homeless and damaged educational and sanitation facilities. In other cases, whole communities (e.g., Fuveme) have been washed away by tidal floods over time. Those who remain find their livelihoods at risk due to low fish catch. With the sea level projected to rise 20 cm by 2050,[3] coastal systems are expected to be further degraded. To address these impacts, Ghana must identify and pursue multiple adaptation strategies that can increase the resilience of coastal inhabitants and systems to climate change.

This policy brief on Ghana's coastal systems—part of a broader climate change assessment—details: (i) the impacts of climate change on the systems, (ii) the constraints to addressing these impacts, and (iii) recommended interventions to reduce these impacts and deliver a climate-resilient coastal zone in the future.

Climate Change Assessment

This policy brief on coastal systems is part of the Ghana Policy LINK Activity's broader climate change assessment, which focused on six key areas—agriculture, water, energy, forest, coastal systems, and climate finance. The assessment methodology included a literature review as well as inclusive stakeholder consultations through interviews, focus group discussions, and sector workshops in Tamale and Accra. The Ghana Policy LINK Activity consulted 43 institutions and groups, including USAID and its implementing partners, other development partners, the Government of Ghana, academia, civil society organizations, farmer groups, the private sector, and the media.

Climate Change Impacts on Ghana's Coastal Systems

Ghana's coastal systems have been significantly affected by climatic changes, including altered rainfall and temperature patterns, sea

1 http://rhody.crc.uri.edu/gfa/wp-content/uploads/sites/10/2018/04/Ghana-Fisheries-and-Aquaculture-Sector-Development-Plan-2011-2016.pdf

2 Refers collectively to all coastal resources including fisheries, mangroves, environmental tourism, and cultural heritage sites.

3 Röhrig, F., Lange, S., Aschenbrenner, P., Chemura, A., Gornott, C., Murken, L., Grams, E., Klockemann, L., Romanato, E. and Haider, J., 2019. Climate Risk Profile: Ghana.

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level rise, and associated tidal floods and erosion. The assessment identified the following six categories of climate change impacts:

Declining wild catch fisheries. Changes in rainfall and temperature patterns (sea-level rise and high waves) are affecting the fishing industry in numerous ways, including by making fishing riskier, causing fluctuations in fish stocks and distribution, shortening the fishing season, and leading to high rates of fish spoilage and mortality.[4] These impacts affect not only fisherfolk (in terms of productivity and income) but also other actors in the value chain, including fish marketers and processors (e.g., fish smoking), most of whom are women. Reduced productivity also leads to higher prices for consumers, with impact on their nutrition. These adverse impacts on coastal systems are expected to increase in the future as the changes in climatic variables worsen.

Reduced tourism. The increasing incidence of tidal floods and coastal erosion due to rising sea levels is negatively affecting tourism infrastructure, including monuments, boat fleets, and hotels situated along the coast. Studies conducted a decade ago found that 31 percent of tourism installations along Ghana's coast could not withstand hazards associated with rising sea levels.[5] Apart from the susceptibility of this infrastructure to tidal floods and erosion, the pursuit of hard engineering solutions such as sea defense walls, *groynes* (low walls or sturdy barriers that prevent erosion and drifting), and revetments (retaining walls) cause the loss of beaches and/or restrict access to important tourist sites. As a result, the number of visitors is declining, which will lead to financial losses for facilities and jeopardize the livelihoods of nearby communities.

Wetland and biodiversity loss. Changing rainfall and temperature patterns affect coastal wetlands by altering habitats, which, in turn, affects species richness and distribution. Other climate change impacts, such as ocean warming and the salinization of freshwater habitats, can also cause species migration and extinction. These changes are having a debilitating effect on biodiversity, which is especially problematic in the coastal wetlands, which are home to a wide variety of endangered species. The Keta Lagoon Complex Ramsar Site, for example, is home to threatened species such as the olive ridley sea turtle (*Lepidochelys olivacea*), leatherback turtle (*Dermochelys coriacea*), the green turtle (*Chelonia mydas*), and the sitatunga (*Tragelaphus spekii gratus*), the only aquatic antelope in the world. Wetlands are being further degraded as a result of climate change impacts on the livelihoods of coastal communities (e.g., fishing and mangrove harvesting), which have led to the unsustainable exploitation of coastal resources.

Infrastructural damage. Meeting the social and economic needs of Ghana's many coastal inhabitants requires significant educational, health, sanitation, transportation, and energy infrastructure. Unfortunately, this infrastructure is under threat from tidal floods associated with sea level rise and extreme rainfall events. Damaged infrastructure can cause a host of problems. The destruction of health facilities can trigger disease epidemics, for example. Damage to thermal plants can lead to energy crises, while the disruption of road networks can cause supply chain issues and lead to food insecurity. Floods can also pollute water sources, reducing the availability of clean water. Vulnerable populations—many of whom live along the coast due to land insecurity—are disproportionately at risk. These impacts are expected to worsen in the coming years as the sea level rises and rainfall and temperature patterns continue to change.

Declining crop productivity due to saltwater intrusion. Sea-level rise can also cause saltwater intrusion, which could render some agricultural land less productive and unusable. In addition, the increased demand for water for irrigation (due to high temperatures and heat stress) cannot be met solely by groundwater pumping in coastal areas. Excessive pumping of groundwater along the coast lowers the groundwater table, causing seawater to rise above the freshwater. Uncontrolled groundwater exploitation for dry season cultivation in the Anloga-Keta area of the coast, for example, has already resulted in saline water intrusion, which is threatening agricultural productivity and, subsequently, food security.

Reduced viability of coastal livelihoods. Ghana's coastal inhabitants rely on nearby natural resources for their livelihoods, including fishing, crop production, and mangrove harvesting; many are also employed by coastal enterprises, such as thermal plants, tourism companies, and maritime traders. The livelihood options available to coastal inhabitants, however, are increasingly restricted, as climate change impacts reduce crop yields and the amount of arable land available (due to salinization) and lead to overfishing and the exploitation of mangroves. This trend is expected to accelerate, leaving coastal residents with fewer viable, sustainable livelihood choices and putting added pressure on the few remaining coastal resources (e.g., fish and mangrove wood) for economic survival.

4 Akaba, S. and Akuamoah-Boateng, S., 2018. An evaluation of climate change effects on fishermen and adaption strategies in central region, Ghana. In *Climate Change Impacts and Adaptation Strategies for Coastal Communities* (pp. 133-147). Springer, Cham.

5 Sagoe-Addy, K. and Appeaning Addo, K., 2013. Effect of predicted sea level rise on tourism facilities along Ghana's Accra coast. *Journal of coastal conservation*, *17*(1), pp.155-166.

Unfortunately, unsustainable harvesting and degradation of coastal vegetation also harm the ability of coastal ecosystems to serve as protective barriers against erosion, storm surge, and tidal flooding, which further puts coastal populations at risk.

Constraints to Addressing Climate Change Impacts on Coastal Systems

The assessment identified the following constraints to addressing climate change impacts on coastal systems:

Absence of a dedicated coastal zone policy. The responsibility for managing coastal resources is spread across various ministries and sectors. As a result, Ghana lacks a dedicated policy (e.g., an integrated coastal zone management [ICZM] plan) that considers the coastal zone as an integrated system and clarifies roles and responsibilities. The absence of a clear policy framework has resulted in fragmented policies and activities that fail to address coastal issues (e.g., fisheries, wetlands, biodiversity, tourism, etc.) holistically. The result is missed opportunities for climate mitigation and adaptation activities. Even sector-based policies and plans that touch on coastal issues have not sufficiently mainstreamed or integrated climate change and biodiversity. Furthermore, Ghana lacks a legal framework to guide the formulation and implementation of interventions to reduce climate change's impacts on the coastal sector.

Inadequate monitoring infrastructure. To design effective interventions to combat climate change, Ghana needs accurate and timely information. Unfortunately, the infrastructure to collect these data (e.g., tidal gauges, weather stations, groundwater monitoring stations) is non-existent or inadequate in Ghana's coastal areas. The use of state-of-the-art technology such as unmanned aerial vehicles (UAVs) and high-resolution, remotely sensed satellite data for monitoring coastal systems (e.g., vegetation changes, illegal activities) is also limited. Inadequate infrastructure and, subsequently, poor data make climate change impact assessment and modeling efforts less accurate.

Limited awareness and engagement. Coastal residents have limited awareness of the cause and impacts of climate change, how its impacts are exacerbated by their actions (e.g., unsustainable exploitation of mangroves), or how the sustainable management of coastal resources can ameliorate these impacts. Education on coastal zone policies, laws, and regulations is also limited. Failure to involve community members in designing climate change interventions was also identified as a constraint. The resulting lack of ownership of projects and interventions is evident in apathy and poor cooperation from community members and other local actors.

Limited coordination across government ministries. Combatting the effects of climate change on Ghana's complex coastal system requires cooperation across multiple ministries, departments, and agencies, including the Ministries of (i) Fisheries and Aquaculture Development (MoFAD), (ii) Lands and Natural Resources (MLNR), (iii) Sanitation and Water Resources (MSWR), (iv) Environment, Science, Technology, and Innovation (MESTI), and (v) Tourism, Arts, and Culture (MoTAC). Unfortunately, mandates on coastal management often overlap. For example, when it comes to managing coastal wetlands, there are overlaps between the mandates of the Forestry Commission (MLNR), the Water Resource Commission (under MSWR), and the Fisheries Commission (MoFAD). Moreover, coordination is poor, including on data collection and sharing. While Ghana does have a Coastal Development Authority, its mandate is limited to planning and implementing development projects to reduce poverty along the coast; it does not have an explicit mandate to coordinate with others working in the coastal zone.

Coastal residents have limited awareness of the cause and impacts of climate change, how its impacts are exacerbated by their actions, and how the sustainable management of coastal resources can ameliorate these impacts.

Limited enforcement capacity. The enforcement of coastal management regulations is constrained by limited technical and human capacity. Understaffed ministries and departments are often unable to deploy staff to ensure compliance with regulations. There's also limited technical capacity and resources to adopt and deploy state-of-the-art data and technology (e.g., UAVs, remote sensing/GIS, modeling, etc.) for monitoring coastal processes and managing resources.

Recommended Interventions

The following recommended interventions can help reduce the impact of climate change and variability on coastal systems, making the coastal zone more resilient in the future:

Develop a dedicated coastal zone policy. Stakeholders recommended developing a dedicated coastal zone policy that considers the coast as an integrated system, promotes policy coherence and coordination across line ministries, and incorporates the perspectives of the government, academia, development partners, the private sector, nongovernmental organizations (NGOs), civil society organizations (CSOs), and coastal communities (including vulnerable populations). By using ICZM, stakeholders can create an enabling environment (including incentives and a legal and regulatory framework) for sustainable livelihoods and coastal systems management. The policy should also delineate and streamline mandates of the various ministries, departments, agencies, and authorities involved in coastal management. Further, this policy should give directions on mainstreaming climate change and variability into critical investments to monitor, manage, coordinate, and enforce regulations needed for the sustainability of coastal systems.

Improve coordination. Stakeholders recommended strengthening coordination between coastal management stakeholders to avoid duplication and maximize the complementarity of efforts, including in data collection, monitoring, and enforcement. Improved coordination is needed between state actors (i.e., ministries, departments,

agencies, authorities), as well as between state and non-state actors (i.e., private sector, CSOs/NGOs, community members). Specifically, stakeholders suggested selecting a lead ministry to oversee the implementation of the dedicated coastal policy and coordination among stakeholders.

Strengthen capacity. Stakeholders stressed the need to strengthen institutional capacity to implement sectoral activities related to coastal management. Recommendations included: (i) hiring new staff at key ministries and building staff capacity in monitoring and enforcement, especially at the sub-national and community levels, (ii) improving the technical capacity of institutions to adopt and deploy state-of-the-art technology for coastal management, (iii) strengthening extension service delivery, especially in fisheries and aquaculture, and (iv) promoting community awareness of causes of climate change and how to adapt to its impacts (e.g., support community members as they pursue more sustainable alternative livelihoods). In addition, strong collaboration with the research and academic community is needed to strengthen the capacity of state institutions in modeling and climate change impact assessments (e.g., climate change impact on biodiversity).

Invest in infrastructure. Stakeholders recommended investing in data collection, monitoring, and protection infrastructure to reduce climate change impacts and increase the resilience of coastal communities. For data collection and monitoring, stakeholders mentioned adding a tidal gauge on the eastern part of the coast to improve tidal monitoring and support the development of early warning systems to alert coastal communities of tidal floods. Groundwater monitoring infrastructure is also required to track extractions and identify potential saline water intrusion. In addition, any proposed infrastructure (e.g., harbors, ports, health, and energy facilities) should consider vulnerabilities to and potential impacts of climate change. Coastal businesses should incorporate climate change considerations into their business continuity plans.

Raise awareness and increase engagement. Stakeholders recommended raising awareness of the causes and impacts of climate change and how unsustainable resource exploitation can exacerbate these impacts on socio-ecological systems. Education, sensitization, and outreach efforts should use various platforms (e.g., electronic media) to maximize reach. Increased awareness of existing policies, regulations, and laws on sustainable coastal management is also needed, as it would help reduce the number of violations. Stakeholders also recommended engaging community members in designing and developing adaptation strategies, especially when it comes to integrating indigenous knowledge and practices.

Promote hybrid solutions. To date, the Government of Ghana has focused predominantly on hard engineering solutions to coastal erosion (such as sea defense walls). While these structures are effective in and around specific locations, they have been found to cause more erosion downdrift.[6] As such, stakeholders recommended interventions blending hard and soft solutions to reduce coastal erosion with little or no environmental impacts on other localities. Soft engineering approaches include beach nourishment (transporting sand/sediments to fill areas along the coast that have lost sand due to erosion) and nature-based solutions (e.g., cultivation of mangroves and increasing wetland extent for flood control, etc.).

Restore landscapes. Stakeholders emphasized the need for interventions to restore degraded coastal landscapes and enable the conservation of critical biodiversity and coastal vegetation. Ideas included mangrove restoration through afforestation and reforestation and wetland expansion for flood control. These interventions help restore coastal landscapes and are important tools for ecosystem-based adaptation, which has proved more cost-effective than hard engineering solutions in many cases.

6 Alves, B., Angnuureng, D.B., Morand, P. and Almar, R., 2020. A review on coastal erosion and flooding risks and best management practices in West Africa: what has been done and should be done. *Journal of Coastal Conservation*, *24*(3), pp.1-22.