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Ghana Climate Change Policy Brief

WATER SECTOR

Introduction

Ghana has abundant water resources. The total volume of freshwater withdrawn by major economic sectors is only 6.3 percent of its total resource endowment—lower than the water stress benchmark.[1] Most of the country is covered by the Volta River Basin, which includes the Black, White, Oti, and Lower Volta Rivers. This basin is critical to hydroelectric generation, agriculture, and fisheries. The water available for hydropower generation and agriculture, however, is vulnerable to drought; it also depends on upper basin dam releases and abstractions in Burkina Faso. Access to groundwater resources—which are used extensively for drinking water and domestic use in rural areas, especially in northern Ghana—is more limited. For example, limited development of and access to aquifers limits their viability for large-scale agriculture, municipal, and industrial use. In addition, saltwater intrusion in coastal aquifers undermines groundwater quality for agriculture and urban uses in the coastal zone.

Climate change threatens Ghana's water availability, quantity, timing, and quality. Rising temperatures, for example, lead to high evaporative losses, which reduce the amount of available water. Vulnerable populations in northern Ghana, which experiences single-peak (unimodal) rainfall distribution, are particularly impacted by this phenomenon. Evaporation losses of up to 70 percent frequently—and quickly—deplete water stored in small reservoirs and dams for use in the dry season for domestic, livestock, and irrigation purposes. The increasing frequency and severity of weather events, such as intense rains, floods, and droughts also affect water availability, distribution, and usability. These climate-induced impacts compound related challenges, such as rapid urbanization, the conversion of natural areas to industrial and agricultural uses, and unsustainable resource extraction practices, such as gold mining, which is already polluting waterways in major river basins in southern Ghana.

Models indicate climate change impacts on water availability and quality will worsen significantly over the next 30 years. Stream flows of major rivers such as the White Volta and Pra, for example, are projected to decline by 50 percent and 46 percent, respectively, by 2050 due to climatic changes.[2] Given water's importance to human health, agriculture, and energy, Ghana must take immediate action to identify and invest in climate-resilient interventions that can reduce potential impacts on socio-ecological systems and help the country realize global water security targets (Sustainable Development Goal 6).

This policy brief on the water sector—part of a broader climate change assessment—details: (i) the impacts of climate change on

Climate Change Assessment

This policy brief on the water sector 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. The policy briefs will be used to further engage stakeholders to prioritize transformative actions to achieve a climate resilient future.

1 https://www.wathi.org/ghana-water-resources-profile-usaid-swp-august-2021/.

2 Kankam-Yeboah, K., Obuobie, E., Amisigo, B. and Opoku-Ankomah, Y., 2013. Impact of climate change on streamflow in selected river basins in Ghana. *Hydrological Sciences Journal, 58*(4), pp.773-788.

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the sector, (ii) the constraints to addressing these impacts, and (iii) recommended interventions to reduce these impacts and deliver a climate-resilient water sector in the future.

Climate Change Impacts on the Water Sector

The water sector is already experiencing significant impacts as a result of climatic changes. Models predict these impacts will only worsen in the future, as described below.

High evaporation rates. High evaporation rates cause the loss of surface water from reservoirs, rivers, and streams, reducing the overall availability of water. Increased evaporation rates are due primarily to high temperatures, which are estimated to have risen one degree Celsius in northern Ghana between 1960 and 2000.[3] The country's highest evaporation rates are in northern Ghana, which also has higher temperatures. Higher temperatures have the double impact of reducing water supply while simultaneously increasing water demand. Warmer weather increases the demand for water for domestic consumption (e.g., drinking water) and agriculture (e.g., irrigation, water for livestock). Climate models project rising temperatures across the country, which will further increase evaporation rates.

Infrastructure damage. Water, sanitation, and hygiene (WASH) infrastructure, including water treatment plants and toilet facilities, is under increasing threat from extreme rainfall events such as floods. These events damage infrastructure and leave vulnerable populations without basic water and sanitation services. When the Akim Oda water treatment plant (Eastern Region) flooded in 2020, for example, the water supply was disrupted for several weeks. With extreme weather events expected to increase in frequency and severity in the future, the impact on WASH infrastructure will be even greater.

Water pollution. The increasing incidence of extreme weather events arising from climatic changes (e.g., floods) makes surface water more susceptible to contamination. Floods wash sand, plastics, household items, fecal matter, and chemicals such as pesticides and herbicides into surface water and other water sources, rendering them unfit for human consumption. Contamination also negatively impacts habitats for biodiversity, such as fisheries, which are critical for livelihoods. In addition, as climate change reduces the productivity of agriculture, people resort to alternative sources of income such as illegal gold mining, which is further polluting water resources. Increased contamination raises water treatment costs, reducing the availability and affordability of water for critical uses such as domestic consumption and agriculture.

Competition and conflict over resource use. Declining freshwater resources—caused by high temperatures (evaporation) and pollution—coupled with rising demand for water often leads to resource use conflicts between countries that share common resources, such as the Volta River that runs through Ghana and Burkina Faso. Conflicts over water resources also occur at the local level (e.g., between upstream and downstream communities

that compete over water for irrigation, industrial, and other uses). Water scarcity from climate change will intensify existing water use conflicts arising from increased water demand due to population growth, as well as rising food production, industrialization, and hydropower generation. In addition, urbanization and internal migration resulting from climate change have increased water pollution and wastewater generation, further reducing the availability of usable water.

Increased sedimentation. In semi-arid regions such as northern Ghana, small reservoirs (dams) are often the only sources of water during the dry season. Unfortunately, the storage capacity of these structures is decreasing due to high levels of sedimentation. Flash floods—which are expected to worsen given the changing climate—wash sediment and sand into reservoirs, where it settles, reducing water depth and storage capacity. Recent studies found storage capacity losses of up to 34 percent due to sedimentation.[4] Sedimentation is also a problem in river channels, including major rivers such as the White and Black Volta.

Shrinking wetlands. Wetlands are home to fish as well as animal and plant species that are important for food, nutrition, shelter, and nature-based tourism. As critical spaces for flood attenuation, wetlands can also reduce flooding in populated areas. But erratic and irregularly distributed rainfall is changing the timing and volume of peak water flows in wetlands. At the same time, low rainfall volumes cause droughts and deprive wetlands of the needed water resources. Both situations affect the functioning and sustainability of wetlands for ecosystem service delivery and protection of biodiversity. Moreover, urban wetlands are under increasing threat as climate change-induced migration forces more people into cities, increasing urban sprawl, including into nearby wetlands.[5]

Threats to health and sanitation. The increasing incidence of extreme weather events—such as heavy rains and floods—will result in more standing water, which contributes to more waterborne dis-

3 https://link.springer.com/article/10.1007/s42452-020-3095-3.

4 Adongo, T.A., Kyei-Baffour, N., Abagale, F.K. and Agyare, W.A., 2020. Assessment of reservoir sedimentation of irrigation dams in northern Ghana. *Lake and Reservoir Management, 36*(1), pp.87-105.

5 Cobbinah, P.B., Korah, P.I., Bardoe, J.B., Darkwah, R.M. and Nunbogu, A.M., 2022. Contested urban spaces in unplanned urbanization: *Wetlands under siege. Cities, 121*, p.103489.

eases such as malaria, diarrhea, and dengue fever.[6] In addition, studies have shown an increasing incidence of cerebrospinal meningitis epidemics resulting from higher temperatures and associated heat stress, especially in warm environments.[7] Finally, climate-induced water shortages are expected to decrease access to sanitation and lead to deteriorating hygiene in vulnerable populations.

Constraints to Addressing Climate Change Impacts in the Water Sector

The assessment highlighted several constraints to addressing climate change in the water sector. These are categorized into four main areas, as described below.

Outdated policies. Sectoral policies and plans do not sufficiently address climate change impacts on water resources in terms of offering guidance on appropriate technologies, infrastructure requirements, or water management practices. The Water Policy of 2007, for example, provides little direction on developing and using unconventional water resources[8] through the adoption of climate-smart technologies. Similarly, the National Irrigation Policy of 2011 offers little guidance on the water conservation technologies and practices needed to promote efficient water use.

Inadequate measurement and monitoring infrastructure. More frequent and severe weather events, as well as rising water demand, must be considered in planning, monitoring, and decision-making on water resource allocation, usage, and pricing. Good data are needed for sound planning and decision-making, as well as for seasonal monitoring and accurate climate modeling. Unfortunately, the sector's data collection and monitoring systems are weak, which complicates efforts to develop strategies to combat climate change impacts. For example, Ghana has only 22 synoptic stations to measure rainfall and only two of the three required coastal measurement stations to monitor sea level rise and deterioration of the coastline. Improving this measurement and monitoring infrastructure (e.g., to measure water availability and use, rainfall, groundwater usage, river discharges, irritation water releases) is required to make evidence-based decisions.

Limited capacity. Urbanization and unsustainable resource use are increasing the pollution of water sources (wastewater), even as high evaporation rates and erratic rainfall patterns reduce water availability. Although innovative technologies to treat and reuse polluted resources (e.g., wastewater treatment for aquaculture) are available, the technical capacity to adopt these technologies at scale is limited. Similarly, technologies to increase water use efficiency and save water need to be widely adopted. This represents an opportunity for youth, who, by adopting these technologies can address climate change risks while creating employment and business opportunities. Furthermore, limited capacity in water resource modeling (including future availability and demand), impact assessment, and early warning system development results in poor resource planning and decision-making.

Limited awareness, engagement, and coordination. Limited awareness of policies, plans, and strategies, especially at the sub-national level, hinders the effective implementation of increasingly important water sector activities. Awareness is limited, in part, because local actors are not fully engaged in policy formulation and implementation, water governance, or the development of water-efficient or water-conservation technologies. Limited engagement also means indigenous knowledge is not incorporated into policies, plans, or strategies. In addition, coordination among water actors from different stakeholder groups at the national and sub-national levels is weak, especially during intervention design, which leads to policy implementation challenges.

Recommended Interventions

Stakeholders recommended several interventions to reduce the impact of climate change and variability on water resources and achieve a climate-resilient future. The interventions are categorized into five areas:

Conduct policy reviews. Stakeholders recommended reviewing the Water Policy (2007) and the National Irrigation Policy (2011), among others, as a first step in making the water sector more climate resilient. Revisions to the policies should promote the adoption of climate-smart technologies (e.g., to develop unconventional water resources) and water efficiency practices across sectors. Policies should offer guidance on mainstreaming climate change in water infrastructure planning, design, and budgeting. They should

6 Suhr, F. and Steinert, J.I., 2022. Epidemiology of floods in sub-Saharan Africa: a systematic review of health outcomes. BMC public health, 22(1), pp.1-15.

7 Akanwake, J.B., Atinga, R.A. and Boafo, Y.A., 2022. *Effect of climate change on cerebrospinal meningitis morbidities and mortalities: A longitudinal and community-based study in Ghana. PLOS Climate, 1*(8), p.e0000067.

8 These technologies include the byproducts of specialized processes such as desalination; pre-use treatment (recycling); pertinent on-farm management when used for irrigation; and special technology to collect/access water (e.g., rainwater harvesting).

also emphasize the decentralization of governance structures and encourage grassroots participation in water management, especially at the local level.

Improve water sector coordination. Stakeholders stressed the need to improve coordination among national and subnational actors on water sector activities. For example, stronger coordination between the research and practice communities (e.g., industry, entrepreneurs, etc.) is needed to develop and apply climate-smart water technologies. Greater coordination is needed not only among water sector stakeholders but also among all stakeholder groups, including government, research, academia, civil society organizations, the private sector, and vulnerable groups (e.g., women and youth). Greater inclusivity in water sector decision-making is important given the multi-sectoral nature of water use; it also enables Ghana to leverage and make effective use of a wider range of skills and resources to address the sector's challenges.

Strengthen capacity. Stakeholders recommended enhancing the capacity of (i) vulnerable groups (e.g., farmers, youth, and women) to develop and adopt climate-smart water conservation and reuse technologies, (ii) water sector stakeholders to improve water resource modeling and early warning systems for effective planning, monitoring, and allocation of water resources, and (iii) local actors, including metropolitan, municipal, and district assemblies and unit committees, to improve the implementation of water sector policies at the sub-national level.

Improve existing infrastructure. Stakeholders stressed that making the water sector climate resilient will require improvements to both monitoring and water capture/storage infrastructure. Investments in monitoring infrastructure such as meteorological stations, streamflow gauges, groundwater monitoring stations, and tidal gauges will enable data-driven decision-making. At the same time, developing multi-purpose water storage infrastructure (e.g., multi-purpose dams), irrigation systems, and hydropower can increase access to water for all Ghanaians, including vulnerable populations, and make the water sector more climate resilient. Climate change considerations should also be integrated into the design, planning, and budgeting of any new water infrastructure.

Increase awareness, engagement, and education. Stakeholders said that increased awareness of water sector policies, strategies, and plans, especially at the sub-national level, is an important part of making the water sector more resilient. Engaging local actors in policy formulation and implementation is the surest way to promote awareness, engender ownership and agency, and encourage the adoption of appropriate technology and practices. Furthermore, local actors are best placed to integrate indigenous knowledge with climate-smart best practices (e.g., climate-smart water technologies). In addition, schools play a key role in raising awareness of the value of water resources and integrated water management, climate-smart water technologies, and efficient water conservation practices. Schools can also encourage inter-school competitions on innovative water management technologies.