

Adapting Together, Thriving Tomorrow



Enabling Environment for Private Sector Investment in Climate Change Adaptation in Ghana

Report of Private Sector Mapping and Assessment



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1. Background

The private sector is increasingly being engaged in climate finance and climate-related activities around the world and this is essentially because of a heightened international interest in the role of the private sector, as a non-state actor, in climate actions and finance. Even as talks of such engagements are on the rise, the evidence of private-sector engagement in climate actions and particularly in adaptation planning is very limited. For the most part, such engagements are grounded on large international companies domiciled in developed marketⁱ rather than the activities of small-to medium-sized enterprises (SMEs) in developing countries.

The situation is even more serious in Africa where the private sector, for the most part, is yet to come to terms with the reality of climate change and what associated impacts mean to their business operations and opportunities. Discussions to date have focused largely on the public sector's role in adaptation, with the private sector viewed primarily as a source of funding or financing when need be. While those discussions have continued, there has been a recent shift in discourse which points to the potential and capacity of the private sector to mobilize financial resources and technical capabilities, as well as use their market creativity to drive innovations for impactful climate adaptation actions at scale.

These developments are more pronounced in the developing regions of the world where the requisite business operational environments have been created for meaningful private sector engagement in adaptation planning at different levels. This, however, is not the case in countries such as Ghana where in spite of current evidence of climate change impacts on key business sectors not a lot has happened in terms of climate change and private sector engagement in adaptation planning. As climate impacts emerge and evolve, inherent risks and opportunities have also become increasingly apparent leading to calls on businesses to take advantage of investment opportunities by applying market solutions. Such calls, invariably, have focused on assumptions and conceptualizations of such opportunities rather than actual leveraging by the private sector.

The apparent lack of action by the private sector in adaptation planning processes in Africa, broadly, add to a growing notion that the evidence base of private sector engagement in adaptation services is weak with talks and discussions focusing largely on what could be rather than what should be. In Ghana, as in many other African countries, there is no doubt that the private sector has the capacity and willingness to take advantage of any such climate change-induced opportunities. The problem, however, is how to start and where to start from. Not many businesses understand the climate change phenomenon and neither do they appreciate the fact that climate risks are business risks. Thus, despite growing talks about climate opportunities, the private sector, as an institution, is yet to know, appreciate and respond to this phenomenon.

Perceived opportunities remain less clear to businesses as most of them lack awareness and understanding of their operational interfaces with climate risks. Consequently, they also lack the ability to appreciate how such risks could be turned into business opportunities. Even when and where businesses want to engage in climate adaptation planning, avenues to financing and funding have remained obscured or constrained by policy and bureaucratic processes. The lack of knowledge and clear rules of engagement of the private sector in adaptation planning in Ghana remain a formidable challenge in current efforts towards resilience building for sustainable development.

1.1. Objectives of this Assessment

The study seeks to map out all the relevant private sector institutions in Ghana based on their interest and influence in climate risks. The assessment also sought to explore how that requisite “enabling environment

“could be provided to support an effective and efficient private sector engagement in adaptation planning. Specifically, the assessment set out to:

- Identify key private sector entities by sectors
- Establish key climate change risks by sectors and implications for private sector
- Identify the interest and influence of the key private sector institutions in climate risks risk and mitigation options

1.2. Methodology

Approach to this work has been mainly desk review of relevant available literature and policy documents. Even though we also engaged some key private sector entities in informal discussions, the overall approach was to review relevant documents such as Ghana’s Private Sector Adaptation Strategy, National Climate Change Adaptation Strategy, research publications and other relevant international documents on private sector engagement in adaptation. To facilitate easy assessment, private sector entities were identified through umbrella associations such as the Association of Ghana Industries, Private Enterprise Federation (PEF) etc. These were further assessed to establish specific business sectors under which they operate and then connected such operations with established climate risk profile of Ghana. Thus, key business sectors were linked to known sector-based climate risks to assess the levels of exposure of businesses to such risks through their business operations. Using such information, we also made some risk mitigation suggestions while also identifying the levels of business influence in mitigating risks as well as their relevant stakeholders whose help would be needed in the mitigation processes.

2. ASSESSMENT FINDINGS

The outcome of the mapping and assessment are presented in Table 1. The results are presented according to key sectors. The assessment covers the climate sensitive sectors, climate risk profiles, key private sector institutions, interest in risk, influence in mitigating the risks, key stakeholders in risk mitigation.

Table 1: Private Sector Mapping and Assessment-

Climate- Sensitive Sectors	Climate Risk Profile	Key Private Sector Business (sector-based)	Interest in Risk	Influence in Mitigating Risks	Key Stakeholders in Risk Mitigation
Agriculture & Fisheries	Most exposed sector to climate change. Models project an increase in crop land exposure to drought. Yields of heat- and drought-sensitive crops such as maize are projected to decline while yields of less sensitive crops such as cassava are projected to benefit from CO2 fertilization. Projected shift in Agro-ecological zones will affect crop production in some areas. Floods will cause damage to farmlands and crops.	Ghana Grains Council (GGC)	To manage risks for business continuity and reputation	Provide awareness on climate change impacts on sector specific activities Provide capacity building	Farmers Organization Network Ghana
		National Farmers and Fishermen Award Winners Association-Ghana			Ghana Cocoa Coffee & Sheanut Farmers Association Peasant Farmers Association of Ghana (PFAG) Chamber of Agribusiness Ghana
	Maize shortage will spark high prices and impact poultry production.		To capitalize on new markets and business opportunities	Implement projects (with funding) Provide adaptation services	National Seed Trade Association of Ghana Chamber of Agribusiness Ghana
		Ghana Agricultural Associations Business and Information Centre			CropLife Ghana (CLG); Apex Farmers' Organization of Ghana (APFOG); G
					Ghana Agri-Input Dealers Association (GAIDA)Seed Producers Association of Ghana (SEEDPAG).
		Poultry Livestock & Aquaculture Federation			Greater Accra Poultry Farmers Association
					Ghana National Association of Poultry Farmers

Climate- Sensitive Sectors	Climate Risk Profile	Key Private Sector Business (sector-based)	Interest in Risk	Influence in Mitigating Risks	Key Stakeholders in Risk Mitigation
	The marine and inland fisheries industries will be negatively impacted by the changing climate. Rising sea surface temperatures are projected to increase the variability of marine fish stock, reducing the catch rate. Also, changes in river flow regimes and saltwater intrusion into freshwater resources are projected to decrease freshwater fish landings, with the potential to lower incomes in fishing communities.	National Fisheries Association of Ghana (NAFAG).	To manage risks for business continuity and reputation To capitalize on new markets and business opportunities	Provide awareness on climate change impacts on sector specific activities Provide capacity building Implement projects (with funding) Provide adaptation services	Ghana Aquaculture Association. National Association of Fish Processors and Traders. Association of Fish Inputs Importers. Ghana Tuna Association Traders. Ghana Industrial Trawlers Association. Ghana Inshore Fishermen Association.
Forestry	High rate of deforestation in Ghana with a current rate of deforestation and forest degradation at 3% annual loss of forest cover in Ghana. Climate change will amplify many existing stressors to forest ecosystems (illegal, unsustainable logging, mining, and agricultural expansion, coupled with land tenure insecurity), through wildfires, invasive species, insect pests and pathogens, etc.	Forest Industries Association of Ghana (FIAG)	To comply with policies and regulations. To capitalize on new markets and business opportunities	Provide awareness on climate change impacts on sector specific activities Provide capacity building Implement projects (with funding) Provide adaptation services	Furniture and Wood Products Association of Ghana (FAWAG) Ghana Timber Millers Organisation (GTMO) Ghana Timber Association (GTA) Domestic Lumber Manufacturers Association of Ghana (DOLMAG) Ghana Sawn Timber Sellers Association (GSTSA) Ghana Canoe Carvers Association (GCCA) Kumasi Wood Cluster Association

Climate- Sensitive Sectors	Climate Risk Profile	Key Private Sector Business (sector-based)	Interest in Risk	Influence in Mitigating Risks	Key Stakeholders in Risk Mitigation
Water	The two main sources of water in Ghana are surface water and groundwater. Surface water is made up of the Coastal River Systems which is the least in comparison with the Volta (the least) and the South-Western (the intermediate). Climate change poses a serious threat to all these sources of water in terms of their quantity and quality. Increase in air temperature and decrease rainfall could affect river flows and, hence, the mobility and dilution of contaminants in surface water. Heavy rainfall and flooding as a results of climate change can affect water quality; as large volumes of water can transport contaminants into surface water systems. Climate-induced changes in sea level, temperature, rainfall, and altered riverine flows, and the spread and intensity of salinization on river water is projected to increase in the coastal river systems of Ghana. Rising temperature increases evaporative demand over land, which limits the amount of water to replenish groundwater. These impacts have the propensity of increasing the cost of treated water and drinking water. Also, climate change affects water quality and quantity, technology in the form of infrastructure development will be required to supply water to places affected.	National Association of Sachet and Packaged Water Producers.	To manage risks for business continuity and reputation Invest in water saving measures and technologies for future water consumption. To comply with policies, regulations, and investor interests.	Provide awareness on climate change impacts on sector specific activities Provide education, training, and capacity building Implement projects (with funding) that protect water basins Identify key stakeholders, empower them to take collaborative actions in local communities Provide adaptation services	Greater Accra Association of Pure Water Producers Ghana WASH Journalists Network Safe Water Network Coalition of NGOs In Water and Sanitation (Coniwas) Water and Sanitation for Urban Poor Resource Centre Network Ghana

Climate- Sensitive Sectors	Climate Risk Profile	Key Private Sector Business (sector-based)	Interest in Risk	Influence in Mitigating Risks	Key Stakeholders in Risk Mitigation
Health	Climate change threatens the health and sanitation sector through more frequent incidences of heatwaves, floods, droughts and dry winds. Climate change impacts on health can be direct, e.g. via increasing exposure to heatwaves or floods, or indirect, e.g. via more frequent incidences of vector-borne diseases, such as malaria, as well as via increasing food insecurity or malnutrition.	Private Health Facilities Association of Ghana (PHFAoG)	To manage risks for business continuity and reputation	Provide awareness on climate change impacts on sector specific activities Provide capacity building Implement projects (with funding) Provide adaptation services	African Health Economics and Policy Association Private Health Facilities Association of Ghana
Waste	Rising sea levels due to the warming climate will lead to increased flooding and erosion of all sorts of wastes and dumpsites into rivers and the sea. This will increase pollution of water bodies and pose danger to human and marine life. Also, both carbon dioxide and methane are major greenhouse gases from waste sector, which contribute to global warming and climate change.	Environmental Service Providers Association (ESPA)	To manage risks for business continuity and reputation. To capitalize on new markets and business opportunities. To comply with policies, regulations, and investor interests.	Provide awareness on climate change impacts on sector specific activities Provide capacity building Implement projects (with funding) Provide adaptation services	Ghana Plastic Manufacturers Association National plastic action alliance

Climate- Sensitive Sectors	Climate Risk Profile	Key Private Sector Business (sector-based)	Interest in Risk	Influence in Mitigating Risks	Key Stakeholders in Risk Mitigation
Tourism	Tourism is an economic sector highly sensitive to climate change and it contributes to the emission of greenhouse gases (GHG). Climate change may affect tourist choice of destination, the period of the trip, or indirectly affecting the quality of the experience. Tourists could also develop adverse perception of an extreme event and insecurity about the destination.	Ghana Tourism Federation	To manage risks for business continuity and reputation. To capitalize on opportunities for sustainable tourism development. To comply with policies, regulations, and investor interests.	Provide awareness on climate change impacts on sector specific activities Provide capacity building Implement projects (with funding) Provide adaptation services	National Hospitality Association Ghana
Mining	The mining sector is vulnerable to climate change, as the industry requires significant water and energy resources for its operations. A combination of climatic impacts (droughts, floods, cyclones, storms, bush fires, heat strokes, sea-level rise) may jeopardize the safety of sector's operating landscape, both spatially (through impacts felt across the immediate vicinity of the mining site and areas further downstream) as well as temporally (including sporadic short-term and more permanent long-term changes). Mining and extractive operations, if not addressed properly, could result in more and lasting damaging impacts to livelihoods and communities already suffering from climate change impacts.	Ghana Chamber of Mines Precious Minerals Marketing Company (PMMC) Ltd Ghana National Association of Small-Scale Miners (GNASSM)	To comply with policies and regulations. To manage risks for business continuity and reputation To capitalize on new markets and business opportunities	Provide awareness on climate change impacts on sector specific activities Provide capacity building Implement projects (with funding) Provide adaptation services	Ghana National Association of Small-Scale Miners (GNASSM) Ghana Jewellers Association Geological Survey Authority Association of Building and Civil Engineering Contractors of Ghana

Climate- Sensitive Sectors	Climate Risk Profile	Key Private Sector Business (sector-based)	Interest in Risk	Influence in Mitigating Risks	Key Stakeholders in Risk Mitigation
Energy	The rise of temperatures would increase evaporation, thereby reducing the available water resources in the reservoirs for power generation. Burning of fossil fuel for energy contributes greenhouse gas emission. With increasing pressure to limit energy production from fossil, sectors players are at risk of losing their investments.	Renewable Energy Association of Ghana (REAG) Chamber of Independent Power Producers, Distributors & Bulk Consumers (CIPDiB)	Envisaged that future hydropower plant investments in the country should take careful consideration into the rainfall and temperature impact on the potential for energy generation To comply with policies and regulations. To manage risks for business continuity and reputation To capitalize on new markets and business opportunities	Provide awareness on climate change impacts on sector specific activities Improved management of catchments of hydroelectric dams would be necessary to minimize further increases in temperatures effects. Provide adaptation services	Chamber of Independent Power Producers, Chamber of Independent Power Producers, Distributors & Bulk Consumers (CIPDiB) Association of Oil Marketing Companies
Transportation & Infrastructure	Transport infrastructure is very important for social, economic and agricultural livelihoods will be very susceptible to extreme weather events such as flooding and rising temperatures. Rural and remote areas of Ghana will be affected in trading goods and accessing healthcare, and education. Extreme rainfall and floods will have an overwhelming effect on economic production sites as well as settlements, particularly in large population centers such as Accra, Kumasi and Tamale. Informal settlements, with venerable structures and dwellers with low adaptive capacity to respond to disruptive events will be affected. Climate change will shorten life span of infrastructure than planned while maintenance costs will increase significantly. Accordingly, the risk for infrastructure damage in the country is likely to increase	Ghana Private Road Transport Union (GPRTU) Ghana Real Estate Developers Association (GREDA) Ghana Haulage Truck Drivers Association The Association of Road Contractors (ASROC). Ghana National Petroleum tanker drivers' Association	To manage risks for business continuity and reputation To capitalize on new markets and business opportunities	There is need for efforts at increasing human and institutional capacity for the extra demand of adaptation. Need for increasing commitment towards integrating considerations of potential climate impacts and adaptation options into transport planning, designing, construction, maintenance, and operations	Ghana Institution of Surveyors Ghana Institution of Engineers Maritime Ghana Institute of Architects Ghana Green Building Council (GHGBC) Aviation

Climate- Sensitive Sectors	Climate Risk Profile	Key Private Sector Business (sector-based)	Interest in Risk	Influence in Mitigating Risks	Key Stakeholders in Risk Mitigation
Banking and Finance	Banks and other financial institutions provide loans and credit lines to enterprises that invest in and run activities in sectors vulnerable to climate change, including agriculture, energy, tourism, real estate, and other infrastructure development. Climate change effects in this sector could mean the deterioration of capital and investment and could hinder loan repayments	Sustainable Banking Committee	To manage risks for business continuity and reputation To capitalize on new markets and business opportunities To comply with policies and regulations.	Provide finance for climate change actions, including adaptation projects and measures, through the establishment and/or identification of climate-driven finance opportunities.	Ghana Association of Bankers Ghana Insurers Association

2.1. Agriculture & Fisheries

Agriculture and Fisheries sectors are the most exposed sectors to climate change considering Ghana's economy is largely dependent on rain-fed agriculture. Both sectors, are dependent on temperature and precipitation variability and change which leads to direct impacts such as floods, drought with significant ramifications to crop production and fishing activities. Projected climate scenarios point to plausible shifts in Ghana's ecological zones to affect crop production in some areas. Flooding in Ghana's coastal zones has already affected coastal settlements cultures and livelihoods. There are coastal or fishing communities who have faced significant flooding, erosion, inundation, salt intrusion to force resettlement which disrupts livelihoods. Rising sea surface temperatures are projected to increase the variability of marine fish stock to reduce catch rates. Also, changes in river flow regimes and saltwater intrusion into freshwater resources are projected to decrease freshwater fish landings, with the potential to lower incomes in fishing communities. Business operations in these sectors are likely to be affected by emerging climate change impacts to disrupt operations, affect business continuity, and cause operational losses.

2.1.1. Agriculture and Fisheries Risk Mitigation

Businesses should show direct interests in both current and future climate change risks. This must begin with awareness, understanding and appreciation of such risks as business risks which needs to be addressed proactively. Businesses must provide sector-specific leadership through capacity building processes and the exploration of funding avenues that support market adaptation solutions in local communities.

2.2. Forestry

The current 3% annual loss of forest cover in Ghana has already proved impactful to the forestry sector. The implication for biodiversity, wildlife and ecosystem health is significant and as has become evident, current, and future climate change impacts will amplify associated stressors in forest ecosystems. The link between forest degradation and the sustainability of Agriculture, especially cash crop farming, has already become a major climate risk concern for farmers, government, and all stakeholders.

2.2.1. Forestry Climate Risk Mitigation

Businesses operating in this sector must know and understand the climate change phenomenon and the implication of forest degradation and loss of forest cover not only to their operational activities but to ecosystems health in Ghana. Business must lead in the provision of awareness, training, and capacity building. They must also work closely with government policy leaders and key stakeholders to enforce forest and environmental protection measures that enhances forest health adaptation to climate change impacts. Market approaches could be used to incentivized local community involvement in forest protection.

2.3. Water

Climate change poses insignificant risk to both water quantity and quality. Ghana's Akosombo dam provides a very good example of the importance of water availability and the quantity. The two main sources of water in Ghana are surface water and groundwater which are both exposed in different ways to hydro-climate variability and change and with severe ramifications for food security, health, energy mining etc. Heavy rainfall and flooding because of changing climatic conditions can affect water quality as large volumes of contaminants are moved around and into surface water systems. On-going sea-level rises, temperature variability, frequent and

intense rainfall continue to alter ravine flows. Continued flooding and the propensity for water pollution poses significant risk to water quality as well as increases in water treatment costs.

2.3.1. Water Risk Mitigation

Private sector operators in this sector must be aware of the risk of climate change to the sector. They must understand impact manifestations and how their business interface with such impacts. They must provide leadership (operational and financial) by creating awareness among their staff and the communities in which they operate. Businesses must embark on concisions risk assessment of river basins and sources to establish current and future risk and vulnerabilities, as well as put in place measures such as tree planting and afforestation to protect water basins. They must also identify all relevant stakeholders and work in collaborative partnership to address current and future risks.

2.4. Health

The link between climate change and health has never been clear and has not been taken seriously in many developing countries. Ghana certainly is yet to be conscious and serious about the risks presented by climate change to the health system and also to the health of citizens. The nexus between climate change, temperature, hydro-climate variability, and health needs to be understood by businesses who operate in this sector. Of particular concern is the link between climate change, water, and sanitation (WASH) and associated health implications. More frequent and intense incidences of heatwaves, floods, droughts, and dry winds bring about significant health challenges. Climate-induced health impacts as they emerge, from climate change impacts on health can be more direct via increasing exposure to heatwaves or floods, or indirect, e.g., via more frequent incidences of water-borne and vector-borne diseases, such as malaria, as well as via increasing food insecurity or malnutrition.

2.4.1. Health Risk Mitigation

Establish sector-specific risks and vulnerabilities. Provide awareness on associated climate impacts and risks and build capacity of businesses to respond proactively to risks and vulnerabilities. Water-related problems are usually cross-sectoral. It is important for private sector-entities operating in the sector to identify key stakeholders and build collaborative partnerships to create constant education and awareness campaigns as well as source or provide funding for specific mitigation actions where necessary.

2.5. Waste

Waste management remain a major problem in both urban and rural communities in Ghana. With growing urban populations, waste generation and disposal have become a critical challenge for most local government authorities and local people. Waste disposal approaches have not been the best in most communities and remains an enduring challenge which has converged with rising sea levels, increased frequency, and intensity of precipitation to cause flooding in local communities. This has a direct co-relation with water quality and health as waste materials are forcefully moved by floods to pollute water sources. There is also air contamination and pollution, as well as the risk of increased carbon dioxide and methane gases emissions from the waste sector to contribute not only to global warming, but also to create significant health challenges for local communities.

2.5.1. Waste Risk Mitigation

Businesses operating in this sector must be aware and knowledgeable of the uniqueness of the sector in terms of its contribution to climate change, and the risks associated with the sector. Waste management businesses must understand not only the role of waste generation and mismanagement in the climate

change phenomenon, but also how waste serves as a hazard to interact with other hazards to cause flood and fire disasters in local communities. Businesses must embark on awareness and education campaigns, forge creative partnerships with public sector policy leaders to enforce existing policies as well as to explore funding to introduce market innovation in waste management at different scales.

2.6. Tourism

The tourism sector is highly sensitive to climate change from both precipitation and extreme temperature perspectives. Apart from the fact that the sector contributes significantly to emissions and waste generation, the sector is highly dependent on weather and climate conditions which guides potential tourists in choosing their destinations. Beyond that, the sector is highly dependent on the resilience and functionality of other sectors such as water, health, infrastructure, transportation etc. When a tourist destination is perceived as being prone to extreme events it tends to affect not just the quality of experience, but also tourists and potential tourists develop a sense of insecurity and may consider their choices. As we have learned from the current COVID pandemic situation, when such vulnerabilities are not well managed the tourist sector suffers and the economic ramifications are always dire.

2.6.1. Tourism Risk Mitigation

Climate change risks in the tourist sector are cross-sectoral and requires awareness and deeper understanding of the sources and manifestations of risks and vulnerabilities. Tourist operators must be aware of climate risks and vulnerabilities pertaining to the sector and must build internal capacity to respond to both current and future risks. The cross-sectoral nature of risks requires the creation of collaborations across sectors and among key stakeholders to mitigate risks and vulnerabilities. This will also involve availability of funds and financing mechanisms.

2.7. Mining

Extreme weather events will likely damage mine energy, transportation, and equipment. These occurrences will disturb construction and operations. Heavy rains and its associated impacts may affect slope stability near open-pit mines. This will interrupt mine water treatment capacity which will affect production. Wildfires may increase as a result of hotter and drier conditions that will threaten mining facilities. The rise in natural disasters and heavy rainfall will disrupt the delivery of major mining input such as steel, cement, hydrochloric acid, and cyanide, or consumables such as diesel, tires, and reagents which will limit production. Scarcity of water and a massive rise in temperatures will make it tougher to reestablish vegetative cover and will result in difficulty implementing environmental mitigation measures in some regions. Conflict over natural resources will increase due to extreme weather conditions resulting from decreased food security, worsening poverty, induce migration contributing to civil unrest. Host mining communities may increase their requests for financial and employee support in response to natural disasters.

2.7.1. Mining risk mitigation

Mining companies must strive to integrate climate-compatible development initiatives into their business models. These initiatives should be targeted at the local mining communities within the project operational areas for sustainable development. Climate change awareness and its impacts on sector-specific sectors mining operations and the local communities. For example, clean and wastewater management, land use and its impact on agriculture and housing, other infrastructure, health, and its related challenges must be at the front burner for both mining companies and host communities. Extreme climate conditions may have a negative impact on the conventional livelihood of the host communities and the mining staff. To address these, companies must provide innovative capacity-building alternative livelihood projects for the

communities and their own staff. In mitigating climate effect on mining infrastructure, engineering design and construction standards for mining facilities must be vigorous with the adoption of the highest design standards. For example, mine water treatment plants should be able to withstand adverse precipitation and evaporation, mining pits and slope stability near opencast mines should be capable of enduring mudslides, and outdoor facilities should be able to survive persistent wildfires.

2.8. Transportation & Infrastructure risk

Transportation infrastructure is very important for social, economic, and agricultural livelihoods. They are susceptible to extreme weather events such as flooding and rising temperatures. Extreme rainfall and floods will have an overwhelming effect on economic production sites as well as settlements, particularly in large population centers such as Accra, Kumasi, and Tamale. Informal settlements, with venerable structures and dwellers with low adaptive capacity to respond to disruptive events, will be affected. Climate change will shorten the life span of infrastructure than planned while maintenance costs will increase significantly. Accordingly, the risk for infrastructure damage in the country is likely to increase.

2.8.1. Transportation & Infrastructure risk mitigation

Business entities operating in this sector must work closely with public policy leaders to understand emerging risks and vulnerabilities in the sector and to work collaboratively to agree on new climate-resilient standards for the sector. City planners and urban designers will have to redesign the city drainage system to withstand large volumes of rainfall and its associated flash floods. Particularly in large population centers such as Accra, Kumasi, and Tamale. Metropolitan, Municipal and District assemblies must have a collaborative effort in modern and sustainable city planning that will meet the nuances of climate change. There is a need for efforts in increasing the human and institutional capacities with funds and logistics for the extra demand of adaptation. This is very crucial because the life span of infrastructure will be shortened, and planned maintenance costs will increase astronomically. In summary, is a need for increased commitment towards integrating the considerations of potential climate impacts and adaptation options into transport planning, designing, construction, maintenance, and operations.

2.9. Energy risk

Increased temperature rises would increase evaporation, thereby reducing the available water resources in the reservoirs for power generation. Extreme temperatures will increase energy demand, and this will put massive stress on the capacity of transmission and distribution facilities can disrupt energy supply. Rising temperatures will increase the energy demand that will be required to cool generating facilities. Massive floods and rising temperatures in host communities will exacerbate the spread of tropical diseases that affect community health.

2.9.1. Energy risk mitigation

In other to ensure the resilience of physical assets and planning responses to maintain business continuity, specific sectors within the energy portfolio must understand climate change impacts on sector activities within the generation, transmission, and distribution supply chain. Given the projected potential for future economic growth and energy demand, it is important to pay attention to energy efficiency improvement across scale. Energy efficiency improvements reduce greenhouse gas emissions and energy consumption. This will reduce stress on generation, transmission, and distribution networks. It will also reduce the amount of energy required to cool all the types of equipment that are required in the energy supply chain because of extreme temperatures. A Meaningful engagement with host communities and critical stakeholders is essential in creating awareness and to build collective capacity to respond to climate risks and vulnerabilities as they emerge in the sector.

2.10. Banking and Finance risk

Climate change will disorganize price adjustments in various financial asset, with a possible spillover into diverse parts of the financial system and a potential disruption of the appropriate functioning of financial markets. Financial products, such as hedging instruments, insurance, and financial system stress, will be further exacerbated by disruptions in economic activity by extreme events such as floods, drought, and fire disasters. Such risks will worsen financial system vulnerabilities leaving behind stressed balance sheets, strained government budgets, and depleted household wealth which will undermine the resilience of the financial system to future shocks. Climate change will suddenly revise market perceptions about climate risk which will lead to a disorderly repricing of assets, which will, in turn, have cascading effects on portfolios and balance sheets. Sub-systemic surprises associated with climate change will undermine the financial health of banks, local insurance markets, community banks with significant ramifications for agriculture, farmers, businesses, and households.

2.10.1. Banking and Finance risk mitigation

The banking and finance sector will have to be aware of the threat of climate change to business continuity. Adaptive technologies and banking approaches will have to be adopted through education, training, and capacity building. Decision-making in the sector must integrate climate risk considerations and this will require staff training and capacity building to understand and operationalize new risks such as climate change and disaster risk. This will require significant changes in institutional risk perception and management culture. Senior management must demonstrate commitment by assigning specialist personnel in new departments to take charge of the new reality of climate risk governance. All the players in the financial sector, for example, the regulators, and other institutional bodies need reliable, consistent, and comparable data and projections for climate risks, exposure, sensitivity, vulnerability, and adaptation for planned, preventive, and predictive decision making. This will assist to advance the effective measurement and management of climate change and its associated risks.

3. Recommendations

Based on our assessment of the private sector environment in Ghana and the climate risk associated with the different sectors, the following actions have been recommended¹:

- The desk top study should be validated through actual engagement with key private sector entities to ascertain and establish their levels of awareness and understanding of climate change.
- Such an engagement should be nationwide and must be channeled through established industry-specific associations to identify key stakeholders across the country.
- An engagement strategy must be developed and used in identifying key private sector stakeholders.
- Engagement with private sector entities must begin with assessment of climate risk awareness and also risk and vulnerability assessments.
- Private sector entities, either as individuals or groups, should be taken through a risk assessment training process which also aim to increase awareness and build capacity for risk mitigation actions.
- Sector-specific risk profiles and mitigation options should be developed and shared with business entities for on-going capacity building.
- Private sector institutions should be engaged on investment opportunities in climate change adaptation and mitigation.

¹ Surminski, 2013

