

**THE EFFECTS OF CLIMATE CHANGE ON THE SOCIO-ECONOMIC  
CONDITIONS OF THE FISHERIES SECTOR  
CASE STUDY OF WEST POINT COMMUNITIES, LIBERIA**

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**ABSTRACT**

Fishing communities in Liberia are susceptible to climate change's impacts, including variations in mean temperature, increased variability in rainfall, and extreme weather events. The severity of climate change and the nature of its effects on both fishing communities and their socio-economic activities is reviewed in this study focusing on fishing communities in WestPoint Liberia. The study also focuses on how communities that depend on fisheries will be affected by climate change, and it concludes by highlighting the techniques fishermen in WestPoint have used to adapt to that shift. A qualitative data collection approach was adopted via a well-structured questionnaire with open-ended responses from focus groups within the fishing communities in WestPoint. Using the Thematic and Grounded theory for data analysis, the study found decreased fish catches in WestPoint fishing communities, which was related to climate change and variability, and adversely impacted the communities' socio-economic activities. Several tactics are used by fishermen and community dwellers in WestPoint to maintain their livelihoods and food security, which are under threat from climate change. However, the study found that there are limited adaptation measures in the fishing communities of WestPoint. Changing of fishing boats and gears, migration, and observation of weather are some of the adaptation tactics used by fishermen and community dwellers to deal with the effects of climate change. To influence policy and fisheries management practices, it is crucial to understand how climate change affects socio-economic adaptation and fisheries viability.

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## 1 INTRODUCTION

### 1.1 Background

Liberia has made significant economic and developmental progress since the end of its civil war in 2003. However, the country remains fragile and highly vulnerable due to high levels of inequality, unemployment, and poverty, with limited access to basic social services (USAID, 2017). Liberia has a population of 5.06 million people with a current population growth rate at of 2.4% (as of 2020). Approximately 51.6% of the population currently live in urban areas and this is projected to increase to 57.3% and 68.2% of the population by 2030 and 2050, respectively (World Bank, Open Data, 2021).

According to Liberia National Adaptation Plan of Action, 2008, Liberia's GDP is dominated by the agriculture sector (inclusive of fishing and forestry), which accounts for 42.6% of GDP and the industry sector (including mining, construction, electricity, water, and gas), which contributes 11.7% of GDP and services comprising 49.7% of GDP. Furthermore, the country is highly vulnerable to adverse effects of climate change. Liberia is also highly vulnerable to environmental instability due to its extreme poverty and high dependence on 'climate sensitive' sectors such as agriculture, forestry, and fisheries (EPA, Liberia National Adaptation Program of Action, 2008). Agriculture, fisheries and forestry are instrumental to Liberia's inclusive economic growth and poverty reduction goals. High reliance on climate-sensitive activities renders Liberia vulnerable to climate variability and change, expected to manifest in higher temperatures, more extreme weather events such as heavy rains, and rising sea levels.

Liberia's fishery sector is an important component of food security and household livelihood structures of both coastal and inland communities. Fishing provides 65% of the animal protein needs of the country, contributes around 3.2% to Liberia's GDP and is a key primary source of protein for children in many coastal areas (USAID, 2017). In Liberia, the sector encompasses three types of fisheries: 1) coastal marine fisheries, involving industrial and artisanal activities; 2) inland river and lake fisheries, which are underdeveloped and largely artisanal; and 3) aquaculture, which consists of small, freshwater ponds producing tilapia in rural areas of non-coastal communities and the sector remains largely underdeveloped in Liberia and is considered to be severely at-risk to climate change and variability (USAID, 2017).

According to Deepananda and Edison (2012), the fisheries sector, which is highly essential to both nutrition and livelihoods of most of the world population especially in the developing

world, has over time faced the negative impacts of overfishing, pollution as well as natural climate variabilities that often arise from extreme events, posing a serious setback to fisheries production. Nevertheless, there is little information on how climate change is affecting the social and economic conditions of the fishery sector in Liberia, specifically in the WestPoint communities, despite the amount of research being done on how climate change threatens the livelihood of underdeveloped countries.

## 1.2 Statement of the Problem

Liberia is at high risk to natural hazards. The country's economic vulnerability is to a high level of poverty and high dependence on climate change sensitive sectors, such as agriculture, fisheries, mining, and forestry. (EPA, 2008; World Bank, 2021). Though historically Liberia's contribution to atmospheric greenhouse gas (GHG) concentrations has been negligible, the country is experiencing warmer temperatures, increases in annual rainfall, and increases in the frequency of heavy rainfall events. Thus, the country is unfortunately confronted with the daunting challenge of adapting to these new climatic conditions and their impacts.

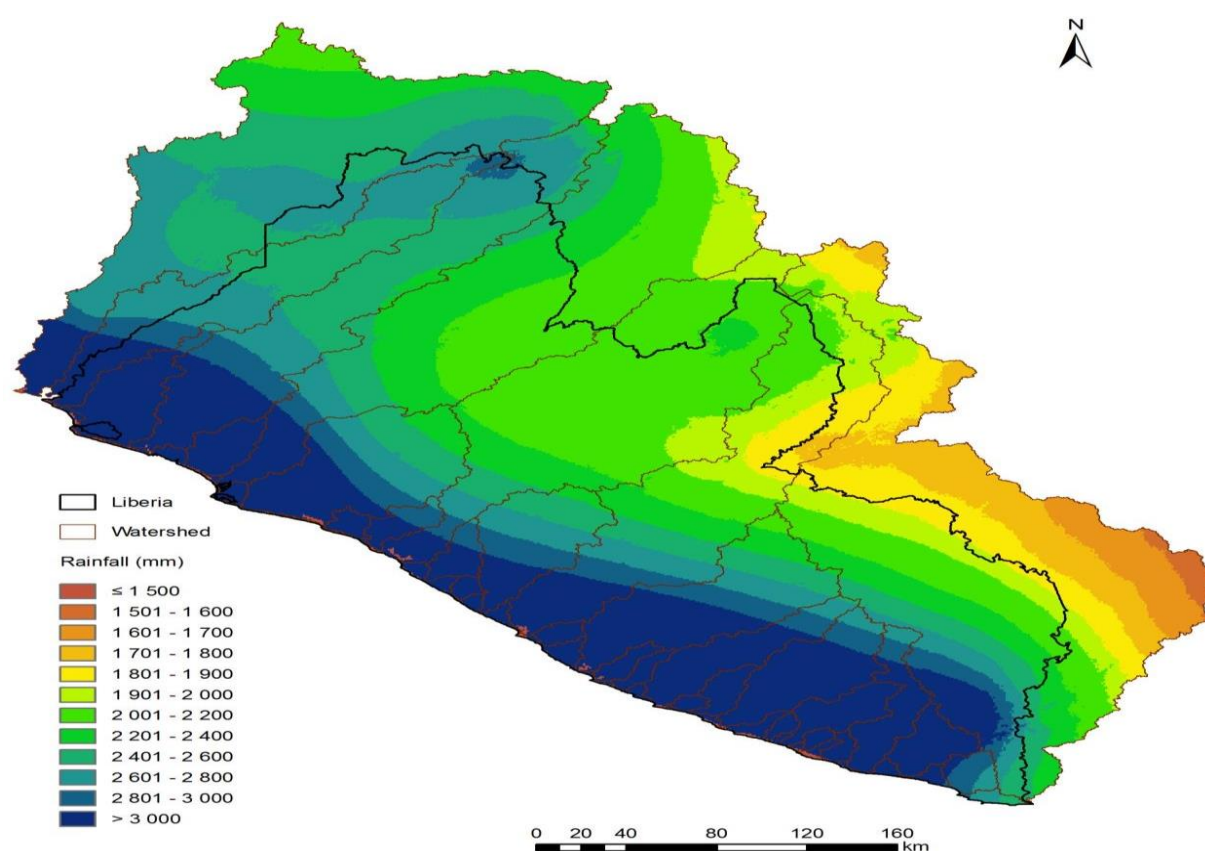


Figure 1: Mean annual rainfall in Liberia (Liberia Hydrological Authority, 2018).

According to World Bank Country portfolio on Liberia, the country is one of the wettest countries in the world, with average annual rainfall exceeding 2,500 millimeters (mm) (Figure 1) and the heaviest rainfall occurring from May to October. Rainfall is highest along the coast, but decreases towards the interior plateaus and low mountains, where average rainfall reaches approximately 2,030 mm per year (World Bank, 2021).

Drawing from Liberia Environmental Protection Agency (EPA) initial communication to the United Nations Framework Convention on Climate Change (UNFCCC) (2013), the wet season typically occurs in the summer months between May and November, with average temperatures of 25°C. The dry season typically occurs in the winter months, December to April. The dry season is dominated by the harmattan winds with average temperatures between 24 to 27°C. Relative humidity reaches 90%–100% during the rainy season and 60%–90% during the dry season (Figure 1).

Recognizing the implication of climate change for its national development and in response to its international commitments, the Government of Liberia (GoL), through the Environmental Protection Agency (EPA), has taken various actions to support climate change adaptation planning with several climate-related policies. Liberia has undertaken climate vulnerability assessments and risk on several priority sectors to support these policies, including coastal zones, agriculture, waste management, forestry, and fisheries.

Socioeconomic development comprises many factors like population, economic activity, urbanization, education, social equality, consumption patterns, lifestyles, and institutions.

Climate change and socioeconomic development are deeply intertwined. Social and economic activities and processes are among the primary determinants of vulnerability to the impacts of climate change. According to the 2019 Climate Vulnerability and Risks Assessment for the Agriculture, Forestry and Fisheries Sectors of Liberia, the economic and social challenges faced in local communities in Liberia, can be largely attributed to climate change, including energy shortages, damaged infrastructure, and food and water scarcity. These changes are, however, interrelated. Accordingly, economic losses associated with climate change make it difficult for residents to maintain their livelihoods and thus exacerbate social issues, including poverty and hunger. Simultaneously, some demographic and socioeconomic characteristics of cities can make them especially vulnerable to climate change. The success of climate change adaptation

strategies depends mainly on social economics. Therefore, exposures in a country may often be more significant among populations with low socioeconomic status (Gasper, Blohm, & Ruth, 2011; IPCC, 2013).

The West Point community is one of the most socioeconomically challenged in Liberia. The community is located in very close proximity to the coastline, thus rendering residents of the community extremely vulnerable to climate change impacts such as sea level rise and coastal erosion. Thus, the need to enhance adaptive capacity in this community is necessary for reducing vulnerability, particularly for most of our vulnerable regions or sectors as estimated from the vulnerability and assessment project and socioeconomic groups. Activities required for the enhancement of adaptive capacity are essentially equivalent to those promoting sustainable development<sup>1</sup> According to the Environmental Protection Agency Analysis on Climate Resilience (EPA, 2018), rising sea surface temperatures are reducing biodiversity and overall stocks because of death, diminished reproductive cycles, and migration to cooler waters. Climate induced changes in the biophysical characteristics in Liberia, along with extreme events, will have significant effects on the ecosystems which support fish (especially inland).

There is currently a dearth of knowledge regarding how climate change is affecting Liberia's fisheries, as well as the socioeconomic status of the country's fishing communities. To address the latter, this research uses the West Point fishing community as a case study to understand the impact of climate change on fishing communities.

### **1.3 Objectives**

The objective of this research is to investigate the impact of climate change on the social economic conditions of groups belonging to different aspects of the value chain of the fishery sector in WestPoint Communities.

Research objectives:

- To explore how climate change has impacted the livelihood of the fishing communities in West Point.
- To explore how climate change is influencing the social wellbeing of WestPoint communities.



- To investigate adaptation strategies in cases where climate change has been identified as negatively affecting social and economic conditions in West Point Communities.
- To provide policy recommendations that can be used to address climate change issues affecting the West Point fishing communities.

## 2 LITERATURE REVIEW

### 2.1 Poverty in Fisheries and Aquaculture

Approximately 11 percent of the world's population (about 767 million people) is living in extreme poverty (World Bank, 2016). In addition to low income, poverty is comprised of factors that hinder the realization of human rights as stated in the Universal Declaration of Human Rights, the right to food guidelines (FAO, 2005) the voluntary guidelines on the responsible governance of tenure of land, fisheries and forestry in the context of national food security (FAO, 2012) and the voluntary guidelines for sustainable small-scale fisheries in the context of food security and poverty eradication (FAO, 2015). Among these factors are food insecurity and malnutrition, poor health, low levels of education, insecure tenure rights, marginalization, and political discrimination (FAO, 2018).

According to FAO (2017), poor people typically lack representation in governance systems, which makes them vulnerable in ways that affect their overall well-being. In addition to this, their limited integration in the formal economy frequently results in their marginalization from the formal employment system and social programs.

### 2.2 Overview of the Liberia Fisheries Sector

There is no doubt that the fishery sector has enormous potential for lifting the poor out of poverty and, over the years, has provided employment and livelihoods for more than 11,250 people in Liberia (Tigani & Brandolini, 2006). Fish are an essential component of the Liberian diet and the primary source of protein in coastal areas. Liberia's fisheries include coastal marine fisheries involving industrial and artisanal activities; inland river and lake fisheries, which are underdeveloped and artisanal; and aquaculture, which consists of small, freshwater ponds producing tilapia in rural areas non-coastal communities.

The fisheries sector suffered during the civil war and now faces risks from climate change and climate variability. Climate change is a major driving force behind the decline in fish species

in Liberia's fishery sector (EPA, 2018). Indeed, climate change has impacted the fishery sector by shifting the distribution of species, loss of biodiversity, and loss of livelihoods (USAID, 2017). The USAID (2017) report indicates that an increase in temperature is causing disruption to production patterns and migration of fish species and has reduced aquatic biodiversity and the overall productive capacity. While on the other hand, the increased frequency of intense precipitation has led to more frequent loss of fishing days caused by bad weather, leading to loss of income and livelihoods, as well as reduced protein intake. Rising sea surface temperatures reduce biodiversity and overall stocks because of death, diminished reproductive cycles, and migration to cooler waters.

Specific impacts depend on the ecosystem and fishery, as nearshore and marine fisheries experience different impacts than freshwater fisheries. For example, changes in precipitation and evapotranspiration are more likely to affect freshwater fisheries through increased sedimentation from extreme events, lower water levels from drought, and other biophysical processes including eutrophication. Climate-induced changes to Liberia's biophysical characteristics, along with extreme events, have had significant effects on the ecosystems that support fish, including those inland. With respect to marine fisheries, climate change risk assessment indicated that fish species might experience low productivity or may migrate away from Liberian waters. Decreasing fisheries productivity will impact communities in several ways, including reduced earnings from fish exports and increased food insecurity (Fobissie, Chia, & Enongene, 2019). Inland fisheries, particularly crucial for small-scale artisanal fishers in Liberia and an integral part of Liberian rural livelihood and food security systems, could be severely impacted by climate change (USAID, 2017).

Nevertheless, so little is known about the inland fishery regarding rates of exploitation, diversity, and status of fishes exploited, and state of the aquatic ecosystem that projections of climate change impacts on this critical national resource are virtually impossible beyond broad generalizations. Precipitation and evapotranspiration changes, including an increase in extreme events (e.g., exacerbated floods, severe drought), affect inland waters causing changes in magnitude and timing of high and low river flows (USAID, 2017). This hydrological variability could adversely affect fish habitats, reproduction, growth, recruitment, and mortality (USAID, 2017). Therefore, the impactful climate change planning for these resources would require better information about current formal and informal management regimes and levels of exploitation.

Liberia has a coastline of 579 km and an exclusive economic zone of 246,152 km<sup>2</sup> harbouring valuable demersal and pelagic fisheries resources, which in turn are a source of food and livelihoods for many Liberians and an important source of government revenue (Weeks, Owadi, Dahn & Agbor 2010). According to the 2018 Annual Report of the National Fisheries and Aquaculture Authority of Liberia, artisanal fisheries across the eight coastal counties of Liberia caught a total of 13,201 tons of fish, valued at nearly \$37.5 million dollars. The catch is mainly consumed locally, while shortages in fish supply are complemented through imports.

A recent World Bank report on Liberia's fishery sector suggested that it is an important component of food security and household livelihood structures of coastal as well as inland communities (World Bank, 2021). Fishing provides 65% of the animal protein needs of the country and contributes around 3.2% to Liberia's GDP and is a key primary source of protein for children in many coastal areas. Additionally, the sector remains largely underdeveloped in Liberia and is severely at-risk to climate change and variability. Within coastal areas, mangroves provide critical breeding grounds for important fish species and rising seas pose a risk to these ecosystems, along with other pressures such as the need for fuel and firewood and land for road building (USAID, 2017; World Bank, Open Data, 2021). According to the Fisheries policy, fishery accounts for about 14% of the total marine catch landed in Liberia and its catch is supplied to the domestic market, although a part is also exported (BNF & MOA, 2014).

According to Merlin (1989), an industrial fishery is any large-scale harvesting or associated activities using vessels with an engine capacity >100bhp and >90ft. The industrial fishery in Liberia comprises coastal trawl- and offshore large pelagic fisheries. In the coastal fishery, trawlers deploy mid-water and bottom trawls mainly targeting the shallow-water demersal finfish and shrimp species. The offshore large pelagic fishery consists of large vessels that employ purse seines, long lines and pole and line gears primarily targeting tuna and tuna-like species (BNF & MOA, 2014). The Fisheries Policy revealed that in 2011, the governmental revenue from the industrial fishery subsector totalled US\$ 400,000. This figure increased sharply to about US\$ 6.0 million in 2013 (BNF & MOA, 2014). This is probably because of the fisheries management reforms and increased enforcement introduced by the Government of Liberia in 2010.

### 2.3 Climate Change Impacts in Liberia

The baseline and projected climate change in Liberia are experienced through physical processes including variations in rainfall patterns and weather conditions, rising sea levels, increased frequency of extreme weather events, and variation in the country's temperature (EPA, 2019). These physical processes can either have a direct or indirect impact.

In Liberia, the impact of climate change includes deforestation, increased agricultural pests, reduced quality of water resources, and the displacement and migration of populations. The impact of climate change can induce drought-associated effects on forest ecosystems, thereby decreasing the sector's economic and social benefits. This could exacerbate the incidence of poverty in affected areas. Forecasts from climate models suggest an increased risk of droughts in tropical forests, like that in Liberia, over the next few decades, potentially threatening these large existing carbon sinks and creating vulnerability and risk for local communities.

Vulnerability and adaptation assessments have revealed that Liberia is faced with climate change and variability, leading to extreme events, which negatively impact agriculture, forestry, health, energy, and other sectors. Climate change impacts in Liberia are marked by irregular rainfall patterns, flooding, high temperature, and coastal erosion. These factors result in crop and livestock losses that intensify food insecurity and loss of income. Women and children are particularly vulnerable to the impacts of climate change because of their limited access to resources such as food and shelter and their lower adaptive capacity to climate-induced disturbances. However, their unique knowledge and perspectives also provide opportunities for inclusive, equitable, and efficient adaptation responses and coping strategies. The limited supporting infrastructures increase the vulnerability of the population. Coastal areas in Liberia are the most populated and economically vibrant areas. Sea erosion continues to pose increasing threats to coastal cities' shorelines, including major infrastructures and investments (EPA, 2019). It can also lead to displacement, loss of lives and properties and can severely undermine national security (IPCC, 2013). Rising sea surface temperatures are reducing biodiversity and overall stocks because of death, diminished reproductive cycles and migration to cooler waters. Climate induced changes in the biophysical characteristics in Liberia, along with extreme weather events, will have significant effects on the ecosystems which support fish (including those inland). This is projected to significantly affect food security and key livelihoods. (EPA, 2018; World Bank, Open Data, 2016)

## **2.4 Climate Change Impact on Fisheries**

Being located at the waterfront, fishing and fish farming communities are exposed to climate related extreme weather events and natural hazards, such as hurricanes, cyclones, sea level rise, ocean acidification, floods, and coastal erosion. Millions of people living in coastal and floodplain lowlands are unable to escape regular flooding. Climate change impacts are harming human and natural systems including coastal infrastructure, fish stocks, coastlines, natural resources and critical ecosystems. These climate change impacts are therefore a threat to human health, well-being, and livelihoods (Barange, et al., 2018).

The ability of individuals and communities to adapt to climate change depends on their vulnerability, exposure, and adaptive capacity. In turn, this is related to their financial and social capital, such as social networks. Their exposure and vulnerability to climate change impacts is also related to the existing infrastructure and institutional framework, including government sponsored social safety programs. Their adaptive capacity also depends on their ability to acquire assets, such as insurance, technologies, and knowledge (Heck, Christophe, & Reyes-Gas, 2007). Those who are poor and vulnerable have fewer opportunities to access these resources, and thus are less able to adapt.

The poverty and vulnerability of fishers and fish-workers are also often linked to and determined by their political marginalization (Kurien, 1995). They typically do not have a voice in the climate adaptation planning process, which reduces their short- and long-term resilience. Unequal power relations, such as the control exerted by intermediaries who buy the fish, provide credit, extend consumption loans, and offer land on which fishers can build their homes, contribute to their vulnerability and poverty status. In these transactions, fishers and fish-workers are easily trapped in a cycle of exploitative deals, which tend to undermine their capacity to respond to additional threats, such as those related to climate change (FAO, 2018).

## **2.5 Coastal Zone and Coastal Erosion in Liberia**

Liberia's densely settled coastal zone is vulnerable to risks resulting from climate change (Balk et al., 2009). Sea level rise and associated coastal flooding and erosion place increasing stress on Liberia's extensive and productive coastal zone. In addition to supporting essential agriculture and fishing activities, the coast is home to almost 60 percent of the population, much

of which resides in areas already at risk from inundation. Liberia's Environmental Protection Agency is concerned that the rise in sea level will increase migration to higher lands and/or result in shock waves of migration to the interior when coastal inhabitants seek refuge from flooding. Monrovia, such as the West Point Slums, has had to be evacuated because of storm surges.

If sea levels rise one meter, areas of major Liberian cities including Monrovia, New Kru Town, River Cess, Buchanan, and Robertsport will be submerged, incurring losses of land and infrastructure worth \$250 million (NPRSCC, 2018). In addition, rapid coastal erosion (both from sea level rise and sand mining) puts settlements and infrastructure at risk in areas like Buchanan, Greenville, Harper, and Robertsport. Rising sea temperatures and intense rainfall levels will impact unique mangrove ecosystems through erosion, leaving the coast even more exposed to storms and wave damage. These factors will also negatively impact fish and other marine species that rely on mangroves as a habitat and food source.

A rise in sea level along the coast in Liberia could cause saltwater intrusion into freshwater areas. Coastal flooding is an obvious and immediate threat to economic growth, energy supply, roads and transport, food and agriculture, education, health, water and sanitation, and social protection. The potential rise in sea levels could add to existing coastal erosion trends in Buchanan and Monrovia, with a loss in infrastructure and land of around \$250 million, on top of the population's social and psychological stress. The more than 550km of coastal area in Liberia is highly populated and can easily be affected by climate change. The combined effects of ongoing coastal erosion, climate change-induced sea-level rise, increased storm frequency and intensity, increased precipitation, and warmer ocean temperatures will combine to create significant risks in coastal areas.

In addition, many houses have low strength due to structural instability and poor construction. These include those dwellings that can be considered "shanty structures," as well as houses made of low resilient materials, i.e., tin. Built-up areas and areas under plantations or near of agriculture are all considered as highly vulnerable due to the combination of livelihood importance, low resilience of structures, the dependence of the population on agricultural products and possible economic losses in the developed areas (ports, industrial and merchant areas). Similarly, a high proportion, about 62%, of the coastal area is under some form of economically and environmentally valuable forests and mangroves (with highly valuable

ecosystem services) and thus raising the overall vulnerability of the coastal region to a medium range.

Although the geographical coverage and duration of storms are sometimes small and short, the damage and losses caused by windstorms are enormous. According to the National Disaster Management Agency, approximately 150,000 persons have suffered from the impact of intense storms over the recent three years in Liberia. Damage, including falling of trees on vehicles and homes, dropping of power lines and poles, De-roofing of buildings, flying of zinc and other dangerous objects, eye injuries caused by flying dust or debris, is primarily attributed to exposure and low capacity for storm-resistant construction practices and inputs.

## **2.6 Adaptation Options**

According to World Bank climate risk profile of Liberia (2021), Liberia should recognize the importance of the country's fishing sector as a major contributor to the country's food supply, food security and livelihoods. Policies should be developed and adopted to reflect this priority accounting for climate change impacts. Robust monitoring, reporting and verification systems should be established to capture and report changes in the stock, productivity, and pressure on fisheries. Significant research is required both to fully understand the fishing pressures of projected climate change on Liberia's coasts and to understand potential impacts more fully on fishing communities (USAID, 2017).

Additionally, the risk profile also recommends findings that can inform requirements to adjust sustainable quotas, predict fish population movement and support selective breeding for aquaculture. Investment should be made to support the protection and restoration of mangroves, recognizing their role as an important habitat for aquatic species, which contributes to biodiversity and increased food product availability for consumption and livelihoods. Recognizing the potential impacts to local communities, support should be directed to the diversification of the livelihood portfolio of communities that are fishery dependent (World Bank, Open Data, 2021).

## **2.7 Socioeconomic Profile of Liberia**

Liberia is challenged with climate change. Climate change is driven by anthropogenic global warming, leading to increased frequency of extreme events in various regions of Liberia and rainfall patterns, flooding, landslides, and consequent population displacement in the affected regions. Such changes will have severe consequences for society, ecosystems, and various

sectors of the economy. Climate change threatens to create a negative development trajectory with inter-generational impacts and fuel an ongoing cycle of poverty and underdevelopment. Liberia remains fragile due to several non-climate factors, including widespread poverty, high inequality and unemployment, and limited access to essential services (water, sanitation, and energy). These non-climate factors combine with climate change processes to create significant vulnerabilities for Liberia and the national and local levels (EPA, 2019). Such vulnerability is exacerbated by high dependence on natural resource-intensive sectors that are climate-sensitive – such as agriculture, fisheries, and forestry– for economic growth and livelihood support (USAID, 2017). Without practical actions to build resilience to the expected impacts of climate change, poverty and other socioeconomic issues will likely be worsened. As a result, Liberia’s progress towards improving livelihoods and living standards for all Liberians will be undone.

Through the Environmental Protection Agency (EPA) and its partners, Liberia took its first coordinated steps to combat climate change by formulating the National Adaptation Programme of Action (NAPA) in 2008. The NAPA outlined Liberia’s most urgent and immediate needs for climate change adaptation. After this, Liberia initiated the National Adaptation Plan (NAP) process in 2010 to establish a nationally coordinated approach to addressing the country’s medium and long -term adaptation needs. Under the NAP process, the government (through EPA) has developed the National Policy Response Strategy of Climate Change (NPRSCC, 2018) and other relevant policy documents such as the National Disaster Risk Management Plan (NDMP). However, the challenges still remain enormous. Climate change will be manifested in Liberia through rising sea levels, changing precipitation patterns, higher temperatures, and more extreme weather events such as heavy rains and droughts.

Agricultural productivity, which already suffers from land degradation and extreme weather events, is even more vulnerable to a changing climate given its reliance on climate sensitive staple crops such as rice. Climate change will make existing stressors worse, for example, by contributing to the increased incidence of pests and diseases. Agriculture is also expected to be increasingly and negatively affected by the increased frequency and intensity of drought and floods due to expected long-term changes in rainfall patterns and shifting temperature zones.

Saltwater and freshwater fisheries, which are critical economic and nutritional resources, are likely to suffer as sea temperatures increase, coastal ecosystems (mangroves and wetlands) are



damaged, and changes to temperature and precipitation patterns affect water quality and availability in Liberia's surface water resources (USAID, 2017).

These impacts are already being observed in Liberia. Climate change-induced extreme events limit the ability of communities to meet their basic needs due to a reduction in the amount of productive land and pest-infestation of crops (NPRSCC, 2018). The potential impacts of climate change worldwide constitute a significant concern (Godde, Mason-D'Croz, Mayberry, Thornto, & Herrero, 2021). Moreover, as a critical factor of the earth's ecosystem, vegetation is sensitive to climate change, and its feedback has a pronounced effect on climate, hydrology, and ecology.

Significant emissions cuts over the coming decades can lower climate risks in the twenty-first century and beyond, improve the likelihood of effective adaptation, lower the long-term costs and difficulties of mitigation, and support climate-resilient development paths. Global progress in lowering greenhouse gas emissions, such as carbon dioxide, has been negligible over the past 25 years. We are already experiencing health issues including an increase in mortality due to global warming, declining biodiversity, water pollution, and air pollution. These effects have manifested themselves more rapidly and intensively than previously expected, with impacts falling disproportionately on the shoulders of the most vulnerable and most disadvantaged people. The result is increased mortality and incidence of climate-related zoonosis, heat stress, more asthma, and allergies, with resultant loss of labour productivity. In the near future we can expect increased cardiovascular and pulmonary diseases as well as mental ill-health, besides the health consequences of food insecurity, water shortage, climate migration, and territorial conflict (Lachman & Ossebaard, 2021; Pathak, Van Beynen, Akiwumike, & Lindeman, 2021).

As the impacts of climate change have become apparent around the world, adaptation has attracted increasing attention and as a result, adaptation to climate change is becoming a routine and essential component of planning at all levels (IPCC, 2013). However, adaptive capacity is limited in the developing world and among the poorest of the poor. Therefore, the need to reduce climate vulnerability and risk for the country and safeguard the country's social and economic growth trajectory against climate change remains a high priority.

## **2.8 Gender in Climate-related disaster**

The World Bank climate risks profile of Liberia (2021), reports that an increase body of research has shown that climate-related disasters have impacted human populations in many

areas including agricultural production, food security, water management and public health. The report further stressed that the level of impacts and coping strategies of populations depends heavily on their socio-economic status, socio-cultural norms, access to resources, poverty as well as gender. Key factors that account for the differences between women's and men's vulnerability to climate change risks include: gender-based differences in time use, access to assets and credit, treatment by formal institutions, access to policy discussions and decision making, and a lack of sex-disaggregated data for policy change (World Bank, Open Data, 2016).

## **2.9 The role of women in the fishery sector of the value chain**

Women are instrumental in fish production and trading activities all over the world (Figure 2). Their contribution has arguably increased through the advent of globalization and the associated increase in opportunity. In almost every region of the world, the proportion of women in the labour force has grown substantially. In transition countries, women are estimated to comprise 20% of entrepreneurs (Kwong, 2005).

Furthermore, women's participation in fishing is higher than commonly imagined. They make up 46 percent of the labour force in small-scale capture fisheries-related operations, including pre- and post-harvesting tasks, according to current estimates from nine major fish-producing countries. In many developing countries, formal statistics rarely indicate the magnitude and type of women's vital contribution to men's pursuit of fisheries as a source of income. Men might not be fishing at all if women's job was not concealed, under enumerated, and undervalued. While men are typically proud of their status as fishermen, it is unclear which identities are essential to women. Women support, complement, and subsidize men's fishing efforts in a variety of ways that we are only beginning to comprehend (Kamara, 2022).

Value-added services performed by middlemen were limited and indicative of low service value chains. Wives purchase roughly 85% and 90% of the total quantities traded during the dry and rainy seasons. They then smoke and sell to artisanal fish traders through market interactions.



Figure 2: Women involved in processing fish as part of the fisheries value chain.

Fresh fish are normally preserved for a brief period by ice blocks for only a few hours during to the lack of electricity in most part of the fishing communities (Jueseah, Knutsson, Kristofersson, & Tomasson, 2020).

### 3 METHODOLOGY

#### 3.1 Study area

The study was conducted in West Point, which is a township of the Liberian capital city of Monrovia, located on a 0.53 km<sup>2</sup> Peninsula which juts out into the Atlantic Ocean between the Mesurado and Saint Paul rivers (Figure 3). West Point is one of Monrovia's most densely populated slums with total number of inhabitants of 34,605 and household 8,439 (UN-HABITAT, 2014), divided in to six different community segments: Centre West Point, Fish Town, Grandcess Yard, Police Station, Power Plant and West Point with landing sites. It is one of Monrovia's best-known informal settlements and one of its oldest. It consists of a flat, sandy spit of land abutting the highly active Water Street market area. The area was built up in the 1940s through the deposit of sand dredged during the construction of the port facilities on nearby Bushrod Island. As a result, West Point consists largely of recovered land, leaving it in relatively unambiguous public ownership relative to virtually all other areas of Monrovia, where historical claims cannot be ruled out. According to residents, West Point was officially made one of Monrovia's townships in 1960. As many as one-third of the area's residents arrived as displaced persons during the conflict in an influx that led to the physical expansion of the

settlement. The livelihood of inhabitants is dependent on fish and fish-related activities. This fishing community consists of both Kru and Fanti fishermen.

### 3.2 Data collection and analysis

The study adopted qualitative data research methods in data collection and analysis with the overall objective to provide a better understanding of research. Empirical data was collected in the communities through focus group discussion, administering a well-structured interview guide that gathered open and close-ended responses. The data was collected by identifying

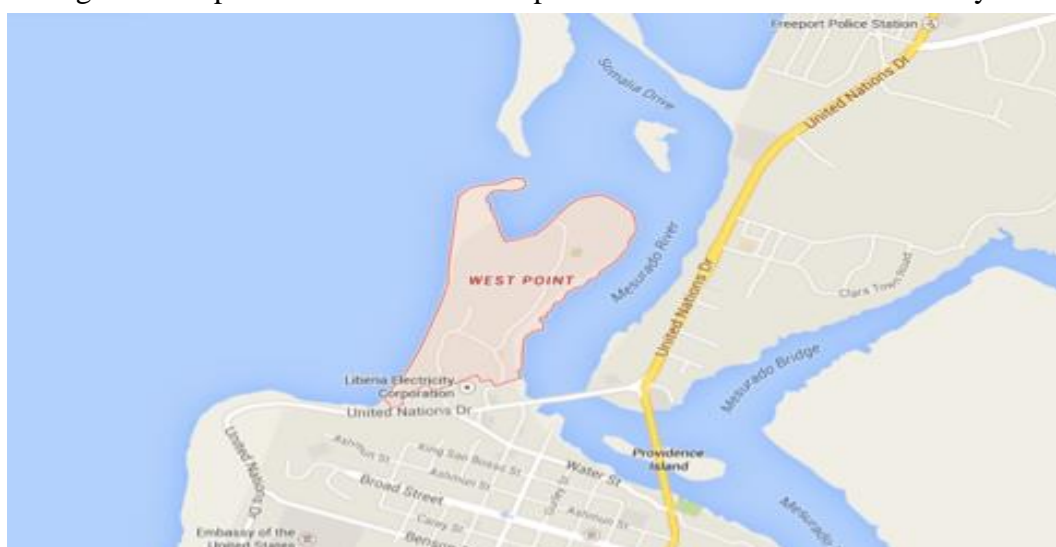


Figure 3: West Point Communities (outlined in red), Monrovia, Liberia (Tomburke, 2015).

specific groups in the value chain, including community leaders, crew members, fish processors, and boat owners. The specific information that was collected is on the effect of climate change and the socioeconomic status of fisher traders and processors in West Point Communities.

Four focus group discussions were conducted with a total of 20 participants that were randomly selected from four groups in the fisheries sector in the West Point community. The four focus groups were community leaders, fish processors/traders, boat owners, and crew members. The 20 respondents consisted of 11 males and 9 females from the two main ethnic groups that work within the fisheries sector, the Kru and the Fanti. There were three respondents from the community leader group, eight from fish processors/traders, four from boat owners, and five from crew members. The groups were coded with letters from A-D for identification and distinction while the respondents were numbered as participants 1 to 20 (P1.... P20) to create anonymity. Respondent details are shown in Table 1.

The focus group discussions concentrated on three thematic points affecting the fisheries sector in West Point community. These thematic points were: the current situation, gender roles, and climate change and adaptations. Discussions were guided by a well-structured interview guide and standardized procedure (Appendix 1).

Thematic analysis and grounded theory approaches were used to analyze the data. Thematic analysis is a technique for studying qualitative data that involves looking through a data collection to find, examine, and document recurring patterns (Braun & Clarke, 2006), while grounded theory is a theory that was generated from evidence, systematically obtained and analyzed during the research process (Bryman & Bell, 2011). The information used may come from a variety of sources, including interviews, observations, paperwork, films, newspapers, letters, or books to provide a meaningful analysis (Corbin & Strauss, 1990). The researcher can "explain a process or scheme related with a phenomenon" by using grounded theory and its methodologies in a study (Birks & Mills, 2010).

Table 1: Participants of the focus group discussions.

<b>Group A: Community Leader</b>						
Participants	Gender	Age	Position/ Occupation	Date Interview	Location	Interview Time
P1	Male	61	Community leader	4-Mar-23	WestPoint Community	45 minutes
P2	Male	54	Elder	4-Mar-23		
P3	Female	38	Chair lady	4-Mar-23		
<b>Group B: Fish Processor/Traders</b>						
P4	Female	46	Fishmonger/ trader	4-Mar-23	WestPoint Community	45 minutes
P5	Female	43	Fishmonger/ trader	4-Mar-23		
P6	Female	45	Fishmonger/ trader	4-Mar-23		
P7	Female	38	Fishmonger/ trader	4-Mar-23		
P8	Female	55	Fishmonger/ trader	4-Mar-23		
P9	Female	53	Fishmonger/ trader	4-Mar-23		
P10	Female	40	Fishmonger/ trader	4-Mar-23		
P11	Female	36	Fishmonger/ trader	4-Mar-23		

<i>Group C: Boat owners</i>						
P12	Male	35	Boat owner/Kru	4-Mar-23		
P13	Male	46	Boat owner/Fanti	4-Mar-23	WestPoint Community	45 minutes
P14	Male	47	Boat owner/Kru	4-Mar-23		
P15	Male	43	Boat owner/Fanti	4-Mar-23		
<i>Group D: Crew Member</i>						
P16	Male	28	Crew member	4-Mar-23		
P17	Male	32	Crew member	4-Mar-23	WestPoint Community	45 minutes
P18	Male	33	Crew member	4-Mar-23		
P19	Male	30	Crew member	4-Mar-23		
P20	Male	34	Crew member	4-Mar-23		

## 4 RESULTS

The Following sections are presentation of key results, organized under the same thematic headings as the interview guide used in the focus group discussions (Appendix 1).

### 4.1 Current Situation

The participants from all groups said they have been involved in fisheries activities for approximately 10 to 30 years. They all agreed that they enjoyed doing their respective jobs/roles in the fisheries sector, which is their daily responsibility and source of livelihood.

Group C and D (boat owners and crew members) said that some of them have to leave earlier in the morning (4 am) and some late at night (11 pm) to go fishing based on the fishing season and the species they are targeting while members of Group B (female fish mongers and traders) said their working hours are dependent on the arrival of boats from fishing. Groups C and D members said that they spent 8 to 12 hours on fishing activities and doing other jobs like home chores and repairing fishing materials for the rest of the day while Group B participants disclosed that most often their fish processing is done for the entire day and they sometimes do it simultaneously with home chores.

The Participants from all groups stressed the importance of their various roles in the sector. Group A participants (community leaders) used their roles to create law and order in the community, Group B participants served as a link between the fishermen and the consumers,

and Groups C and D participants go fishing to provide fish for nutrition and income generation for their families and the community. They all report that the income generated from fishing activities is not enough to take care of all their needs because of the high cost of fishing and living. The major challenges mentioned by all the participants were issues of seasonality and safety that are linked to climate change. They mentioned flooding and severe storms that cause them to put a stop to fishing activities.

*“Oh! The issues of climate change have resulted in ten deaths that occurred between February to December of 2022 while fishing over the sea. Another participant mentioned that there is a persistence of droughts, floods and overflow of water in the communities, and people to leave their various homes.”*

*Group discussion respondent*

## **4.2 Gender Roles**

Participants from all groups said they have different roles to play in the fisheries sector.

Group A consisted of both males and females that work together for the betterment of the community. They serve as the governing body to make, regulate, and enforce policies or laws that govern the fishing community. They also settle disputes and grievances amongst members of the community that includes members of the fishing community.

When asked about gender roles in the community, the majority of the respondents from the four groups said that men take on a major leadership role while females are somehow skeptical and shy away from taking leadership. For example, only one female serving as Chair Lady among the male Kru-Liberian fishing leaders, while in the Fanti- Awe Ghanaian fishery, there are few women in leadership positions.

*“Actually, we are gender sensitive within our community here but what is troubling is that whenever you designate some of the [women] to act in a position, they often shy away from said responsibility.”*

*Community Elder*

Group B is made up of both fish processors and traders and they are all female. According to the fish processors in this group, their main role is to get the fish from the fishermen through negotiation either by cash payment or on credit (sell and pay). After such negotiation, they are responsible for the processing of the fish under hygienic conditions, either by smoking which

is the most common way of preserving fish in Liberia, or by salting, freezing, icing, or sun-drying. The major fish preservation method is smoking which is primarily done using firewood.

*“They are the ones that add value to the fish and determine the quality of the fish through these preservation methods, thereby preventing post-harvest losses and making quality fish reach consumers.”*

*Group Discussion Participant*

Although most of them perform the role of both traders and processors, there are some that only process, and some only trade or sell fish. The role of the trader, according to another responder, is to buy the fish from them for a certain price or amount and transport it to the market for sale, they add extra money to make profits. One respondent said they increase the price of the fish and sell it either at various markets, restaurants, hotels and to individuals in the community. Some also buy fish from one county and travel to another county to sell to make more profits. According to members of group B, they face challenges with pricing the fish, they said years back they used to buy fish from fishermen very cheaply and when sold they generated lots of profits to pay their kids’ school fees, buy medications, take care of the home and save some (“putting susu”), but currently due to the high price of fish, it is difficult for them to make high profits. They said the business is like hand to mouth, they don’t save money for the future anymore because the profit is not enough and that buyers complain and buy less due to the high prices. When asked why they think the fishermen increased the price of fish, they said the fishermen told them they are not catching fish like before, they do not reach distances they used to reach due to stormy winds, sea waves, and other factors relating to the weather. They said lack of electricity for freezing and icing their fish, as well as inadequate storage facilities, high cost of materials for fish processing, and increase in transportation, are major challenges they are faced with.

*“When we buy fish, we can buy ice and place the fish in a big tub and use a blanket to cover the fish so that it can’t get rotten or smell. This type of processing is done because we do not have storage facilities.”*

*“Yes! we can dry the fish after the fishermen come from over sea, we buy woods, and wash the fish before putting it on the dryer because we don’t want for sand to be in the fish and after we take it to the market and sell by kilo or part.”*

*Fish Processors*

Group C consists of boat owners (Kru and Fanti Fishermen). They own canoes, having bought them at prices ranging between \$1000 to \$2,500 depending on the size of the boat. According



to the group, men highly dominate this area in fisheries, although there are a few women that own boats. Unfortunately, there were no female boat owners in these discussions. They said they make up the central part of the fishing and so they are considered stakeholders economically and socially they make the decisions in fishing. Most of them are both owners and fishermen, even though there are fishermen that are not boat owners and there are boat owners that are not fishermen. They own the most important fishing gear and because of them, the fish are on the markets and in various homes. It is the canoe or boat that crew members use to fish and it is one of the most effective artisanal fishing methods in Liberia. Their role is to go fishing at sea, bring the fish and price it. They ensure the availability of fish on the market and determine the kind of fish available. Aside from going fishing, their role is to maintain and repair the boats.

According to respondents, most of the bigger boats or canoes are owned by the Fanti and they use motorized engines of 40 horsepower, while the Kru own the majority of the smaller or paddle boats. Crew members stated that Kru canoes carry 1-3 persons to fishing while the Fanti canoes carry 15 to 20 men on each fishing trip. In addition, they added that the Kru canoes travel 3 to 6 nautical miles while the Fanti canoes travel 3 to 8 nautical miles for a fishing trip.

*“We the Ghanaian own majority of the big, big canoes due to the economic conditions of the other crew members who cannot afford to buy engine for their canoes.”*

*Group Discussion Participant*

Group D (crew members) play the role of assistant during fishing operations. They are all men that help the fishermen to fish at sea, providing any necessary assistance as needed. They guide the fishermen at sea and help with operating the fishing gear. They throw nets and help with sailing and during landing. They help in preserving the fish until landing. They work to increase catch and prevent risks at sea. They assist in cleaning and maintaining the canoes and boats. According to the group, fish is their main source of livelihood and so their lives depend on fish. They get paid based on the number of fish they catch per day and if they go fishing and the catch is low, it affects their income and those depending on them. Sometimes they don't go fishing because of bad weather and so they are unable to get paid. The weather and cost of fish materials remain a major challenge for them. Some go fishing early in the morning and come back in the evening, some also go fishing in the evening and come in the morning while others go for days. They fish for different kinds of fish species. Sometimes the fish are based on the fish seasons. Most of the fishing gear is bought in Liberia, while some Fanti buy their materials

from Ghana. They land their catches at their assigned landing sites although some fishermen land at other landing sites. According to the group some of them use protective gear like life jackets, but not all of them. The most valuable fish caught are herrings, cassava fish, grouper, porjoe, and gbarpele.

*“For me, my boss man (Fisherman) and I fix our nest and leave as early as 4 am before the day light shows up, we are already in my fishing area. We normally do this because of the distance we travel to get the fish. One of the major things we notice is that people with big, big vessels are now coming into our water to fish, so this makes things difficult for us to catch enough fish.”*

*Group Discussion Participant*

In Liberia, gender roles in the fisheries sector are customary and traditionally sensitive. It has been a tradition and custom that men head the home and go out to fetch for food while women manage the home. In the small-scale fisheries, labor is intensive, fishing crafts are small and dress codes are not defined. Based on these, fishing is typically done by men. On the other hand, the processing and value addition of the fish is done by women which is customarily considered as a home chore. When it comes to leadership, men are dominant because traditionally, they are considered the head of the home.

### **4.3 The Impact of Climate Change**

Participants in all four groups said they have experienced climate change in many ways. They have seen severe storms that have carried the roofs off their homes and destroyed the entire structure, flooding where water enters their homes, destroying their property and in some cases displacing them. According to some members, when they experience this they usually migrate to other communities or move in with friends and families temporarily.

*“Oh yes, I have been in the fishery sector for more than 30 years now and it has been because of fishing I was able to build two different houses in this West Point township but because of this same climate change the sea came and broke my house.”*

*Group Discussion Participant*

Groups C and D expressed that bad weather affects their catches and most times during the rainy season they are unable to go fishing due to fear of their canoes capsizing and resulting in lots of death. Participants mentioned that in the past the weather was not as bad as now and they were able to cover longer distances, catch more fish, and make more fishing trips than they are

now. A respondent said these were some of the reasons that the fish are now more expensive. Members of the groups said they really benefit from fishing during the dry season, because during the dry season, the weather is favorable and the fishermen can catch more fish and sell it for less.

Members of the four groups said they have participated in workshops on climate change organized by the Environmental Protection Agency (EPA). According to them, they started experiencing these changes approximately 10 years back. They reported that the sea used to be very far from them, they used to walk a bit before entering the water or sailing their boats, but currently the sea is at their doorsteps, so it is easy to believe that many changes have taken place. During the rainy season, they predict the weather by looking at the sky and linking their observations to past experiences, and they make decisions to go fishing based on that. Sometimes they are warned by their friends that went fishing earlier. They said those fishermen that are using paddle canoes are greatly affected by hash storms or winds as compared to those using engine boats. Those using motorized canoes catch more fish frequently as compared to those using paddles since they can cover longer distances.

*“Some 10 – 15 years ago, we used to walk far to go to the water to go fishing but these days the water is right to our house. The water keeps coming and taking over houses.”*

*Group Discussion Participant*

#### **4.4 Climate Change Adaptation Strategies**

Participants in the focus groups mentioned several coping mechanisms when asked about adaptation to the changes they experience. Participants in group C, for example, said they are now buying and making more durable boats to help minimize the effects of climate change on their livelihood. They buy materials that are very cost-effective, but it is all geared towards preventing them from experiencing accidents at sea and increasing catches. They were told by the government not to build houses close to the sea to prevent flooding and water from entering their homes, but most community dwellers do not listen. According to them, the government (NaFAA) has distributed free life jackets to fishermen to protect them at sea. According to a respondent, most fishermen refused to use the life jackets because they said they are not used to it, even though they are aware of the risk. Another respondent said that he does not believe all fishermen have received a free life jacket from the government, while another argued that even if the government does not provide them with free jackets, they should be able to buy their own jackets since it is not expensive.

According to the groups, even before the life jackets distributions, the government (NaFAA) grouped them into cooperatives and distributed motorized engines to help them reach far at sea and to increase their catch. Again another respondent said the engines were not enough to replace all the paddle boats.

*“We were given free engines as members of the cooperatives, but not as individuals and so it’s difficult to realize profit because of too many people. Secondly the engines were not given to all the fishermen because we are many and the engines could not cover all of us.”*

*Crew Member*

## 5 DISCUSSION

This study suggests that currently there are limited adaptation plans relating to the impact of climate change in fishing communities in WestPoint as there is no alternative livelihood to fishing. Statements from focus groups in WestPoint show that fishing communities are engaging in self-adaptation measures like buying a climate resilience fishing book and observing weather before going fishing. Extreme weather events and changes in biophysical properties of Liberia's freshwater and marine environments brought on by climate change will have a substantial impact on the ecosystems that support fish. This will have a variety of effects on food security. These include loss of some fish species due to extinction and low productivity to support local consumption, migration of many fish species to aquatic environments with ideal climatic conditions outside of Liberian waters, lower fish export earnings due to reduced fish production, resulting in a decreased capacity to import food and an increase in local food insecurity, and fisheries products and supplies. As a result, given the anticipated rise in demand for fish products, initiatives to ensure food and livelihood security must consider projections of how climate change will affect fish productivity and the social and economic effects that would follow.

### 5.1 Climate change impact on the livelihood of fishing communities in WestPoint.

Fishing Communities in Liberia such as WestPoint are exposed to extreme events like sea level rise, coastal erosions, and floods. These events have become threats to the existence of the communities and livelihoods of humans (Barange, et al., 2018). To investigate how climate change has impacted the livelihood of the fishing community in WestPoint, the study

considered focus groups that represent key actors in the community. These focus groups included community leaders, fish processors/traders, fishing boat owners, and crew members.

It was established from these key actors that in recent years, climate change has had negative impact on the livelihood of people and the community. According to interviews conducted, evidence of flooding, the encroachment of the ocean on dwelling places, and reduced catch from fishing during the rainy season (Jueseah, Knutsson, Kristofersson, & Tomasson, 2020) are major impacts being faced by the community. The fishing community in WestPoint contains approximately 1,250 full-time fishermen and one third of the 75,000 dwellers of WestPoint are dependent on fishing and fishing-related activities for their livelihood (Dunbar, Mungai, & Muthee, 2021). The continuous negative effects of climate change will greatly impact the already poverty-stricken community of WestPoint. These adverse effects of climate change have led to the relocation plan of the community by national government (Baskin, 2017).

## **5.2 Climate change influence on social wellbeing of WestPoint communities**

Discussing further with participants of the focus groups, they added that the impact of climate change has increased the already high cost of living in the communities. It has been evident from the interviews conducted that climate change impacts adversely affect the way of life in the WestPoint communities. Socio-economic activities come to a stand-still whenever there are flooding and storms. As stated in the literature review from (Dunbar, Mungai, & Muthee, 2021), community dwellers in West Point Community are highly dependent on activities such as fish processing, fish trading, assistance at sea, net repair, and boat maintenance.

There are other socio-economic activities such as the use of firewood to smoke fish and the mining of sand from the beaches for construction purposes that exacerbate climate change impacts and require urgent attention. The major methods used to process and preserve fish are freezing and smoking. Fish processors who are predominantly women and stand at high risk of climate change impact, use firewood fetched from coastal mangrove forests to smoke fish. The depletion of coastal mangrove forests increases community vulnerability to climate change induced events like coastal erosion and flooding (Alongi, 2002).

## **5.3 Adaptation strategies in cases where climate change has been identified as negatively affecting social and economic living conditions in West Point Communities**

Climate change adaptation is the ability of a system to adapt to climate change (including climate variability and extreme weather events), to mitigate possible harm, to seize

opportunities, or to deal with the effects (IPCC, 2007). Building adaptive capacity is a priority, especially for those who are most at risk. In some circumstances, lowering exposure or sensitivity to climatic effect is also necessary to lessen susceptibility to climate change. For human systems to adapt, a wide range of stakeholders must be involved at various levels and across many industries. Analysis of current climate shock and stress exposure is necessary, as is model-based analysis of potential future climate consequences. It necessitates an awareness of the vulnerability that people, households, and communities currently face. Strategies for adaptation can be created and put into action using this information. Critical elements of the process include knowledge transfer and sharing, monitoring, and evaluating the efficacy of actions, and documenting lessons learned.

The result of the study shows a vivid adverse impact of Climate change on the fishing communities in WestPoint. The evidence of flooding, damage to properties and forceful migration due to climate induced events is alarming. Storm surges and coastal erosion are projected to cause harm to habitats and breeding grounds, further impacting depleted fish stocks. Moreover, there is a lack of regulatory and legal framework to enforce habitat conservation (USAID, 2017).

#### **5.4 Research Gap and Future work**

This study conducted focus group discussions in fishing communities in Westpoint, a township in the suburb of Liberia's capital city, Monrovia, to determine how climate change is affecting people's livelihoods and socioeconomic activities as well as the adaptive strategies that are being employed. The findings of this study may not be applicable to fishing communities located far from Monrovia because they are based on practiced-based uncertainty for communities in Westpoint. The government, the environmental protection agency, international and local non-governmental organizations, as well as the present focus groups included in this study, should all be involved in subsequent investigations to acquire more information.

## **6 CONCLUSION AND RECOMMENDATIONS**

A thematic analysis and grounded theory approach was used to assess the effect of Climate change effects on the socio-economic activities of the fishing communities in WestPoint. Based on the analysis of empirical data gathered from focus groups, it can be concluded that climate change has major negative effects on the socio-economic activities of fishing communities in WestPoint and there are limited adaptative measures to prevent it.

Based on the results of the study and the above conclusion, the following recommendations can be made:

- Support artisanal fishing communities by providing funding for training, fishing equipment, and alternate sources of income.
- Promote research to fully comprehend challenges on fisheries related to consequences of climate change and identify relevant responses, including diversifying the portfolio of livelihoods of populations depending on fishing.
- Guarantee that fisheries are incorporated into larger development planning, fully integrate fisheries into national food security and climate change adaptation strategies (and write and enact them where none currently exist).
- Promote the diversification of the communities that depend on fishing for a living.
- Encourage the creation of early warning systems to identify potential risks and threats to fisheries.
- Encourage the development of better networks for information and communication inside and among fishing communities to facilitate information sharing about potential systemic shocks.

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## 7 APPENDIX 1. DISCUSSION GUIDE

### 7.1 Introduction

These focus group discussions are intended to collect primary data on the impact of climate change on the social economic status of the fishery sector of Liberia with key emphasis on the value chain within the WestPoint fishing community. The research will provide a comprehensive report to GRO-FTP which is being sponsored by United Nations (UNESCO). This program is being designed to build the capabilities of staff actively involved with fisheries and aquaculture sectors in developing countries, including Liberia.

These discussions aim to explore how climate change has affected fish value chain actors and develop some sound strategies and policy recommendations to mitigate these challenges for the sustainability of the fishery sector. This discussion is expected to take approximately 30 to 40 minutes to be completed and is divided into five thematic areas: the current situation, gender roles, climate change, and adaptive strategies and policies.

The process of collecting this empirical data is done on a voluntary basis. Responses will be treated with anonymity and all information provided would be treated confidentially and used only for research purposes.

### 7.2 The current situation

Tell me about your role in the fishery sector

*Follow-up questions (if needed):*

*What are your tasks (fishing, processing, trading, etc.)?*

*How long have you been involved in the fisheries sector?*

*Why is your role important?*

*Is it something you enjoy doing?*

*How is your income like?*

Can you describe to me a typical day?

*Follow-up questions (if needed):*

*When do you have to get up?*

*What type of activities are you involved in?*

*How big part of the day is for working in the fisheries sector and how long on other things (household chores, taking care of children, free time, etc.)*

What are your main challenges in daily life?

*Follow-up questions (if needed):*

*Do you have enough time for your daily activities?*

*Do you have enough support around you?*

*Do you feel financially secure?*

### 7.3 Gender roles

How are the roles of men and women differing in the fisheries sector?

*Follow-up questions (if needed):*

- What are the works for men when it comes to fishing?*
- What are the works for women as it relates to fishing?*
- Are there some works that men cannot do?*
- Are there some works that women are not allowed to do?*
- Who owns most of the canoes?*
- Why is it this way?*

What are the responsibilities of men and women in the home and within families?

*Follow-up questions (if needed):*

- Who does the cooking?*
- Who is responsible for cleaning the house?*
- Who takes care of the children?*
- Who brings in most of the income?*
- Who keeps the money?*
- Who pays the bills (water, electricity, tuition, transportation, etc.)?*

What is the role of men and women in the community?

*Follow-up questions (if needed):*

- Who occupies important positions?*
- Who sits on committees?*
- Who is in a leadership role when making joint community decisions?*
- How many women and how many men?*
- Are women consulted in making major community decisions?*
- Do the women partake in the leadership selection?*

What are some rare laws, taboos, or norms in this fishing community?

*Follow-up questions (if needed):*

- Are the laws gender sensitive?*
- What are examples of laws/policies that marginalize people in the community?*
- Who does law enforcement in the community?*
- What happens when you break the law, (go to jail, fines, etc.)?*

Which types of activities in the fisheries do you conduct?

*Follow-up questions for women fish traders & processors:*

- How do you get your fish?*
- How do you preserve your fish?*
- Are there challenges in getting the fish, processing, and preserving your fish?*
- What are they? Name examples*
- How do you prize your fish?*
- How profitable is selling fish for you?*
- Is the money you received from fishing/selling fish enough to take care of your needs?*

*Follow-up questions for crew members and vessel owners:*

- Can you explain the fishing process?*
- What kind of fishing do you do?*

*How many of you are on the boat?*  
*How much does it cost you to fish (gear, food, fuel, salary, etc.)?*  
*How far do you go on the Sea to fish?*  
*When do you go fishing?*  
*How many hours do you spend fishing?*  
*Do you face challenges at sea? What are some challenges?*  
*Where do you buy or get your fishing gear from?*  
*Do use protective gear?*  
*What is your most catch species and quantity?*  
*Where do you land your catch?*

#### **7.4 Climate change and its impacts**

Have you noticed/experienced any changes in the weather in this community compared to what it was some years ago?

*Follow-up questions (if needed):*

*If yes, what type of changes? Can you give examples?*  
*What have you heard about climate change?*  
*When did you first notice there have been significant changes in climate/weather patterns?*  
*Do you experience flooding/drought in this community?*  
*Have you observed the sea coming closer to the community?*  
*Are you aware of climate change's impact on nature and society?*  
*Do the changes in the weather affect fishing activities?*  
*Which season is the best for fishing activities?*  
*Have you experienced any changes in the quantities of catch per season?*  
*How or where do you hear to get information about the weather?*

#### **7.5 Adaptive strategies to climate change**

What actions have been taken to minimize the impact of climate change in this community?

*Follow-up questions (if needed):*

*Is the community or government have a policy in place to minimize the impact of climate change? If yes kindly explain.*  
*How has adapting to the changes in weather been for this community?*  
*Have you ever received any capacity-building training like a workshop, or seminar on changes in weather and fishing?*  
*Are you aware of any government policies or interventions from the government or other NGOs that are dealing with climate change?*  
*What are the monitoring tools or strategies being developed to safely guide the environment in this community?*

#### **7.6 Discussion Group Procedures**

- Visit the community to schedule a meeting date and venue for the discussion group.
- Send a reminder text or call before the group discussion.
- Make a note of the date, time, and location of the interview

- Start with recording/ writing the name of the group, occupation, and number of participants in the group,
- Ask for permission to record the interview
- Start with an explanation of the purpose of the interview, how the information obtained will be used, and an assurance of confidentiality.
- Avoid jargon except when interviewing technical experts
- Start with factual questions. Questions that require opinions and judgments should follow later. In general, start with the present and move on to questions about the past or future.
- Phrase questions carefully to obtain detailed information. Avoid questions that can be answered with a yes or no. For example, questions such as “Please tell me about your role in the fisheries sector?” are better than “Do you know about your role in the fisheries sector?”
- Encourage informants to detail the basis for their conclusions and recommendations. For example, an informant’s comment, such as “The has affected has really changed things around here,” can be probed for more details, such as “What changes have you noticed?” “How has it affected your work in fishing or income?” “Can you give me some specific examples?”
- Remain neutral at all times. Do not express strong views on the subject under discussion. Neutrality is essential because some informants will say what they think the interviewer wants to hear.
- Be sensitive
- Sometimes while answering one question, it is possible that the respondent will have answered some other questions as well. In that case, there is no need to repeat or ask the questions already covered.
- Take notes and develop them in detail immediately after each interview to ensure accuracy. Use a set of common sub-headings for interview texts, selected with an eye to the major issues being explored. Common subheadings ease data analysis