



**WASCAL**

West African Science Service  
Centre on Climate  
Change and Adapted Land Use

FACULTY OF ARTS AND HUMANITIES  
DEPARTMENT OF GEOGRAPHY  
**MASTER RESEARCH PROGRAM ON CLIMATE CHANGE AND HUMAN SECURITY**

Social Vulnerability to Coastal Erosion: Empirical Assessment of Gunjur Village  
in The Gambia

**Thesis No.....**

Thesis submitted in fulfillment of the requirements for the Master Research Degree

**Domaine:** Humanity and Social Sciences

**Mention:** Climate Change

**Specialty:** Human Security

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*October 2015*

### **Disclaimer**

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## **DEDICATION**

To

- My father, Albert W. Gomez and my mother, Julia D. Innis for all their sacrifices.
  
- My dear wife, Isatou Colley, and son, Serigne Fallou Gomez, for their encouragement, patience and endurance during my Masters Research Program.

## **ACKNOWLEDGEMENTS**

I am very grateful to Almighty Allah for the grace given to me to be part of this innovative Masters Research Program. I would like to specially thank the German Federal Ministry of Education and Research (BMBF) that funded the program and the West African Science Service Center on Climate Change and Adapted Land Use (WASCAL) for offering me the Master Research Program in Climate Change and Human Security Scholarship.

Furthermore, I am indebted to all lecturers who have imparted their knowledge on me, in one way or the other, during my course work period at the University of Lomé. I am particularly grateful towards Prof. Kouami Kokou, Director of WASCAL Togo, Professor Adote Blim Blivi, Dr. Aklesso Egbendewe-Mondzozo, Dr. Georges Abbey, Prof. Agbeko Kodjo Tounou, Prof. Jean Sogbedji, Miss Sefako and other members of staff in the academic and management team of WASCAL, Université de Lomé for their training, guidance, encouragement and support.

I am grateful to the mentorship of my thesis supervisor, Prof. Olatundun Janet Adelegan, Director of Capacity Building at WASCAL Headquarters Accra, Ghana; as well as to my co-supervisor Mr. Dodou Trawally, Director of Technical Services Network, National Environment Agency, The Gambia for his support and guidance. I thank all my colleagues for their support and meaningful company; it was an immense pleasure to have met you all. Special appreciation to Joshua Ntajal for assistance rendered in the vulnerability analysis, Kebba Bah, Lamin Jammeh and Buba Touray for their support during the field survey, and to Ousmane Diouf Sane from batch1 MRP CCHS. Thereon, my appreciation goes to the Alkalo of Gunjur Omar Jiki Darboe and the people of Gunjur for their hospitality and support during my field work.

Moreover, I am thankful to the staff of the National Environment Agency, especially the Executive Director, Mrs. Ndey S. Bakurin, for allowing me a study leave to participate in this Masters Research Program. And finally, to my relatives: George N. Innis and Elizabeth Innis. Hitherto, I would like that everyone that I could not mention here find the expression of my deepest gratitude.

It is my earnest prayer that Almighty Allah rewards all of you bountifully (Amen).

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## **List of Acronyms**

CZMF-Coastal Zone Management Framework

DIVA- Dynamic and Interactive Vulnerability Assessment

FGD- Focus Group Discussion

GBA- Greater Banjul Area

GBOS- Gambia Bureau of Statistics

GDP- Gross Domestic Product

GEAP-Gambia Environment Action Plan

GFLS- Gunjur Fish Landing Site

GHG's- Green House Gases

GIS- Geographic Information System

GMD- Gambian Dalasis

GNAIP- Gambia National Agricultural Investment Plan

GPS- Global Positioning System

HH- Household

IPCC- Intergovernmental Panel on Climate Change

MDGs- Millennium Development Goals

MT- Metric Tonnes

NAPA- National Adaptation Plan of Action

NEA- National Environment Agency of The Gambia

NGO's- Non-Governmental Organizations

PAGE- Program for Accelerated Growth and Employment

SOER-State of the Environment Report

TBA-To Be Advised

UNDP- United Nations Development Program

UNEP- United Nations Environment Program

UNFCCC- United Nations Framework Convention on Climate Change

USD- United States Dollars

WCR-West Coast Region

## **ABSTRACT**

Gunjur village in Kombo South West Coast Region, The Gambia is like several Gambian rural coastal communities vulnerable to the negative impacts of coastal erosion. Wherein such negative impacts are felt by the rural community and influences deleteriously on their livelihood and well-being. Therefore, there is the urgent necessity to reduce the vulnerability of community members such as farmers, fishermen, fish smokers, fish mongers to the impacts of coastal erosion. Furthermore, measuring vulnerability is a key to effective risk reduction and the promotion of a culture of disaster resilience.

Thereupon, this study assesses the social vulnerability of households to coastal erosion in Gunjur village by using the MOVE framework. Primary data is obtained through questionnaire administration, Focus Group Discussion (FGD), expert interview and portable GPS Receiver; while secondary data is obtained from published technical documents, and already published related research. The data is analyzed using Statistical and GIS tools. Meanwhile, the study identifies the socio-economic characteristics, the level of exposure, susceptibility, and lack of resilience of the concerned coastal community.

Moreover, most of the households interviewed are resource poor and at the same time vulnerable to a slow and creeping hazard such as coastal erosion amidst a changing climate and variability. The key finding during the social vulnerability assessment is that women are more vulnerable than men. This is true when considering things such as the high unemployment rate, illiteracy rate, the percentage of women with no ownership of land, reliance on rain-fed agriculture and the heavy dependence on scarce natural resources like firewood. Thus, the urgent necessity for government and relevant authorities to empower women so that they can realize their full potential, and take their rightful place in national development.

Amongst the things recommended, are construction of break waters and groins (hard engineering) at strategic locations along the Gambian coast, beach nourishment project (soft engineering), alternative livelihood activities, a robust well integrated policy framework for Climate Change and Natural Resource Management that takes into account sound adaptation and mitigation measures; this will in turn avoid mal-adaptation, build resilience at all levels, thereby reduce vulnerability and enhance human security.

**Keywords:** Coastal erosion, climate change, Gunjur, household, resilience and vulnerability.

## RESUME

Le village de Gunjur situé à Kombo, Sud-Ouest de la région costale en Gambie est semblable aux communautés costales rurales vulnérables aux impacts négatifs de l'érosion côtière. Dans les zones où de tels impacts négatifs sont sentis par la communauté rurale, l'érosion côtière influence dangereusement leurs moyens d'existence et bien-être. Par conséquent, il est urgent de réduire la vulnérabilité des membres de la communauté tels que les agriculteurs, les pêcheurs, les fumeuses et les vendeuses de poissons aux impacts de l'érosion côtière. Par ailleurs, mesurer la vulnérabilité est une clé pour la réduction effective du risque et la promotion d'une culture de résilience aux catastrophes.

Cette étude a évalué la vulnérabilité sociale des ménages à l'érosion côtière dans le village de Gunjur en utilisant le modèle conceptuel MOVE. Les données primaires ont été collectées en utilisant les questionnaires, le focus group, l'interview avec les personnes ressources et le récepteur du GPS portable alors que les données secondaires ont été obtenues à partir des documents techniques et les résultats de recherche déjà publiés. Les données ont été analysées à l'aide des outils statistiques et de GIS. Aussi, l'étude identifie les caractéristiques socio-économiques et le niveau d'exposition, susceptibilité et manque de résilience des communautés costales concernées.

De plus, la majorité des ménages interviewés sont pauvres en ressources et au même moment sont vulnérables à une catastrophe lente telle que l'érosion côtière dans un climat de changement et de variabilité. Il ressort comme résultat clé de l'évaluation de la vulnérabilité sociale que les femmes sont plus vulnérables que les hommes. Ceci est d'autant plus vrai lorsque nous considérons les facteurs tels que le taux élevé de chômage, le taux d'alphabétisation, le pourcentage de femmes ne possédant pas de terres, le fait de s'appuyer sur l'agriculture pluviale, la grande dépendance des ressources naturelles rares telles que le bois de feu. Par conséquent, il urge que le gouvernement et les autorités adéquates équipent les femmes afin qu'elles déploient leur plein potentiel, et occupent leur vraie place dans le développement national.

Parmi les choses recommandées, il y a la construction des brise-lames et des arêtes (infrastructures lourdes) à des endroits stratégiques le long de la côte gambienne, le projet d'alimentation de la plage (infrastructures légères), les activités alternatives génératrices de revenus et un contexte politique solidement établi pour les changements climatiques et la gestion des ressources naturelles qui prend en compte les mesures effectives d'adaptation et de mitigation ; ce qui au retour évitera la mal-adaptation, construira la résilience à tous les niveaux, ainsi réduira la vulnérabilité et améliorera la sécurité humaine.

**Mots-clés :** Erosion côtière, changements climatiques, Gunjur, Ménage, résilience et vulnérabilité.

## Chapter 1

### 1.1. Introduction

The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea-level has risen, and the concentrations of greenhouse gases have increased (IPCC, 2013). Moreover, the ocean has absorbed about 30% of the emitted anthropogenic carbon dioxide causing ocean acidification (IPCC, 2013). Globally, different set of scenarios predicted that sea-level would continue to rise between 0.18 to above 0.80 cm (IPCC, 2007). The Intergovernmental Panel on Climate Change (IPCC) in its Fifth Assessment Report 2013, report that the rate of Sea-Level Rise since the mid- 19<sup>th</sup> century has been larger than the mean rate during the previous two millennia (high confidence). Over the period 1901-2010, global mean sea-level rose by 0.19 (0.17 to 0.21 cm) (IPCC, 2013). Ocean thermal expansion and glacier mass loss are very likely the dominant contributors to global mean sea-level rise during the 20<sup>th</sup> century. It is very likely that warming of the ocean has contributed 0.8 (0.5 to 1.1) mmyr<sup>-1</sup> of sea-level change during 1901-2010.

Furthermore, most of the world's sandy shorelines retreated during the past century (National Research Council, 1990; Leatherman, 2001; EuroSION, 2004) and sea-level rise is one underlying cause. Major coastal impacts will result from accelerated sea-level rise; these effects will include coastal erosion, saline intrusion, and sea flooding, among other impacts. Impact studies have confirmed that low-lying deltaic and barrier coasts, low reef islands, and coral atolls are especially vulnerable to the potential impacts of sea-level rise (Maul, 1993). In addition, there is likely to be an increase in coastal erosion and inundation of what are now densely populated low-lying areas, such as the Victoria Island beaches in Lagos, Nigeria, and the Greater Banjul Area in Gambia (Jallow *et al.*, 1996; UNEP 1999).

One half or more of the Mississippi and Texas shorelines have eroded at average rates of 3.1 to 2.6 m/ year since the 1970s, while 90% of the Louisiana shoreline eroded at a rate of 12.0 m/year (Morton *et al.*, 2004). In Nigeria, retreat rates up to 30 m/year are reported (Okude and Ademiluyi, 2006). Coastal squeeze and steepening are also widespread as illustrated along the eastern coast of the United Kingdom where 67% of the coastline experienced a landward retreat of the low-water mark over the past century (Taylor, 2004).

Additionally, an acceleration in sea-level rise will widely exacerbate beach erosion around the globe (Brown and McLachlan, 2002), although the local response will depend on the total sediment budget (Cowell *et al.*, 2003a, b).

In addition, some small islands could suffer land loss and experience increased beach erosion, inundation, and flooding from a sea-level rise of between 50 cm and 1 m (Leatherman, 1994). However, islands are not passive systems; they will respond dynamically in variable and complex ways to sea-level and climate changes (Aalbersberg and Hay, 1993; McLean and d'Aubert, 1993; McLean and Woodroffe, 1993).

## 1.2. At Study Site Level

The risk associated with changing climate-induced damage to human and economic development in coastal areas of The Gambia is increasing. When we look at the effects of sea level rise, changes to natural sediment dynamics and erosion of coastal embankments amongst other factors pose a serious threat to the natural resource base and livelihood opportunities of coastal communities. In addition to recurrent and rapid onset of extreme events (i.e. flooding), Gambia's coastal zone is being confronted with a range of "creeping" or slow climate risks (**Risk = Hazard \* Vulnerability/Capacity**), such as dynamic changes in coastal sediment dynamics and morphology, increasing salinity level trends in coastal freshwater resources, sewage problems, and a threat in the functioning of coastal protective ecosystems, for example, mangroves. Photo 1.1 shows coastal erosion at Senegambia beach and Banjul ports.



**Photo 1.1 Coastal erosion at Senegambia and Banjul port**

Due to The Gambia's low lying coastal area, the low lying and sandy beach areas hence receive intense and strong waves as compared to coasts that boast of high topography and rocky beaches that have the natural ability to reduce the impact of incoming violent waves. Photo 1.2 shows beach nourishment along Kotu beach area.





**Photo 1.2 Beach nourishment along Kotu**

Thus, the research study aims to undertake a social vulnerability to coastal erosion and an empirical assessment of Gunjur village in The Gambia.

### **1.3 Problem Statement**

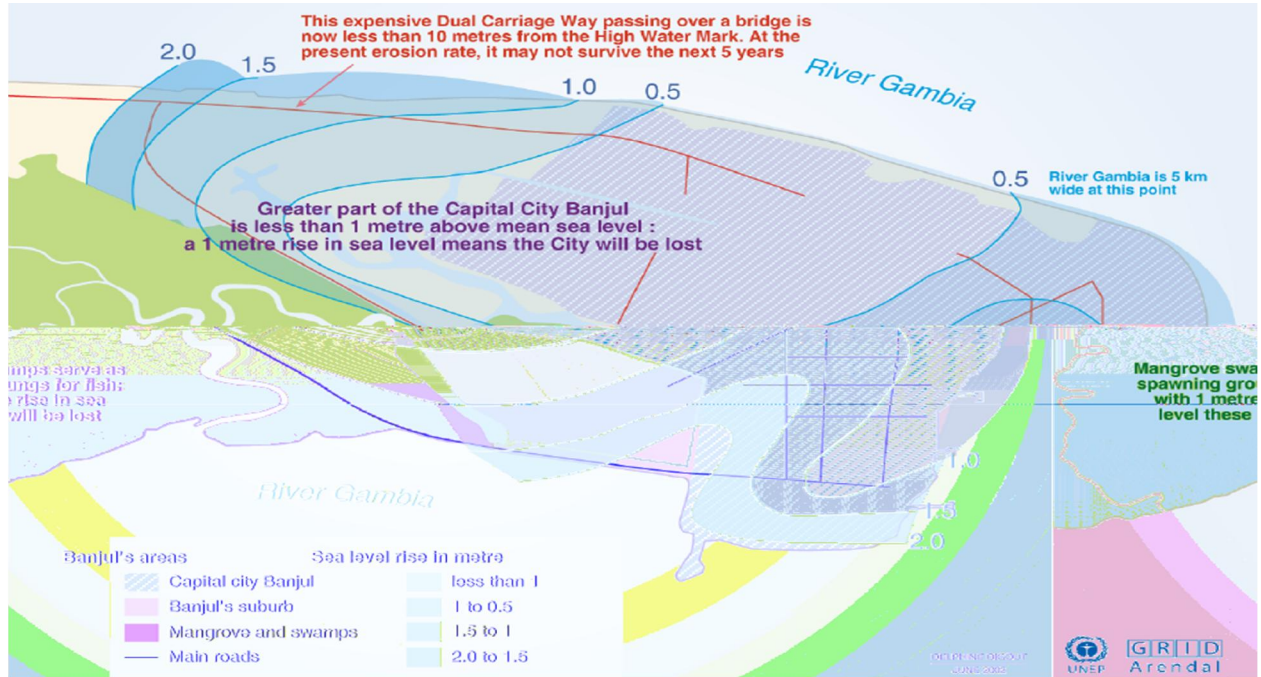
Hitherto in The Gambia, the coastal and marine biodiversity is seriously threatened by coastal erosion, sand mining and pollution. The rate of erosion of The Gambia coastline has been estimated to be 1-2 meters per year amounting to a land loss averaging 2.5- 3.0 hectares of land per year or 200,000- 300,000 m<sup>3</sup> per year (Delft hydraulics, 1992). Furthermore, according to recent studies and model projections by the year 2100, a 1.2 meters rise in sea level will mean the total flooding and loss of the capital city of Banjul. In addition, according to UNEP, The Gambia is among the top ten (10) most vulnerable countries to coastal erosion and sea level rise due to its low lying nature.

Considering the numerous problems in the wetlands and coastal ecosystems, fragile early warning systems, mangrove zones (such as the Mono-specific stands, racemosa intertidal zone, mixed rizophora and avicenia zone, tannes and grass), aquatic ecosystems, biodiversity and terrestrial ecosystem.

So far, the coastal zone has been one of The Gambia's most valuable assets. Many economic and commercial activities take place there, fishing and tourism being the most important. Many resources in the coastal area are very sensitive and show signs of serious degradation (for example, coastal erosion in Palmarima and Senegambia Beach area), threatening the quality of the ecosystems and the subsistence of the coastal communities.

Meanwhile, the *coast line* is the western demarcation of the country on contact with the Atlantic Ocean. It is relatively short, stretching over a length of about 80 km from Karang in the North to Kartong in the South. The coastal zone spreads from the coastal line eastwards, up to some 200 km into the country. The territory is separated in a northern and southern part

by the River Gambia. For the purpose of this research, the inland limit of the coastal zone is taken as the boundary of the Greater Banjul Area (GBA) as this is the official planning area for urban development in the country, where major economic and industrial activities are developing. Figure 1.1 shows the impact of sea level rise projection in Banjul.



**Figure 1.1 Impacts of sea level rise projection in Banjul. Source: as adapted from Brown *et al.* (2011).**

**Table 1.1. Sea Level Rise Scenarios in The Gambia.**

	2025	2050	2075	2100
Relative sea-level rise (since 1995) (m)	0.13	0.35	0.72	1.23
Total cost of residual damage (US Dollars million/yr)	1.2	71.9	113.4	313.4
Population flooded (thousand/yr)	4.0	76.0	126.5	137
Land loss (submergence) (km <sup>2</sup> /yr)	0.0	34.3	113.4	9.8
Net land loss (erosion) (km <sup>2</sup> /yr)	0.1	0.1	0.2	0.4
Sea flooding costs (\$ million/yr)	1.2	10.0	51.6	146.4

**Source: Royal Haskoning, 1999**

When examining the work of (UNEP, 1982; Ibe, 1998; Delft hydraulics, 1992; Delft hydraulics, 1995; Royal Haskoning, 1999; Blivi, 2001; Brown *et al.*, 2011), and many more, one will observe that most of the current literature on coastal erosion focuses more on the ecological and physical aspect (vulnerability, coastal sediment dynamics, wave climate, coastal vegetation etc.).

Meanwhile, when considering the works of Virginia Burkett and Margaret Davidson, Coastal Impacts, Adaptation, and Vulnerabilities, A Technical Input to the 2013 National Climate Assessment; and New Jersey's Coastal Community Vulnerability Assessment and Mapping Protocol, Office of Coastal Management New Jersey Department of Environmental Protection, December 2011; one can note that the issue of social vulnerability to coastal erosion was not in-depth.

Whilst Lele Zou and Frank Thomalla in their research, The Causes of Social Vulnerability to Coastal Hazards in Southeast Asia, Stockholm Environment Institute, Working Paper- 2008; social vulnerability to coastal erosion was in-depth but at a much wider regional scale (that is Southeast Asia). Thus looking at social vulnerability to coastal erosion amidst a changing climate at the village or community level is very important, better still to downscale from regional and national levels to the local village level. So as to hear the story from the horse's mouth and come up with adaptation and mitigation strategies that are suitable to the realities being faced by the grassroots people at the community level.

Thus, more research focusing on the social aspect of coastal erosion at the village or community level is very essential; because saving people's lives and properties should be among our top priorities if not the top. Hence, it is important to look into the socio-economic component and activities along the coast. As we know majority of the population of coastal countries live along the coast and hence various socio-economic activities that have a significant contribution to Gross Domestic Product (GDP) like tourism, fishing, agriculture, manufacturing, real estate, and many other business activities, to mention a few.

Interestingly, the purpose of this research is to assess socially how vulnerable the concerned coastal community is to coastal erosion. Furthermore, it is expected that this research will contribute to generating relevant knowledge in the area of social vulnerability to coastal erosion. This in turn will help us to know priority areas of action for adaptation and

mitigation, enhance smart policy design and implementation; thereby building resilience to the negative impacts of climate change and enhancing human security. Novel findings which will help to excite further inquiry to gain deeper insight into related research in the future would also be made.

#### **1.4 Objectives of the research**

##### **Main Objective**

- To assess socially the extent to which the concerned coastal community is vulnerable to coastal erosion

##### **Specific Objectives**

- To identify the socio-economic characteristics of the concerned coastal community.
- To analyze the exposure, susceptibility and the lack of resilience of the concerned coastal community to coastal erosion.

#### **1.5 Research Questions**

- What are the socio-economic characteristics of the concerned coastal community?
- How exposed, sensitive and resilient is the concerned coastal community to coastal erosion?

#### **1.6 Organization of the Study**

Chapter 1 introduces the paper, states the problem, the objectives and raises the research questions. Chapter 2 deals with literature review on coastal erosion, and highlight gaps in literature. Chapter 3 examines the area of study, methodology, data collection and analysis process to answer the stipulated research questions. Chapter 4 shows in details empirical results on the social vulnerability assessment of the concerned coastal community to coastal erosion. Chapter 5 concludes the paper, makes recommendations, suggests the way forward for future research and shows the limitations of the study.

## **Chapter 2: Literature Review**

### **2.1. Agriculture and Fisheries**

The economy of The Gambia has a dynamic base largely dependent on climate sensitive activities such as crop production, livestock, fisheries, energy and water resources. The Gambia has already acknowledged in its initial National Communication to the UNFCCC in 2003, key climate change impacts in relation to the aforesaid activities. Artisanal fishing boats and industrial vessels operate in the zone and up-to-date available figures show that fish capture progressively increased from 32,016 in 2001 to 42,645 MT in 2008 and that this sub-sector contributes approximately 12% to the GDP (UNDP, 2012). Another sector of significance to the economy in this zone is the horticulture sub-sector which produces and exports vegetables and flowers.

Rice is the staple food of the country. The country's consumption requirement of rice is 160,000 metric tonnes per year, of which only about 7,400 metric tonnes of clean rice is produced locally. Thus, the country only produces 4.6% of its annual requirements. Proof exists that over 70% of the imported food stuff in the country can be produced locally with better planning and support services (PAGE, 2011). Nonetheless, saline intrusion in the productive rice growing areas along The Gambia River and accompanying creeks is currently plummeting productivity or leading to withdrawal of cultivation from affected areas.

The fisher folk and agricultural workers make up the two sectors with the uppermost levels of poverty (PAGE, 2011). In terms of fishery potential, The Gambia enjoys a strategic location with its coastal waters located in an upwelling zone, exactly in the East Central Atlantic Zone; the sixth most productive fishing area in the world (Douglas, 1988). Meanwhile, the artisanal sub-sector is characterised by low levels of investment and operations from many discrete and often remote landing sites. The artisanal sub-sector provides about 70 to 80% (1992-1998) of total fish catch. The overall artisanal production volume of fish in 1998 was about 26,500 tons which has been augmented to about 29,750 tons in 1999 (Royal Haskoning, 1999). An overall of 11 fish landing sites for artisanal fishermen are established along the coast. The locations, in order of prominence in terms of total tonnage of fishing and share of Bonga fish in total tonnage, are shown in (Table 2.1) for the year 1995 and 1999.

**Table 1.1. Total fishing by landing site and share of Bonga fish in total fishing in 1995 and 1999.**

<b>Fish landing site</b>	<b>Total fishing in 1995 (in metric tonnes)</b>	<b>Share of Bonga fish in total fishing per landing site 1995 (in %)</b>	<b>Total fishing in 1999 (in metric tonnes)</b>	<b>Share of Bonga fish in total fishing per landing site 1999 (in %)</b>
Gunjur	6,806	67.2	8,526	86.7
Tanji	4,573	99.6	7,371	100.0
Bakau	2,652	93.4	3,736	97.1
Brufut	2,011	4.5	4,233	1.1
Banjul	1,706	0.25	2,068	0
Jeshwang	1,612	100.0	2,731	100.0
Sanyang	477	52.8	365	0
Kartong	297	31.7	142	24.0
Tu/Bato	115	56.1	96	4.9
Kololi	100	3.0	83	0
Barra	4	0	397	79.9
Total	20,356	67.4	29,754	72.3

**Source: Royal Haskoning, 1999**

## **2.2. Climate Change Impacts – Socio-economic**

In terms of Climate Change, the socio-economic effects for the coastal hinterland of The Gambia are likely to be large. Coastal communities are economically vulnerable to climate change in The Gambia, as sectors such as agriculture (poor crop production due to saline intrusion impacting on rice production etc.), tourism (loss of beach area), and fisheries (possible impact of beach erosion on landing facilities on the coast etc.) all manifest themselves on the capacity and ability of existing livelihood to perform to current level livelihood economic proceeds for families and businesses (UNDP, 2012). The very fact that The Gambia is one of the top ten countries in the world with the uppermost share of population living within lower elevation coastal zone (Bakurin *et al.*, 2010) compounds this issue further.

It was projected by using the DIVA model that an expected sea-level rise of 0.35m by 2050 would lead to flooding of 76,000 people per year and with a sea-level rise of 1.23 m in 2100, 137, 000 people will be flooded per year (Brown *et al.* 2011). It is also important to note that this area includes the somewhat fragile socially and economically significant tourism sector.

Moreover, the total cost of sea level rise for The Gambia, combining costs of land loss, forced migration, salinization, sea floods and river floods is projected to be US\$71.9 million per year for 2050 and US\$313.4 million per year for 2100 (Brown *et al.* 2011). Interventions (and complementary actions such as the work through GNAIP) are in search of improving low-land rice growing by supporting the construction of water retention, anti-saline and flood protection dykes, installation of tidal gates and other flow control structures.

Alongside the loss of productivity in the agricultural systems, especially on the staple rice-crop, and increasing erosive forces threatening tourism livelihood, there are likely to be direct effects of climate change on health. Whilst precise predictions cannot be made, it is likely that incidence of malaria, dengue and yellow fever will increase; more recurring flooding will expose a larger population to *Bulinus* snails carrying Schistosomiasis as well as intestinal infections (NAPA, 2007).

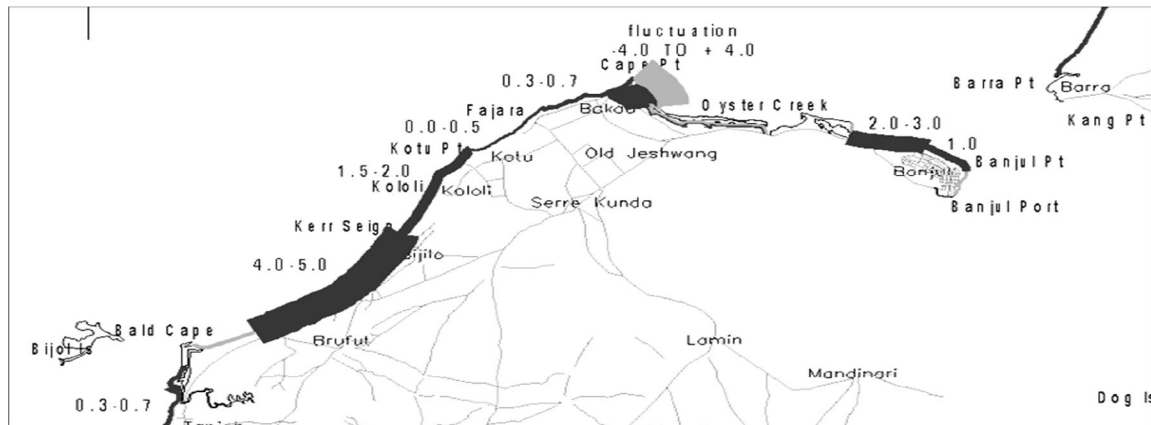
Furthermore, climate change impacts could potentially be severe because they exasperate other issues which are believed to increase the vulnerabilities in the coastal zone. Other factors affecting vulnerability of the coastal area include (i) uncontrolled and unplanned urbanization (ii) haphazard planning of the coastal area, and (iii) unsustainable agricultural and oyster culture practices resulting in habitat degradation of coastal vegetation ecosystems such as the mangroves which are reproducing grounds for the variety of fish species (UNDP, 2012). All these effects increase the climate change effects on the poorest socio economic groups: agricultural and fisheries workers.

Thus the researcher amongst other things aims to work with the concerned coastal community so that they never settle for little but be intoxicated with scientific revelation that

will bring them elevation and therefore, command attention to the direction of achieving well adaptive, resilient community to the serious implications of climate change.

### 2.3. Coastal Erosion and Sediments

The all-year wave rose for the sea waves shows a dominance of waves of a northerly direction in the open sea. The northerly waves are produced primarily in the period October to May, while in the months July and August the sea waves come mostly from westerly directions (UNDP, 2012). This can be expounded on the basis of the predominant wind directions in these periods. The wave characteristics are significant in the sediment type and sediments movement underlying erosion patterns on the coast. Most beaches on the Atlantic coast comprise of medium to fine quartz sand. Current data on the sediment size is limited but data, primarily related to the channel areas, show rather coarse sand ( $D_{50}$  of 0.3 to 0.5 mm). Moreover, an in-depth study was carried out on trends of the erosion and sedimentation along the entire coast of The Gambia (Royal Haskoning, 1999). The sections of the coast with moderate to high erosion rates are indicated below in Figure 2.1.



**Figure 1.1 Erosion rates along the Gambian coast (Bald Cape to Banjul) since 1980 (as of 1999). (Notes: Dark shading = erosion; light shading is accretion; erosion rates are in m/yr). Source: Royal Haskoning, 1999**

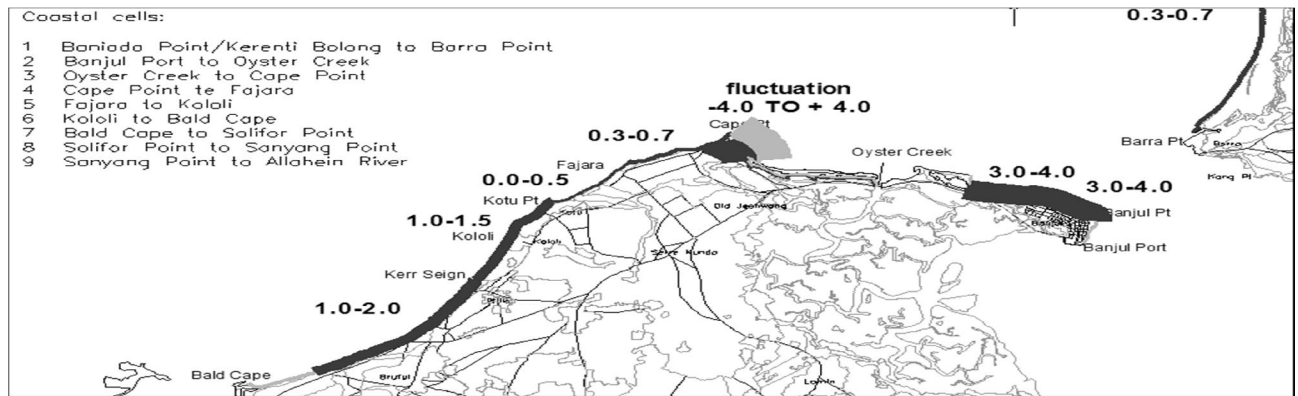
It was concluded that the main causes of erosion were as follows:

- There is a natural trend of erosion along the coast of The Gambia, due to an annual net sand loss from the coast in a long shore direction and the effect of sea level rise. For the large erosive trends between Kololi Point and Bald Cape and along the Banjul-Serre-kunda highway east of Oyster Creek, other mechanisms dominate.



- Along the Atlantic coast, the long shore transports and the natural gradients hereof are small to moderate. The observed large erosive trends in the last decades are for a large part (more than 50%) due to sand mining from the beach.

Predictions have also been made for the erosion to be expected in the next 20 years, as indicated below in Figure 2.2.



**Figure 1.2 Predicted erosion rates up to 2020 (autonomous development) between Bald Cape and Banjul (Notes: Dark shading = erosion; light shading is accretion; erosion rates are in m/yr). Source: Royal Haskoning, 1999**

## Chapter 3: Materials and Methods

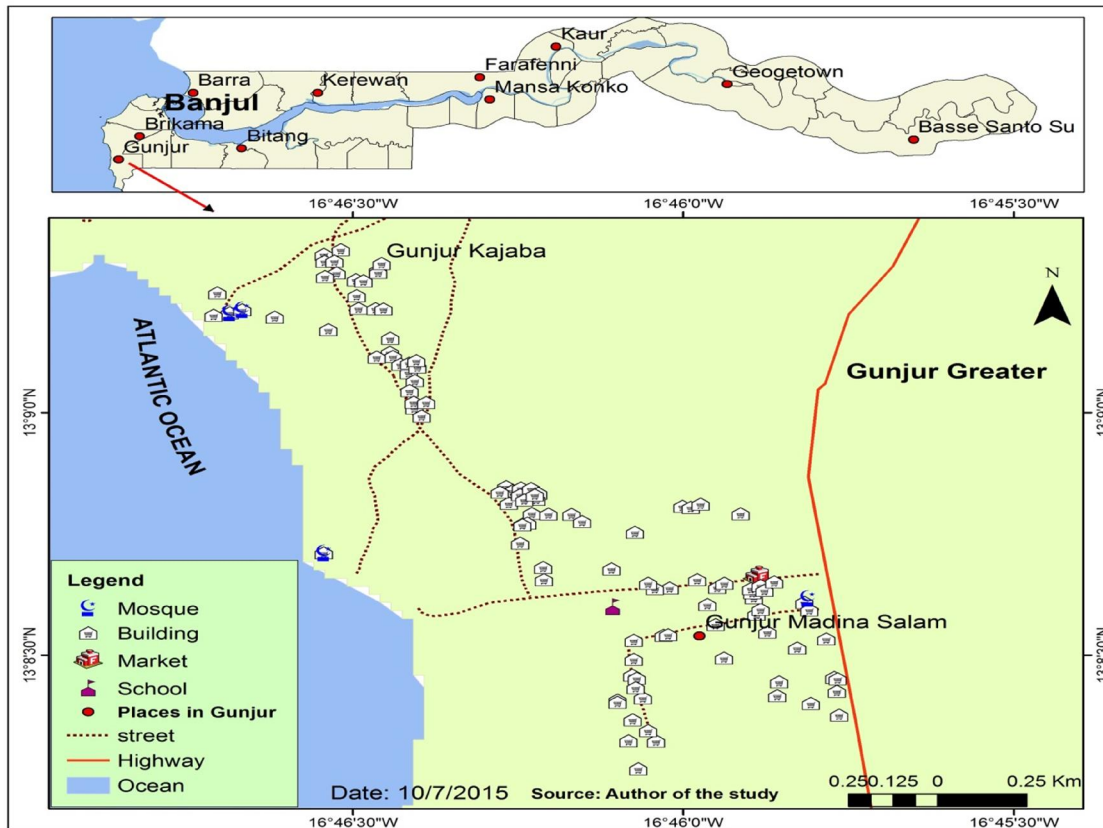
### 3.1. The Area of Study

Gunjur is a coastal village in south-western Gambia. It is located in Kombo South District in the West Coast Region. The village has an estimated population of 21, 000. Common tribes in Gunjur include: Mandinkas, Fulas, Wollofs, Jolas, Sereres, Manjagoes and Karoninkas. It is heavily dependent on artisanal fishing and agriculture.

Meanwhile, The Gambia is the smallest country (~ 11,300 km<sup>2</sup>) on the African continent, lying between latitude 13 and 14 degrees north, and 17 and 1 degrees west. It consists of a narrow strip of land some 400 km long and about 30 km wide on both sides of the River Gambia. It is bordered to the north, east and south by the Republic of Senegal and on the west by the Atlantic Ocean. The population is about 1,882,450 million (50.8% females) (source: 2013 census of the Gambia Bureau of Statistics). The population density is 174 persons per km<sup>2</sup> (up from 127 per km<sup>2</sup> in 2003), thus making the country the 10<sup>th</sup> most densely populated in Africa.

The Gambian population is relatively young, with about 42.6 percent of the population being under 15 years of age, while 3.2 percent are 65 years and above, according to the 2013 census results. Therefore, one can only conclude that there will be an increase in demand on our environment and natural resources and that the future for this country will ultimately lie in the hands of the young generation, the future leaders. In addition, the 2013 census figures indicate an average household size of 8.4 persons at the national level. Whereas, the country is a multi-ethnic and a multi-racial society with an unparalleled degree of ethnic, racial, and religious tolerance.

Furthermore, 20% of the population is children under five years of age. According to the data on Population and Housing Census in 2013, population growth rate average was 3.6% percent per annum. Natural growth was 2.9%, and inward migration, resulting from the influx of refugees, at 1.3 percent. Below is a map of The Gambia, including the study area.



**Map 3.1 Map of the study area**

The population is expected to double in 17 years' time if unregulated, due to a high fertility rate (4.2%) and immigrant influx. 63% of the population is living in the Greater Banjul Area (GBA) as opposed to 40% in 1993. This is attributed to a high internal migration into West Coast Region and Greater Banjul Area. Infant mortality rate is estimated at 84 per thousand live births while life expectancy at birth is 56 years for men and 59 years for women (GBoS, 2003) compared to 55 years for the average for Africa.

Furthermore, the country has a Sahelian climate, characterized by a long dry season (November to May) and a short wet season (June to October). Rainfall ranges from 850 to 1200 mm and average temperatures range from 18 to 33°C. Relative humidity is around 68% along the coast and 41% inland during the dry season and generally over 70% throughout the country during the wet season.

The mean temperature is 25°C. The Gambia has four major landscapes, namely; the floodplain, the colluvial slopes, the lower plateau and the upper plateau, with different soil types. The natural drainage is centered on the River Gambia and its tributaries, namely,

Sandougou, Miniminyang, Baobolon, Sofaniama, and the Bintang Bolongs. The River Gambia, which covers 1,130 km long, originates from the Fouta Djallon highlands in Guinea. With its characteristic Sudan Savanna woodland vegetation, The Gambia has the following main ecosystem types: forest ecosystems (close & open woodland ecosystem), agricultural ecosystems (arable and rangeland ecosystems), marine and coastal ecosystems, inland water ecosystems (wetlands) and terrestrial ecosystems (tree/shrub savanna).

The Gambia is endowed with a high diversity of plant and animal species. The components of biodiversity embrace the wild fauna and flora and associated ecosystems as well as the domestic species, including plant varieties and land races of domestic animals that have been bred and developed for thousands of years by farmers, as well as species that are dependent on the agricultural systems developed and maintained by humankind.

Almost 10% of the country is covered by the River Gambia and another 20% by swampy land and flood plains. The river stretches about 480 km eastwards and a narrow strip of land extends 15-30 km North and South of its banks. Banjul is the administrative center and capital situated on an island on the southern bank at the mouth of the river (GBoS, 2003). Meanwhile, a large proportion of the labour force is employed in the agricultural sector. This comprises 70% of the labour force, two thirds of which are women. The sector's contribution to GDP stands at about 30%.

About 75% of the population depends on crops and livestock for livelihood. The main cash products are groundnuts, cotton, horticulture, livestock and fisheries, while subsistence crops are composed of cereals such as millet, sorghum, maize and rice. Small-scale manufacturing activity features the processing of peanuts, fish, and hides.

**Table 3.1 Showing the village where research was conducted**

STUDY SITE	CATEGORY	REGION	COUNTRY	POPULATION
1. Gunjur	Village	WCR	The Gambia	21, 000

## **3.2. METHODS**

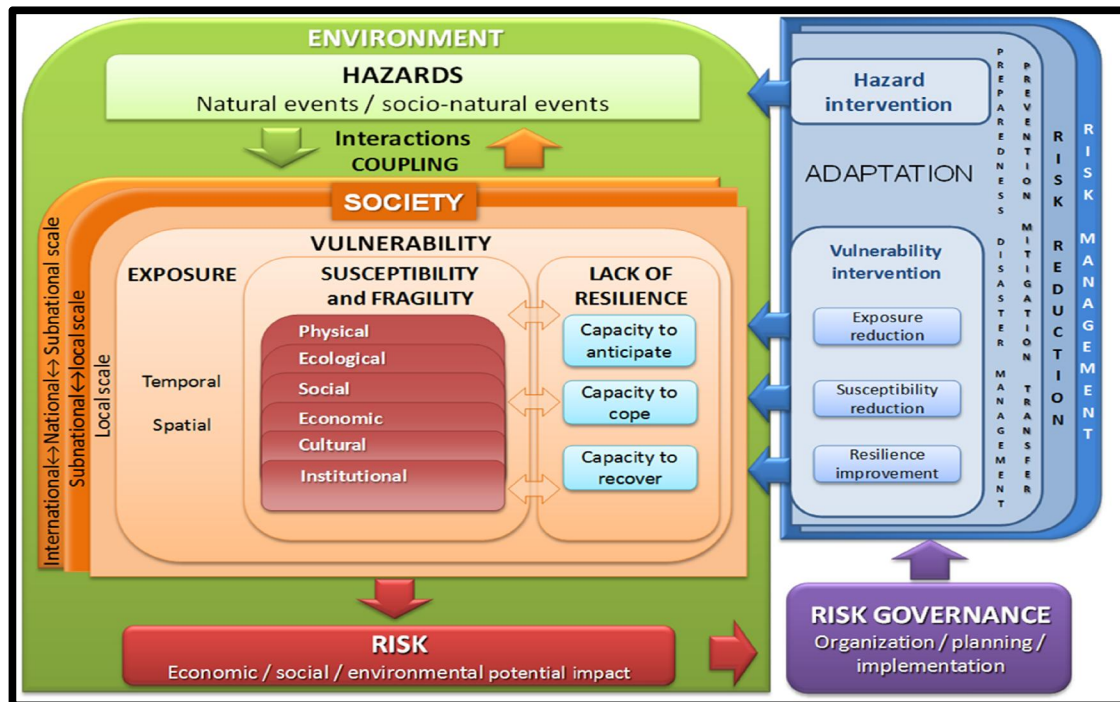
### **3.2.1. MOVE Conceptual Vulnerability Assessment Framework**

Key factors of such a common framework are related to the exposure of a society or system to a hazard or stressor, the susceptibility of the system or community exposed, and its

resilience and adaptive capacity. Additionally, this approach underlines the necessity to consider key factors and multiple thematic dimensions when assessing vulnerability in the context of natural and socio-natural hazards (Birkmann *et al.*, 2013). Developed within the context of the research project MOVE (Methods for the Improvement of Vulnerability Assessment in Europe). Meanwhile, it is important to note that the phenomenon of coastal erosion is natural and has long been existing before climate change. However, the rate of coastal erosion is being exacerbated and fast tracked because of anthropogenic factors like GHG's emissions which lead to rise in temperatures, global warming, melting of glaciers, sea ice, thermal expansion and the resultant rising of sea levels.

As one can observe, as coastal erosion is a creeping disaster, the below mentioned theoretical framework shows the linkage between different concepts of disaster risk management and climate change adaptation and appears as a useful tool for communicating complexity. Thereon, it stresses the need for societal change in order to reduce risk and to promote adaptation. Therefore, the MOVE framework makes a clear differentiation between risk and vulnerability and also deals with the integration of the concept of adaptation in vulnerability assessments to natural hazards (Birkmann *et al.*, 2013).

Furthermore, the difficulty of the problem tackled in this study needs a combination of various tools to generate synthetic information related to causes, consequences and how people within the concerned coastal communities cope with coastal erosion. Later on, the last chapter will deliberate on adaptive strategies to the menace. The next page presents Figure 3.1 showing the MOVE Framework.



**Figure 3.1 Source: Birkmann *et al.* (2013): Figure Framing vulnerability, risk and societal responses: the MOVE framework. Natural Hazards**

### 3.2.1.1. Characteristics of the MOVE Framework

- **Exposure** describes the extent to which a unit of assessment falls within the geographical range of a hazard event.
- **Susceptibility** (or fragility) describes the predisposition of elements at risk (social and ecological) to suffer harm.
- **Lack of resilience** or societal response capacity is determined by limitations in terms of access to and mobilization of the resources of a community or a social-ecological system in responding to an identified hazard.
- **The adaptation box** deals with the ability of a community or a system to learn from the past disasters and to change existing practices for potential future changes in hazards as well as vulnerability contexts.
- **Hazard** is used to describe the potential occurrence of natural, socio-natural or anthropogenic events that may have physical, social, economic and environmental impacts in a given area and over a period of time.

### 3.3. Data Collection

#### 3.3.1. Socio-economic Data

Quantitative method is also used. The advantage of quantitative research is that the findings from the sample under study will more accurately reflect the overall population from which the sample was drawn (Vanderstoep *et al.*, 2009). The questionnaire form is designed to give information on the following variables:

- **Socio-economic indicators:** sex, age, educational level, monthly income, and occupation.
- **Susceptibility indicators:** length of stay of respondents in coastal erosion-affected area, past experience, awareness of the hazard at hand, perception of coastal erosion risks, and preparedness for when things become worst, children under age 5, elderly above 65, strength of social networks, female headed families, prevalence of diseases, percentage of people with insurance etc.
- **Exposure indicators:** the size of the households, distance from the beach, existence or unavailability of coastal vegetation, number of schools & health centers exposed to coastal erosion, percentage of farmers & fishermen etc.
- **Recovery/ coping indicators:** the distance from household to the nearest health center, distance from the closet tarred road, level of education, employment, alternative sources of income, availability of livestock, building materials, percentage of people with at least one vocational skill and usage of sand bags, etc.

**Primary Data:** field survey by a questionnaire, focus group discussion and semi-structured interviews etc.

**Secondary Data:** for analysis obtained from both published and unpublished reports and documents from national and local government departments, State of the Environment Report and journal articles. Reference to reports of neighbouring countries with similar situations will also be used, to mention a few.

- Usage of GPS Receiver to get relevant coordinates of specific elements (such as health center and school).
- Quantitative survey data & underlying vulnerability indicators for exposure, sensitivity and lack of resilience at the local level

- Focus Group Discussion
- In the absence of direct data, the indirect data will be employed and reference data from countries with similar coastal and climate change conditions utilized.
- Parameters for adaptive and mitigating mechanisms noted.

### 3.3.2. Sampling Method

The sampling method of Israel (2013) simplified formula is used to calculate the sample size. A 95% confidence level and P= 5%, 7% and 10% are assumed for different population size by the equation below.

$$(1) \quad n = \frac{N}{1+N(e)^2}$$

Where  $n$  is the sample size,  $N$  is the population size and  $e$  is the level of precision.

Thereupon, in the study area, for instance, my initial investigations give a total population of Gunjur to be 21, 000. According to the formula, the sample will be focused on 100 household sample size i.e. applying P= 10% for Gunjur with the above formula.

Furthermore, this research adopts also an exploratory approach, using predominantly qualitative methods to examine the research questions in order to achieve the stated objectives. The main advantage of qualitative research is that it provides a richer and more in-depth understanding of the population under study.

Techniques such as interviews and focus groups allow the research participants to give very detailed and specific answers (Vanderstoep *et al.*, 2009). For the focus group, a recorder is used so that we can better capture the inhabitants' perceptions of coastal erosion issues. Focus group discussions determine relevant indicators to describe vulnerability. In addition, consideration is given to things such as participation, gender and equity which are key pillars in community-based strategic development are acknowledged. Thereby helping us to know at which level they are involved in finding solutions or coping strategies to coastal erosion.

Several open interviews have been undertaken which are embedded with open ended questions, free and flexible with stakeholders (coastal & marine environment and climate change government officers) about coastal erosion and their consequences on people living in the study area.



In addition, some semi-structured interviews are enriched by real life stories. Meanwhile, a semi-structured interview is a method of research used in the social sciences; it is open and allows new ideas to be brought up during the interview as a result of what the interviewee says. The interviewer in a semi-structured interview generally has a series of themes to be explored. Life stories are biographies or portrayals that stakeholders of an event tell their experiences about what they faced or they are currently facing.

Thereon, the methods of content analysis are used and all organizational documents relevant to the study site, such as work plans, NGOs documents, grant proposals, State annual reports, government agencies reports, students' master thesis, Ph.D., newspapers and so forth.

Whereas, quantitative and qualitative data are from the field survey. For the documents of content analysis, it will be reports from the civil protection agency, academic articles, books, Master thesis and Ph.D. dissertations, soft libraries etc.

### **3.3.3. Vulnerability Data**

In this study, GIS which is considered as a fundamental tool to act promptly in the situation/ scenario of coastal erosion is utilized. Vulnerability indicators, field survey data, GPS Receiver waypoints, coordinates of the study area boundaries and houses where the questionnaires are administrated, other critical infrastructure and so forth. Thereafter, was uploaded in ArcGIS 10.1 software and later geo-referenced before undertaking the process of vulnerability map making. Therefore, the hazard is permanent/continuous and spatial. While satellite images from Google Earth were helpful in the map making process.

### **3.4. Data Analysis**

- Household and Fish Landing Site (FLS) socio-economic analysis using, Systat, Excel, Matlab and SPSS 16
- Analysis of exposure, susceptibility and lack of resilience by using Excel, Arc GIS 10.1 software, Quantum GIS and Golden Surfer for vulnerability mapping

**Table 3.2 Indicators**

Vulnerability Component	Vulnerability Sub-Component	Indicator	Justification	Scale	Nature	Method	Level of certainty
<b>Exposure</b>	Social	Distance of Household from the ocean/ beach	The closer the household to the ocean, the more exposed	Local	Quantitative	GPS Receiver	High
						Sat. image	
<b>Susceptibility</b>	Social	Children <5years	Under 5yrs children are more prone to mal-nutrition & sickness. Under developed immune system	Local	Quantitative	Field survey	High
		Elderly >65years	People above 65yrs are more dependent and prone to sickness	Local	Quantitative	Field survey	High
		Female Headed Households	Single mothers face a lot of challenges due to the absence of the help of a father figure	Local	Quantitative	Field survey	High
		Roofing & Wall Materials	The type of housing material, gives a picture of the economic status of the household owner	Local	Quantitative	Field survey Observation	High
<b>Lack of Resilience</b>		Livestock availability	Livestock is a form of animal banking to cater for a rainy day	Local	Quantitative	Field survey	Medium

### 3.4.1. Normalisation of indicators using functional relationship

When the variables have positive functional relationship with vulnerability, the normalization is done, using the formula:

$$V_{aj} = (X_{aj} - \text{Min} X_a) / (\text{Max} X_a - \text{Min} X_a) \quad (\text{UNDP, 2006})$$

When the variables have negative functional relationship with vulnerability, the normalization is done, using the formula:

$$V_{aj} = (\text{Max} X_a - X_{aj}) / (\text{Max} X_a - \text{Min} X_a) \quad (\text{UNDP, 2006})$$

Where;  $V_{aj}$  stands for the standardized vulnerability score with regard to vulnerability component  $j$ , for community  $a$ ;  $X_{aj}$  stands for the observed value of the same component for the same community;  $\text{Max} X_a$  and  $\text{Min} X_a$  stand for the maximum and minimum value of the observed range of values of the same component, for all settlement of the index.

### 3.4.2. Overall Vulnerability of Households

$$\text{Vulnerability} = [(\text{Exposure} + \text{Susceptibility}) - \text{Resilience}]$$

(Sharma, 2007)

### 3.4.3. Creation of Vulnerability Map

Maps are becoming an integral part of modern decision support systems on which disaster management is being rooted. Therefore, the normalized values of indicators for each component of vulnerability were entered into the various shape files of households in ArcGIS 10.1. The various layers of the social capacity, exposure and susceptibility of households were created and classified into five classes (Very low, Low, Medium, High and Very high) by using Spatial Analyst tool box in ArcGIS 10.1. In order to generate the vulnerability map, individual layers of Capacity (Resilience), Exposure and Susceptibility were overlaid using Raster Calculator in ArcGIS. The resultant overall vulnerability of the households was reclassified into four classes. This was done to give a visual impression of the households whose social vulnerability to coastal erosion is Low, Medium, High, or Very high.

**Duration**

The duration of such a research spanned up to four (4) months.

**3.5. Expected Outputs**

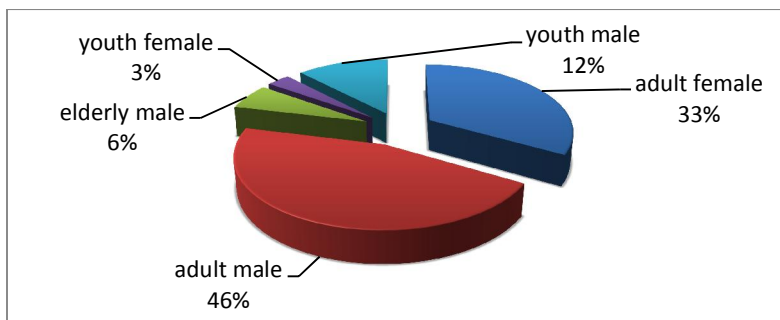
As a result, the following outputs were achieved by the end of the research:

- The socio-economic characteristics of the concerned coastal community known.
- Exposure, susceptibility level and the extent of lack of resilience of the concerned coastal community to coastal erosion known-vulnerability map.
- It is expected that this research will contribute to generating relevant knowledge in reducing social vulnerability, building resilience to coastal erosion thereby enhancing human security, smart policy design and implementation of adaption and mitigation measures.
- That some of the novel findings will help to excite further inquiry to gain deeper insight into related research in the future.
- Scientific mitigating and adaptive recommendations in the latter part of this research document will hopefully help to inform on how to build resilience, reduce vulnerability and enhance livelihood within the concerned coastal community.

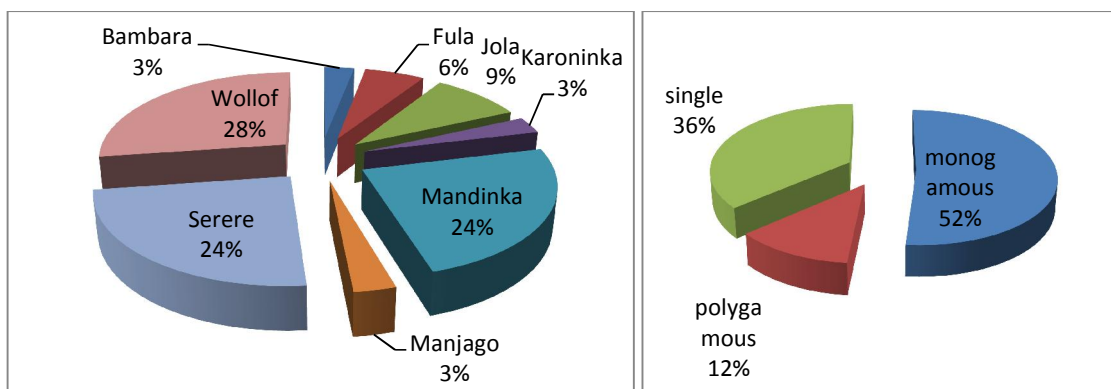
## Chapter 4: Results

Chapter 4 presents the results of response to questionnaires and focus group discussion. A total of 33 people were interviewed within the Gunjur Fish Landing Site (GFLS) and 100 households. Gunjur Fish Landing Site Results.

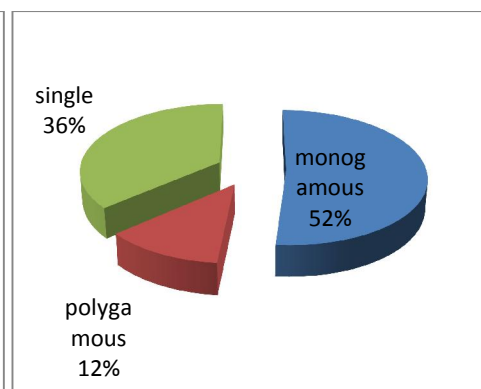
Of all the people interviewed, 64% are male and 36% female. The age composition or bracket is 33% adult females, 46% adult males, 12% youth males, 3% youth females and last but not the least 6% elderly males. Thereafter, 85% are actual present residents and 15% absent or temporal residents. Of the people interviewed, in terms of ethnic composition, 28% Wollof, 24% Mandinka, 24% Serere, 9% Jola, 6% Fula, 3% Manjago, 3% Karoninka, and 3% Bambara. Figure 4.1, 4.2 and 4.3 presents the social characteristics of the respondents in terms of age bracket, ethnicity and marital status respectively.



**Figure 4.1** Age bracket of participants at Gunjur FLS



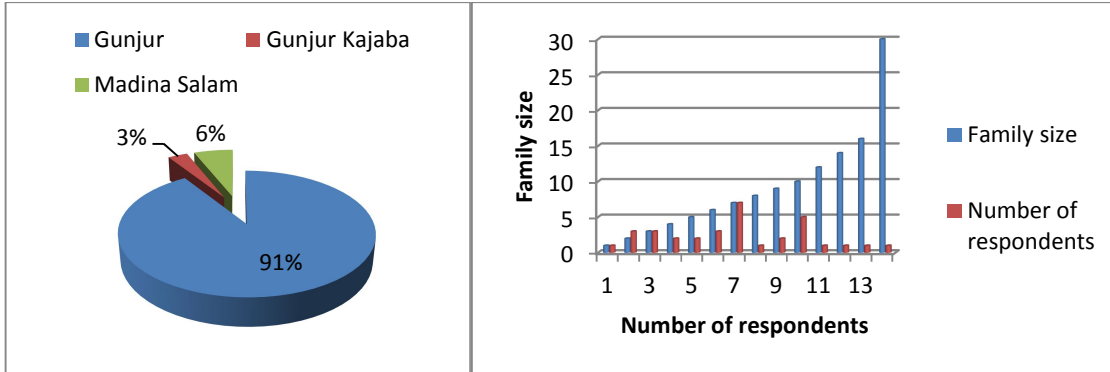
**Figure 4.2** Ethnic Group of participants at FLS



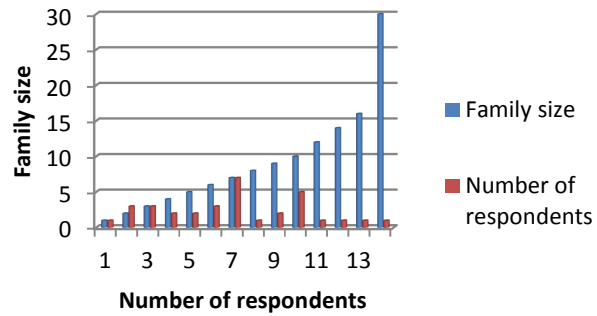
**Figure 4.3** Marital Status at FLS

An analysis of marital status shows that 52% are monogamous, 36% single and 12% polygamous. Furthermore, 61% of the people interviewed live within 3km (<3km) from their work area (i.e. the FLS), whilst 39% of the people's residence was less than 1km away

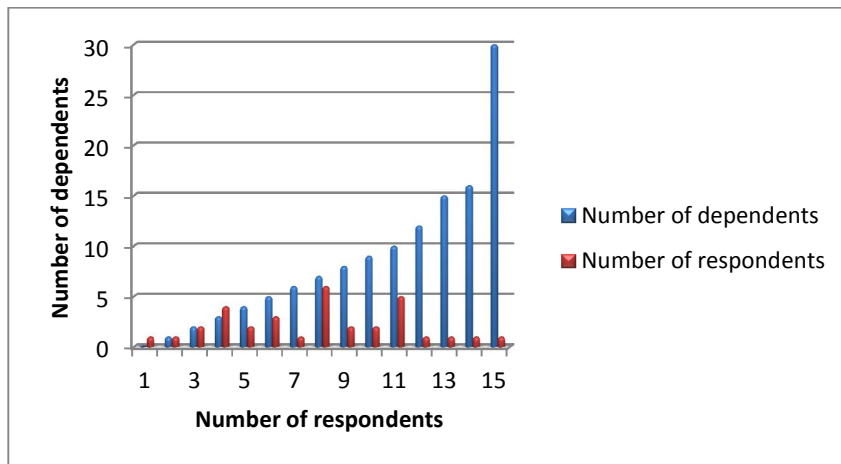
(<1km). In addition, majority of the people interviewed i.e. 91% live in Gunjur Greater, 3% in Gunjur Kajaba and 6% in Gunjur Madina Salam. Figure 4.4, 4.5 and 4.6 presents the social characteristics of the respondents in terms of residence, family size and number of dependents respectively.



**Figure 4.4 Residence of participants**



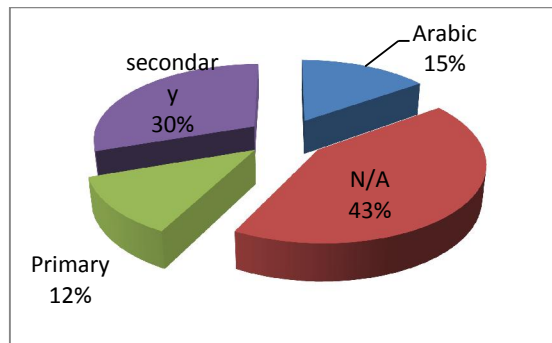
**Figure 4.5 Family size of respondents**



**Figure 4.6 Number of dependents of respondents**

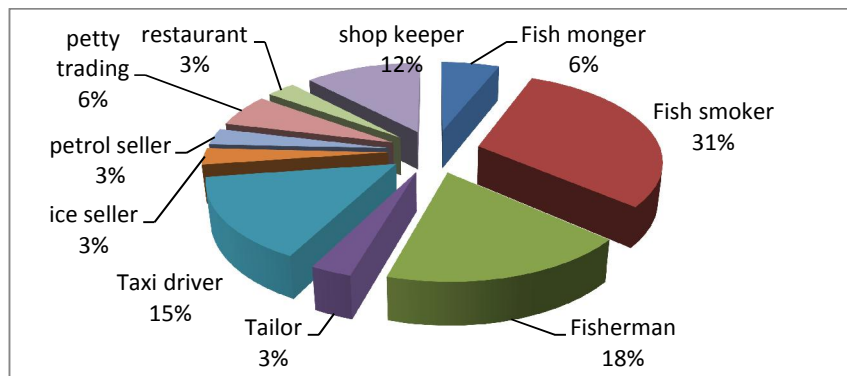
Observably, 58% have some form of education whilst 42% are illiterate. Out of the 58% who are educated, 63% are males and 37% females. There is therefore, an urgent need to accelerate the promotion of girls' education. Furthermore, out of the 42% who are illiterate, 64% are males and 36% females. Meanwhile, 30% have secondary level education, 12% primary, 15% Arabic (Dara) and as earlier said 42% illiterate.

Figure 4.7 presents the literacy level of respondents.



**Figure 4.7 Literacy Level of respondents at FLS**

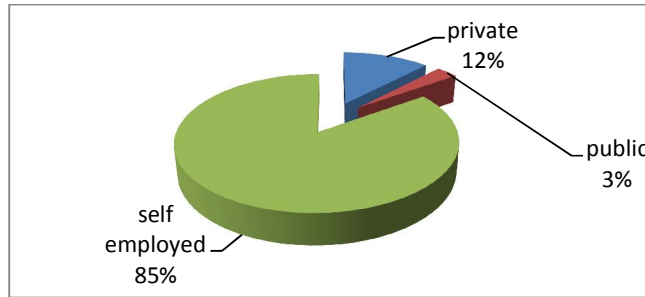
Meanwhile, 27% said that financial problem was the reason for dropping school, 3% said work, and 3% said that they were not interested in school back in the days but have lived to regret it. When it comes to occupation of the people who were interviewed at the FLS; 31% are fish smokers, 18% are fishermen, 15% are taxi drivers, 12% are shop keepers, 6% are fish mongers, 6% are petty trading, 3% are restaurant business, 3% are petrol sellers, 3% are ice block sellers and 3% are tailors. Figure 4.8 presents the occupation of respondents.



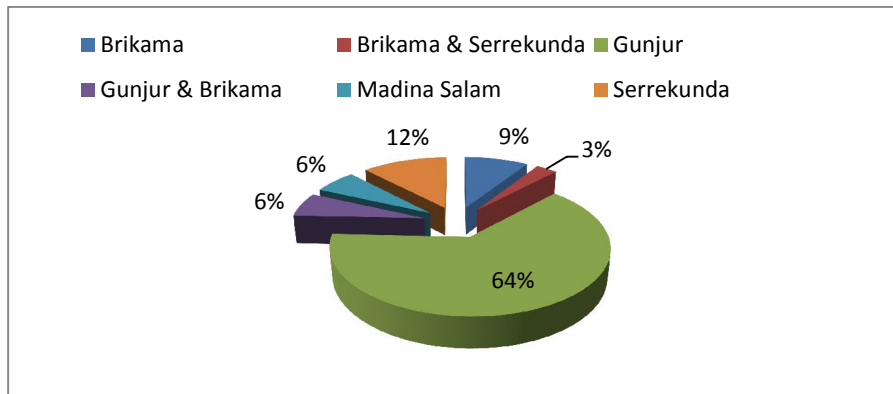
**Figure 4.8 Occupation of respondents at FLS**

As it can be noted, 85% are self-employed, 12% are private and 3% are publicly employed. In addition, 88% receive cash payments (hand to mouth) and 12% salary. Majority of their customers come from Gunjur 64%, Serrekunda 12%, Brikama 9%, Gunjur Madina Salam 6%, Gunjur & Brikama 6%, and Brikama & Serrekunda 3%. Thus the FLS does not only serve Gunjur but also other towns.

Figure 4.9 and 4.10 presents the employer and customers of respondents respectively at the FLS.



**Figure 4.9 Employer of respondents at FLS**

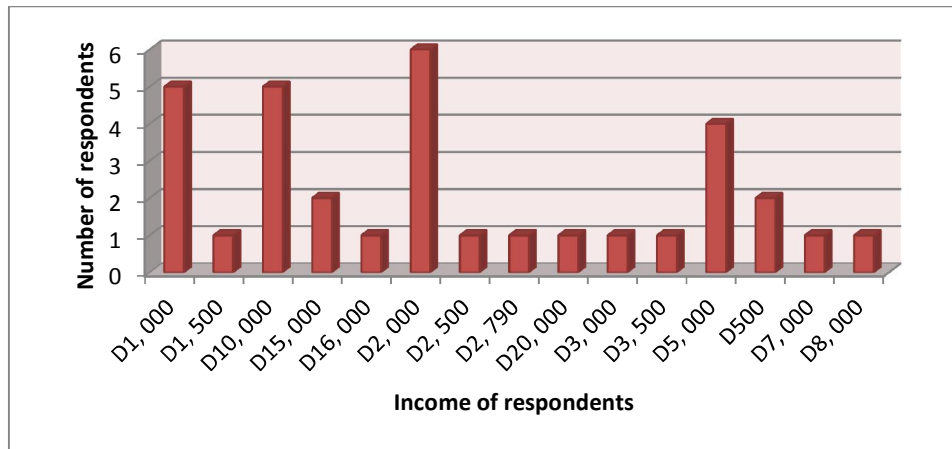


**Figure 4.10 Customers of respondents at FLS**

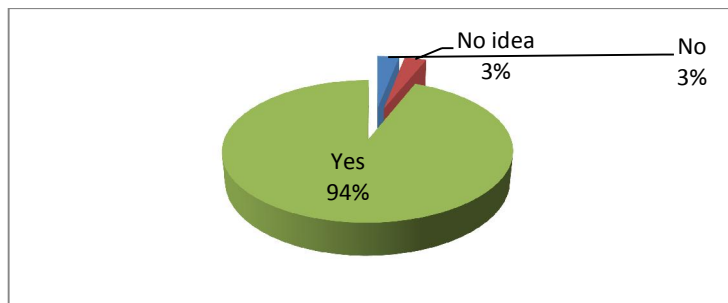
When it comes to average income, the highest to be recorded is D20, 000 and the lowest is D500. Majority of people earn about D2, 000, followed by D1, 000 & D10, 000 respectively and D5, 000. Please note that 1Euro = D50 and thus D5, 000 equals to 100 Euros as at the current exchange rate (October, 2015). Whereas, 94% depend on only one source of income, whilst 3% on hired labour and 3% on traditional music (e.g. Kora player). Furthermore, 94% agree and ascertain that the area is prone to coastal erosion, 3% said no and 3% have no idea.



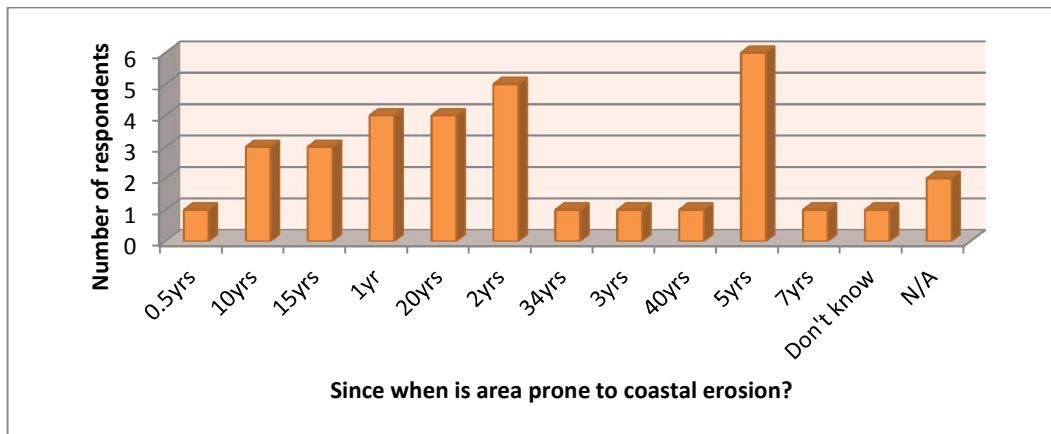
Figure 4.11, 4.12 and 4.13 shows the income of respondents, the percentage of people who ascertain that the area is prone to coastal erosion and the number of years coastal erosion has been noticed in the community respectively.



**Figure 4.11 Income of respondents at FLS**

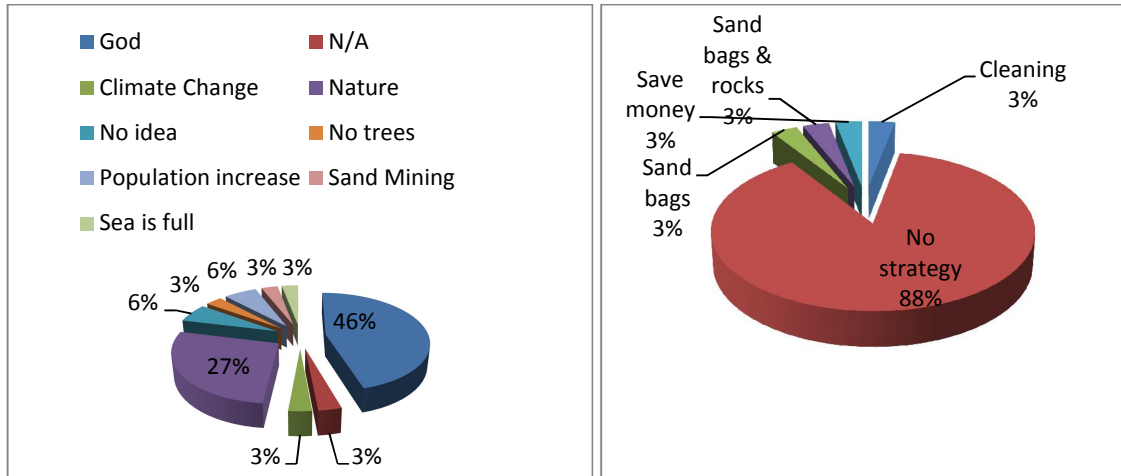


**Figure 4.12 Is area at FLS prone to coastal erosion?**



**Figure 4.13 Since when has coastal erosion been occurring at the FLS?**

Figure 4.14 and 4.15 presents the cause of exacerbated coastal erosion and coping strategies of respondents at FLS respectively.



**Figure 4.14 Cause of exacerbated coastal erosion      Figure 4.15 Coping strategy at FLS**

As one can comment, 97% want to continue working and staying in Gunjur, whilst 3% want to leave for greener pastures. In addition, 46% believe that exacerbated coastal erosion is caused by God, 27% nature, 6% no idea, 6% population increase, 3% when sea is full, 3% sand mining, 3% climate change and 3% deforestation. 88% have no strategy to cope with coastal erosion, 3% sand bags, 3% sand bags & rocks, 3% saving money (possible relocation), and 3% cleaning activities (not helpful). However, 85% have not heard about climate change. Only 15% have, at some time, come across or heard about climate change.

Notably, 85% have observed some changes to their environment in the past few years in terms of temperature increase, decrease in rainfall, late onset of rainfall and so forth; 15% said no changes have been seen with regards to their environment. In addition, 97% said that they have not received any assistance from the government, whilst 3% said yes. Thereafter, 94% said that they have not benefited from any NGO help. On the other hand 6% said that they have received help from an NGO. In conclusion, none of the respondents benefited from any kind of insurance but they are more than happy if availed such an opportunity or facility.

#### 4.1. GUNJUR HOUSEHOLD SURVEY RESULTS

Out of the 100 people interviewed during the household survey, 45% are females and 55% males. Furthermore, 95% are permanent residents, whilst 5% are temporal. In addition, the average time to the nearest water point, market, primary, secondary, health center and tarred road are 3mins, 12mins, 13mins, 42mins, 45mins, and 17mins respectively. 89% of males own a piece of land while only 20% of females own a piece of land. Moreover, 40% of males are unemployed while 60% of females are unemployed. Figure 4.16 and 4.17 presents the age and age bracket of respondents at the household level respectively.

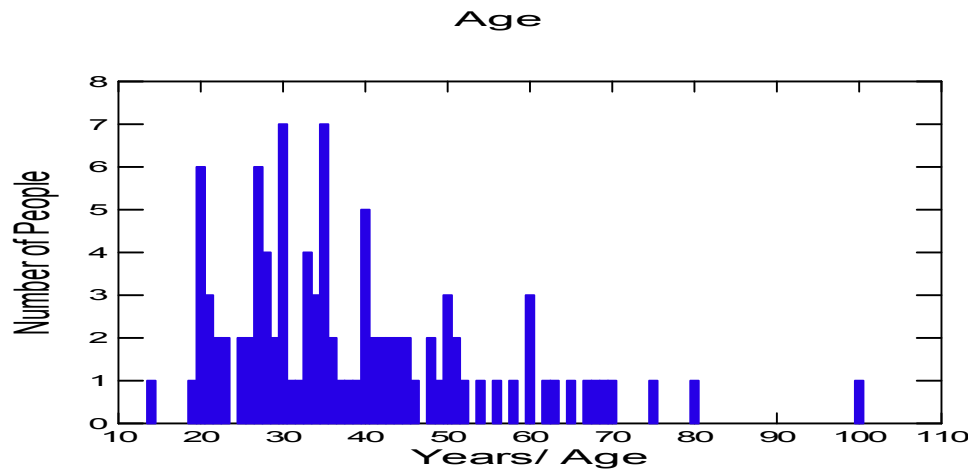


Figure 4.16 Age of respondents at HH

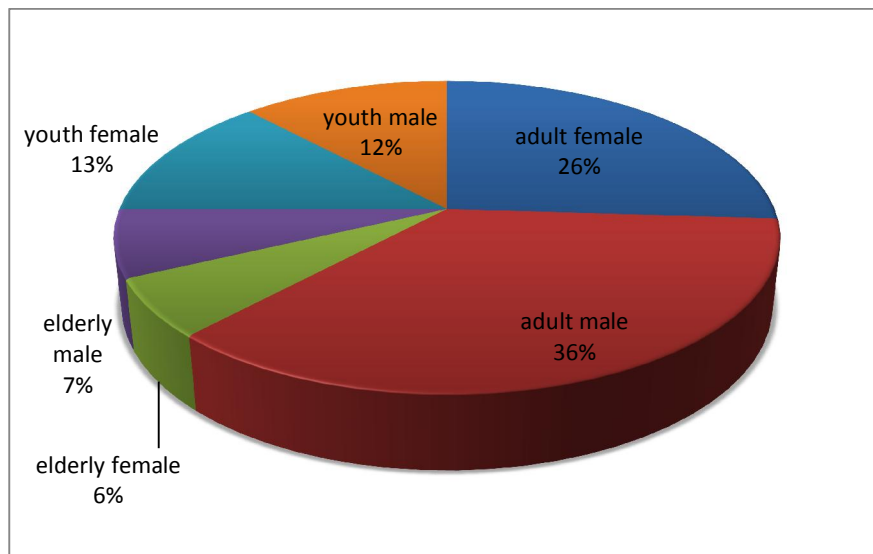
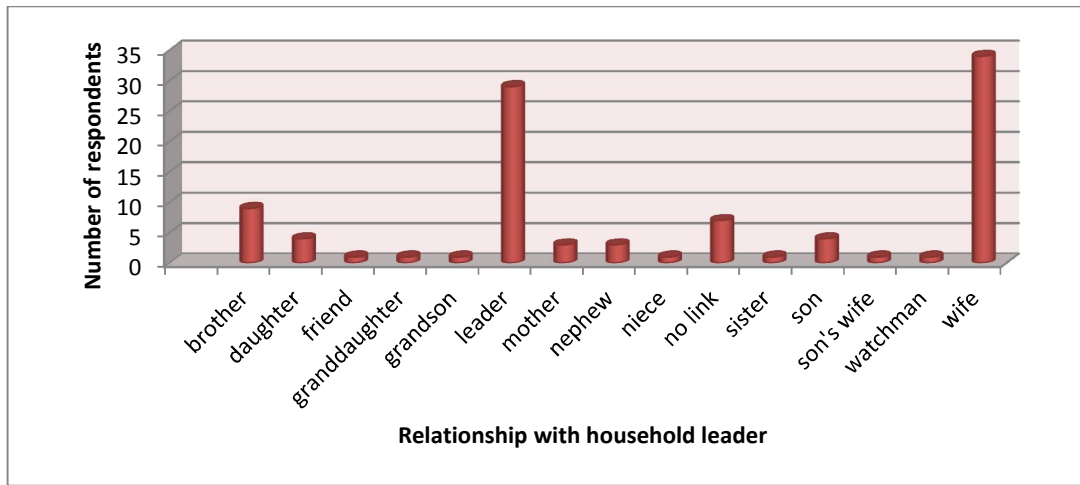


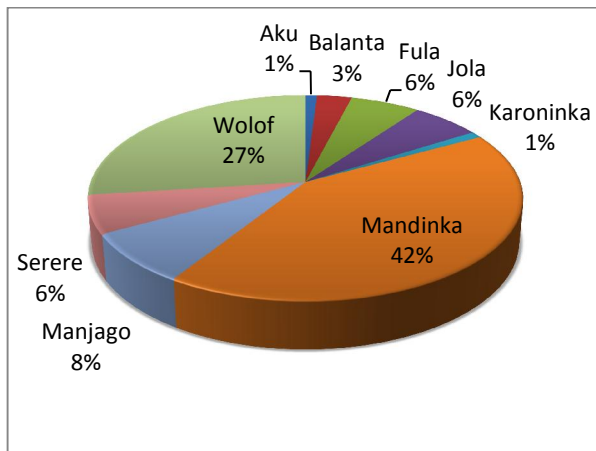
Figure 4.17 Age Bracket at HH level

The majority of the people interviewed were adult males at 36%, adult females 26%, youth females 13%, youth males 12%, elderly males 7% and elderly females 6%. Figure 4.18 presents the relationship of respondents with the household leader at the household level.

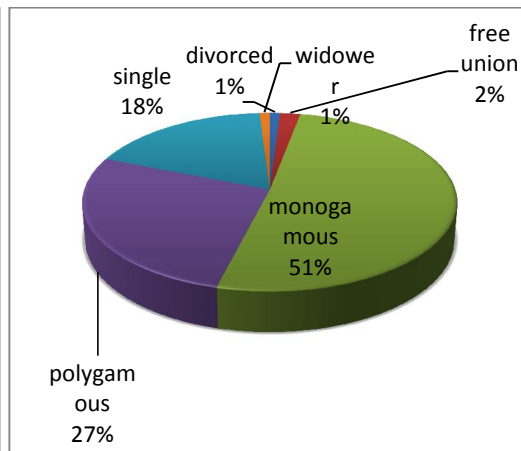


**Figure 4.18 Relationship with household leader**

Majority of the people interviewed were wives and leaders, followed by the brothers of the household leaders. Meanwhile, the largest ethnic group among the interviewees was the Mandinka 42%, Wolof 27%, Manjago 8%, Serere, Jola and Fula were 6% each, Balanta 3%, and last but not the least the Aku and Karoninka at 1% each. Figure 4.19 and 4.20 presents the ethnicity and marital status of respondents at the household level respectively.



**Figure 4.19 Ethnic group at HH level**

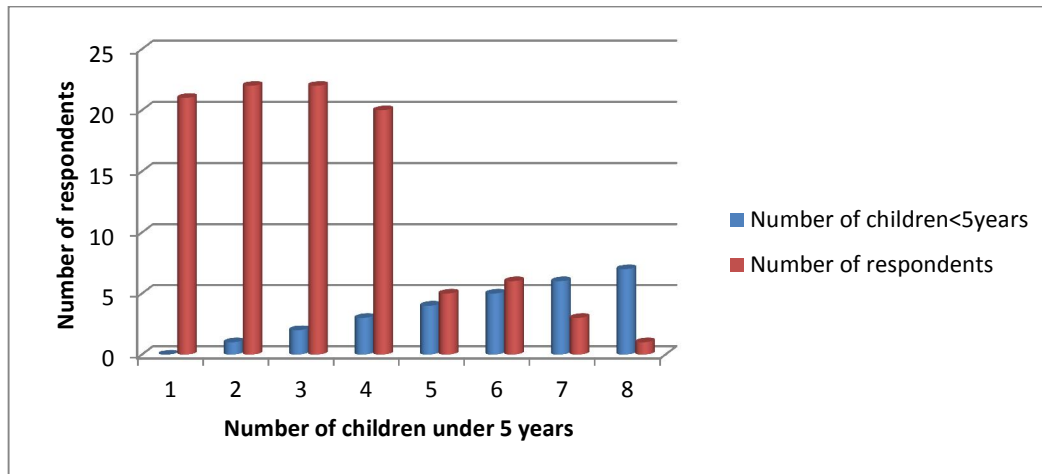


**Figure 4.20 Marital Status at HH level**

Most people are in a monogamous marriage at 51%, polygamous 27%, single 18%, free union 2%; whilst the divorced and widowers remains at 1% each.

Figure 4.21 presents children less than 5 years at the household level.

**Children <5yrs**

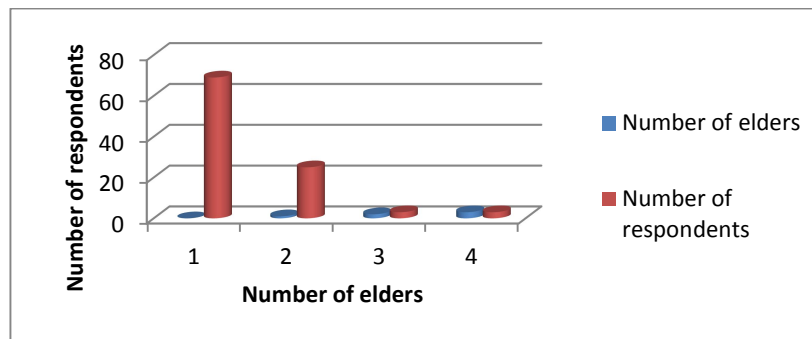


**Figure 4.21 Children under 5 years at HH level**

Concerning children under the age of 5; 22% of respondents said 2 children, 20% said 3 children, 22% said one child, 21% said no children, 6% said 5 children, 5% said 4 children, 3% said 6 children, and 1% said 7 children

With regards to the elderly above 65; 24% said 1 elderly, 70% said none, 3% said 2 elderly and another 3% said 3 elderly. In addition, 87% of household leaders are males and the remainder 13% females. Figure 4.22 presents elderly above 65 years at the household level.

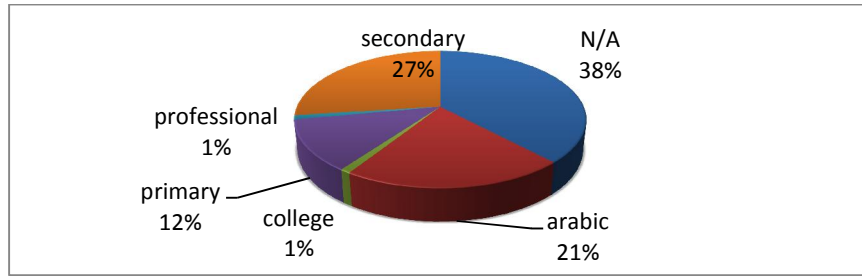
**Elderly >65yrs**



**Figure 4.22 Elderly above 65 years at HH level**

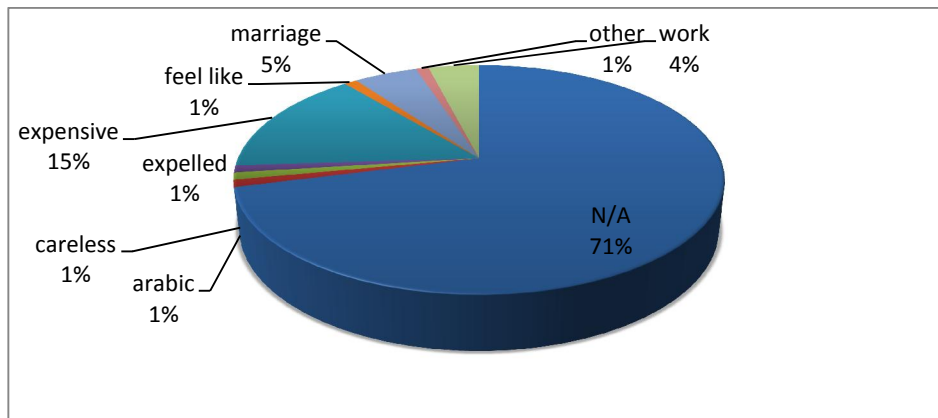
62% had some form of education and 38% are illiterate. In addition, out of the 62% who are educated, 65% are males and 35% females. Whereas, out of the 38% who are illiterate, 39% are males and 61% are females. Hence, the urgent need to ensure that more girl children go to school since they will eventually be the mothers of the future leaders. Furthermore, of the 62% who are educated; 27% attended secondary school, 12% primary education, 1% college

and professional education each and 21% Arabic education. Figure 4.23 presents the literacy level of respondents at the household level.



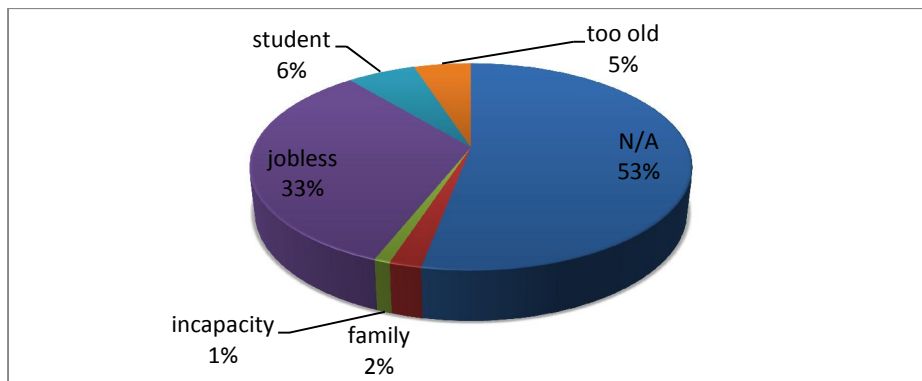
**Figure 4.23 Literacy Level at HH level**

The majority of people who dropped school did so because of money problems, marriage and the need to work to support themselves and their families. 51% had some form of employment, 48% unemployed and 1% unemployed due to being a student or too old. Figure 4.24 presents the reason why some respondents dropped school at the household level.



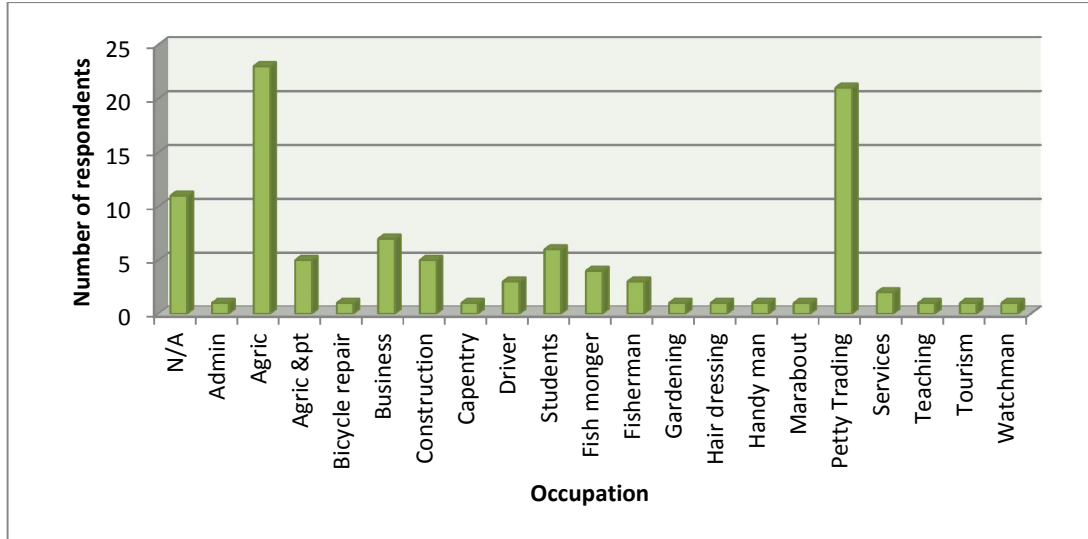
**Figure 4.24 Reason for dropping school at HH level**

The majority of the people who are unemployed are simply jobless, students, too old or as a result of family obligations and incapacity. Figure 4.25 presents the reason why some respondents are unemployed at the household level.



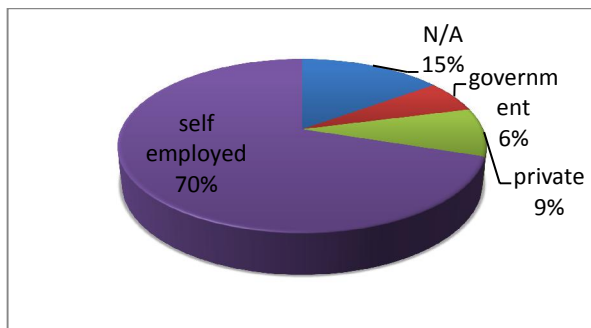
**Figure 4.25 Reason for unemployment at HH level**

Most people are engaged in agriculture (threatened by salt intrusion), followed by petty trading, business, student learning, agriculture and petty trading, construction, fish mongering, fishing, driving and services. Figure 4.26 presents the occupation of respondents at the household level.

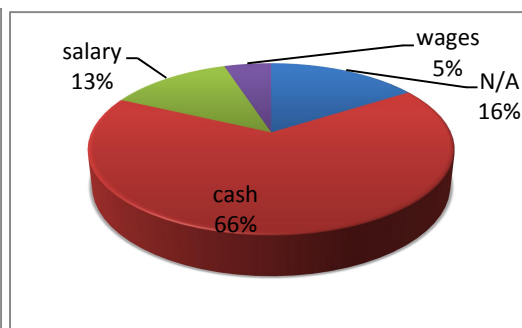


**Figure 4.26 Occupation of respondents at HH level**

Furthermore, most people are self-employed at 70%, 9% by the private sector and 6% employed by the government. In addition, 66% are paid for work rendered through cash payment, 13% receive monthly salary and 5% get wages. Figure 4.27 and 4.28 presents the employer and mode of payment of respondents respectively at the household level.



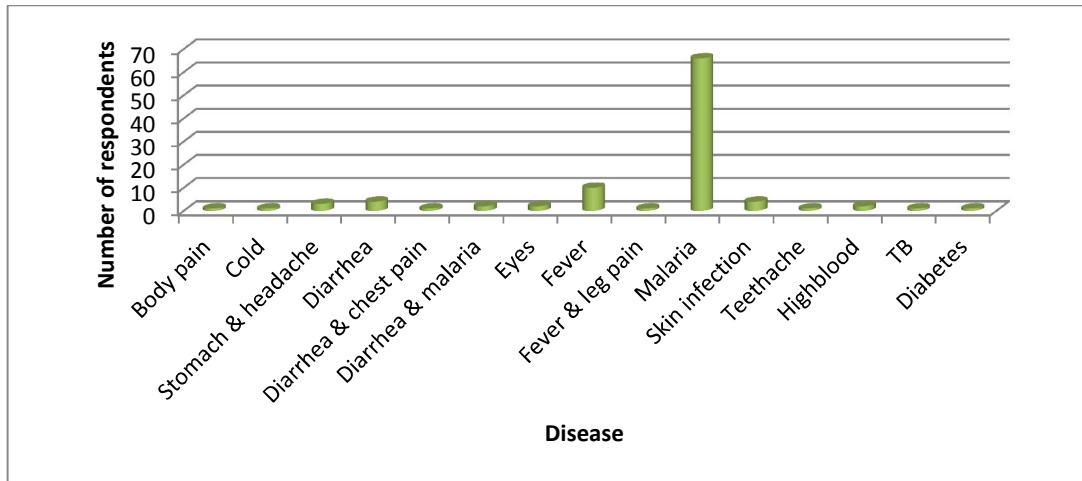
**Figure 4.27 Employer at HH level**



**Figure 4.28 Mode of payment at HH level**

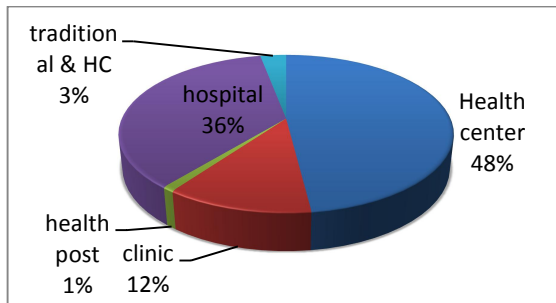
The most pronounced prevailing disease is malaria (66%), followed by fever, diarrhea and skin infection. Thus, one can anticipate that there exists a lot of stagnant water within the community for mosquitoes to lay eggs. The second issue is hygiene, water and sanitation; when considering the problem of diarrhea, to mention a few.

Figure 4.29 presents the prevailing diseases at the household level.

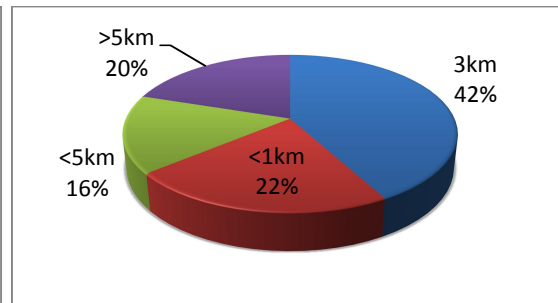


**Figure 4.29 Prevailing Diseases at HH level**

Whilst 100% of respondents received consultation for illness/ sickness, 48% went to a health center for treatment, 36% to a hospital, 12% to a clinic, 3% a combination of a traditional doctor and health center, and 1% a health post. With regards to travelling distance to receive treatment for sickness, 42% travel up to 3km, 22% less than a kilometer, 20% more than 5km, and 16% less than 5km. Figure 4.30 and 4.31 presents the place of treatment and the distance en route to treatment respectively at the household level.



**Figure 4.30 Place for treatment at HH level**

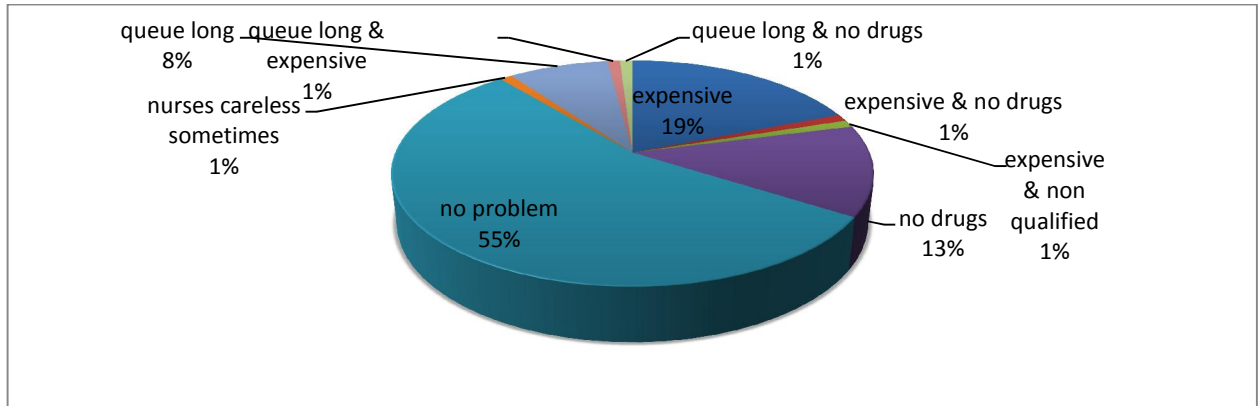


**Figure 4.31 Distance to treatment**

Most people said that they had no challenges in getting treatment, whilst the rest that followed buttressed on things such as treatment being expensive, inadequate drugs supply, carelessness of some nurses and very long queues in health centers and hospitals.

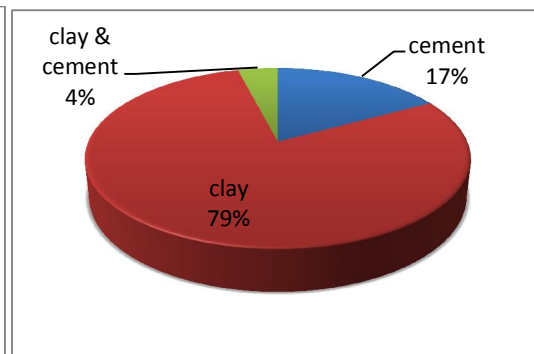
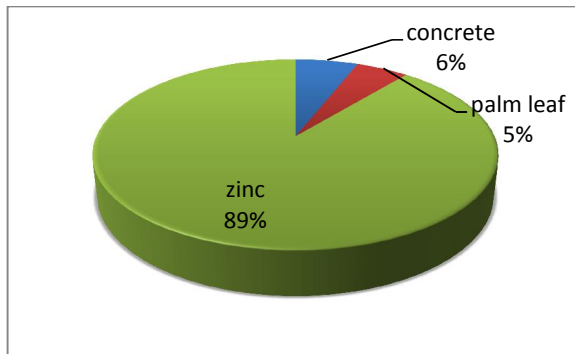


Figure 4.32 presents the challenges respondents encounter in receiving treatment at the household level.



**Figure 4.32 Challenges in treatment at HH level**

In terms of building materials, it was observed that 89% used zinc roofing material, 6% concrete and 5% palm leaves. Furthermore, 79% used clay/ mud as wall material, 17% cement and 4% a combination of clay & cement. Figure 4.33 and 4.34 presents the roofing and wall materials respectively at the household level.

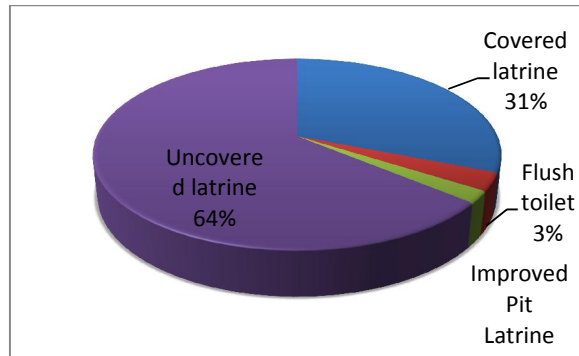
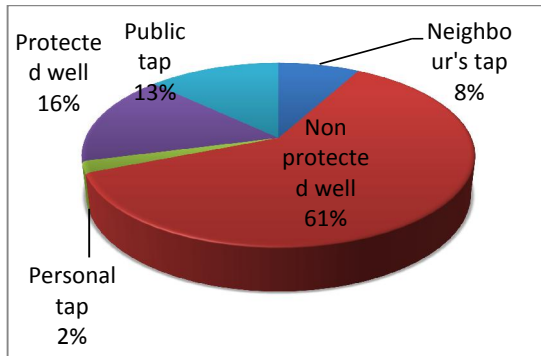


**Figure 4.33 Roofing materials at HH level**

**Figure 4.34 Wall materials at HH level**

Moreover, the majority of residents use non-protected wells as a source of drinking water and other domestic purposes, 16% use a protected well, 13% public tap, 8% a neighbour's tap, and 2% personal tap. The 61% that use non-protected wells to some extent explains the prevalence of diarrhea. In terms of wash/ rest room facilities, 64% have uncovered pit latrine, 31% covered pit latrine, 3% flush toilet with septic tank and 2% improved pit latrine.

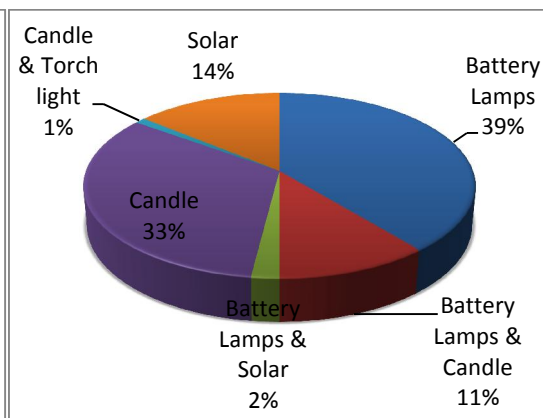
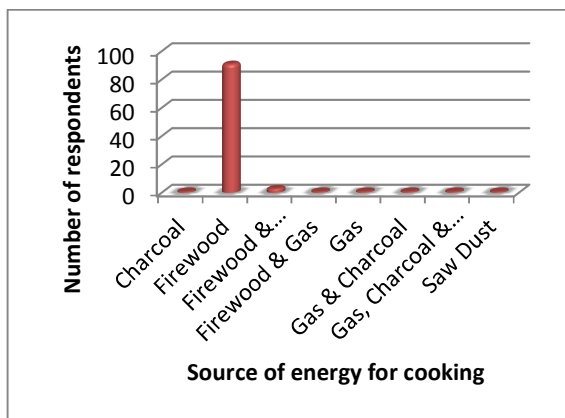
Figure 4.35 and 4.36 presents the source of water and wash room facilities respectively at the household level.



**Figure 4.35 Source of water at HH level**      **Figure 4.36 Wash room facilities at HH level**

91% of respondents use firewood for cooking. Whilst the rest use charcoal, saw dust and gas. Most people used the R lamps that use batteries for electricity/ lightening at night i.e. 39%, 33% use candles, 14% solar, 11% R lamps and candle, 2% R lamps and solar energy, and 1% candle and torch light.

Meanwhile, some people in Gunjur Greater enjoy electricity, however, the people along the coast e.g. in Gunjur Kajaba, Gunjur Njie Kunda and Gunjur Madina Salam are yet to benefit from electricity. While 30% of the respondents are the owners of the house or household leader, the remaining 70% are members of the household. Most households had 3 rooms to 2, 4, 6, 5 and in a few cases up to 10 rooms and so forth. Meanwhile, 49% of households have 2 people per room; followed by 3 people per room, 4 people per room and so forth. Figure 4.37 and 4.38 presents the source of energy and lightening respectively at the household level.

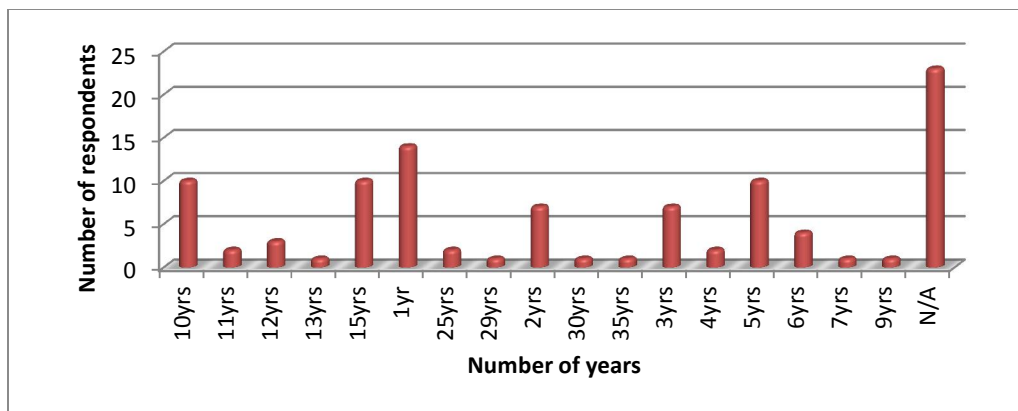


**Figure 4.37 Source of energy for cooking**      **Figure 4.38 Source of lightening at HH level**

Whereas 97% of the households own their own land, 1% said they do not and the remainder 2% is renting for free (on a free ride). With regards to household land evolution; 86% said it remains the same, 13% said their land is becoming smaller (e.g. have possibly sold a part of the land) and 1% said bigger (e.g. bought an additional adjacent plot of land).

Whilst none of them have any cattle, 13% have sheep, 35% have goats, 2% have donkeys for transport and manual labour, 1% has horses, a majority of 80% has chickens, 3% have pigs and 5% have ducks.

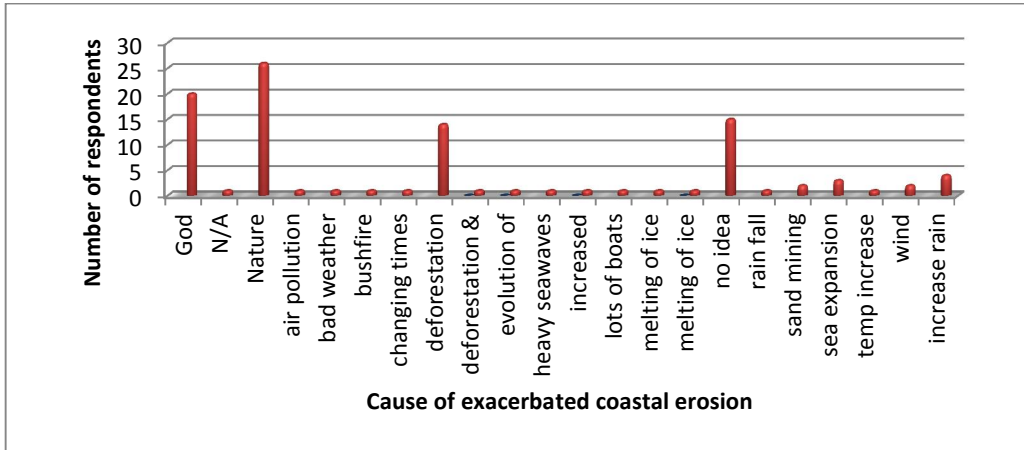
Furthermore, 87% have no sheep, 65% have no goats, 20% have no chickens, 97% have no pigs and 95% have no ducks. In terms of personal assets; 12% own donkey carts, 73% have bicycles, 6% have motor bikes, 12% have cars, 65% have tables and 69% have chairs (furniture at home), 6% have fridges, 6% have televisions, 25% have radios, and 97% have GSM cell phones. Figure 4.39 shows since when respondents observe coastal erosion at the household level.



**Figure 4.39 Since when is the area prone to coastal erosion?**

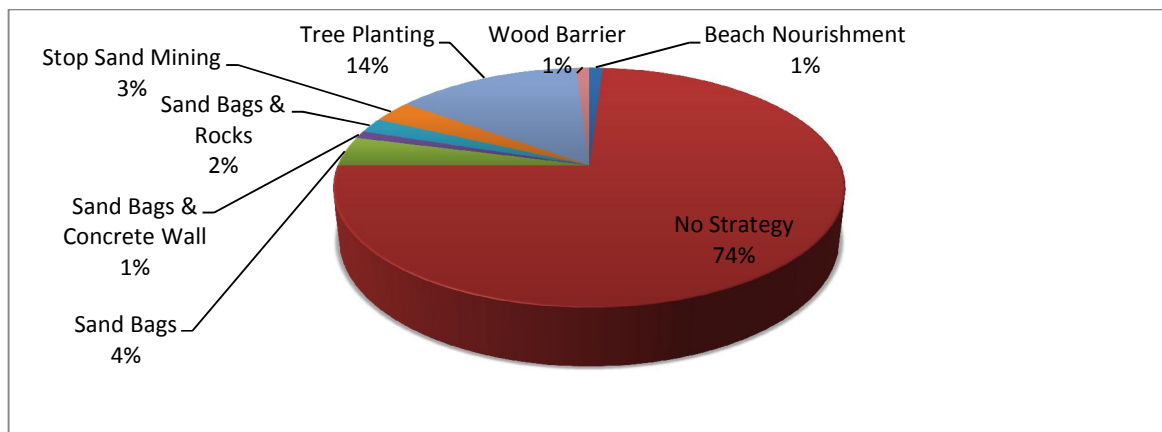
Notably, 77% said that the area where they live is prone to coastal erosion, 19% said that they are not affected by coastal erosion and 4% have no idea whether their residence is prone to coastal erosion or not. Whilst a few have noticed coastal erosion as far back as 30 to 35 years (mostly the old age), some have noticed the coastal erosion trend since 10 years, 15 years, 1 year, 5 years, 3 years, 2 years, 12 years and so forth.

Figure 4.40 shows the respondents perception of the cause of exacerbated coastal erosion at the household level.



**Figure 4.40 Cause of exacerbated coastal erosion**

A whopping majority of 94% do not want to leave and thus prefer to continue staying in the village due to ancestral heritage, cultural ties, properties and fishing activity among many. When it came to the possible causes of exacerbated coastal erosion, the majority underscored nature as being the reason, others highlighted God and some had no idea. Meanwhile, a minority mentioned deforestation, increase in rain, sea expansion, sand mining and the wind, to mention a few. As far as coping strategies to coastal erosion is concerned, 74% have no strategy at all, 14% buttressed on tree planting and a few highlighted the usage of sand bags and the halting of sand mining along the coast. Figure 4.41 presents coping strategies of respondents to coastal erosion at the household level.



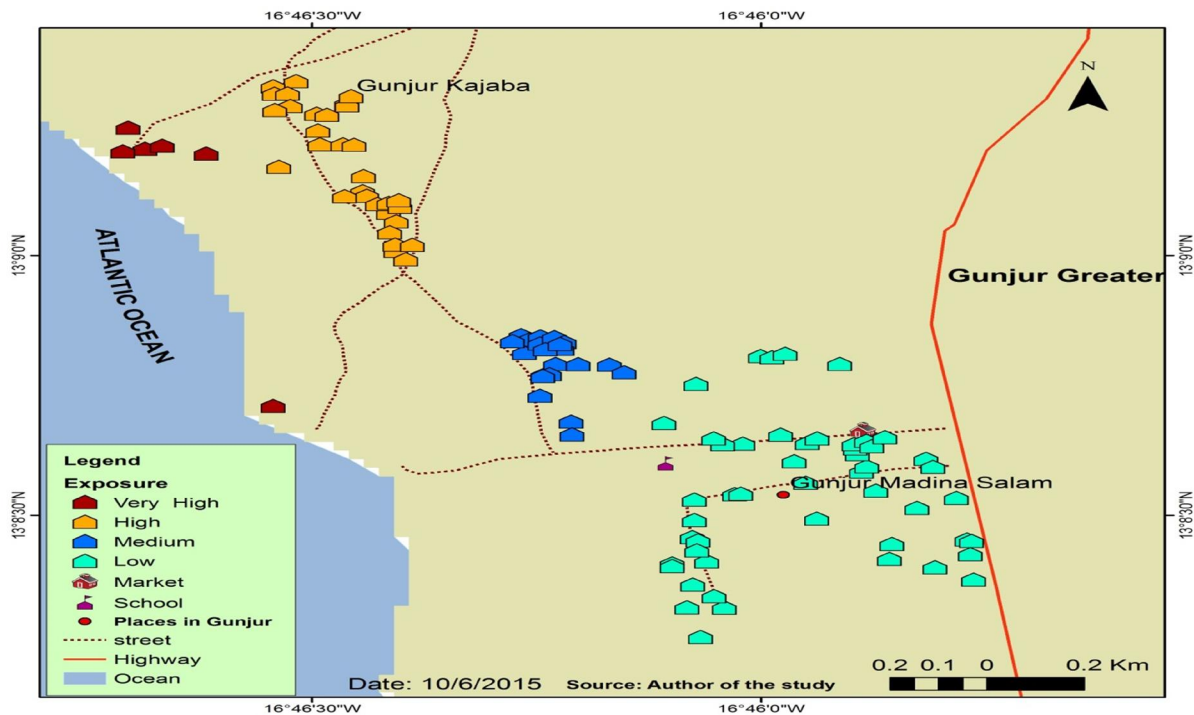
**Figure 4.41 Coping Strategies to coastal erosion at HH level**

Furthermore, 59% declared that they are unaware of climate change, whilst 41% said they are aware of climate change. Whereas, 81% buttressed that they observed changes to their environment, when compared to past years.

The observed changes are rising temperatures, decrease in the amount of rainfall, late onset of rainfall, reduction in cold days and nights and the subsequent increase in warm days and nights (thus decrease in the diurnal range). In addition, 88% said that they did not receive assistance from the government to mitigate their situation. Whereas 59% benefited from some form of NGO assistance e.g. scholarship and provision of bicycles to children. Meanwhile, 42% said that one (1) NGO is operating in the area and 16% talked about two (2). However, none of the respondents was medically insured. Meanwhile, 100% of respondents wanted to benefit from some kind of insurance.

#### 4.2. The results of the exposure mapping

Below is a map showing the exposure of the households according to classes.



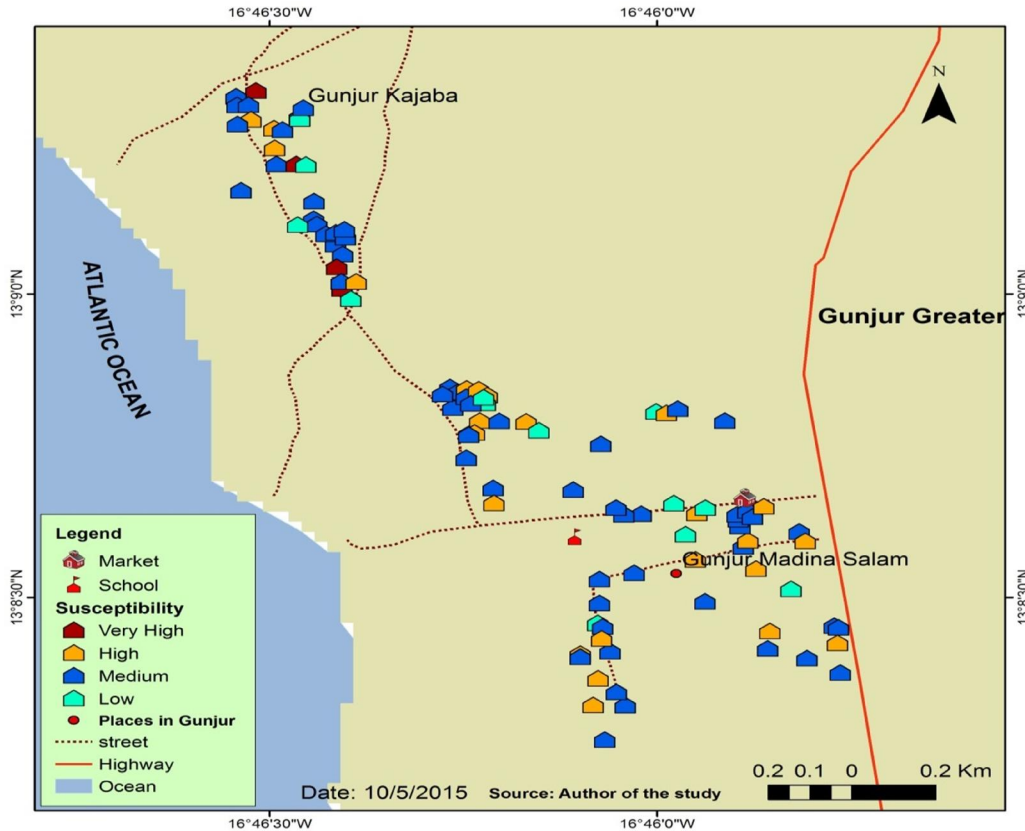
**Map 4.1 Exposure map of the study area**

The indicator used to determine the level of exposure is the distance of the household from the ocean. A distance within 250 meters (Very High), 500 meters (High), 750 meters (Medium) and beyond that (Low). Thus the closer the household to the ocean, the more exposed. Locations along the coast are more physically prone to coastal erosion, while those inland are less physically vulnerable (Melton, 2008). Therefore, from the exposure map generated, we can see that the more exposed households are in Gunjur Kajaba and the FLS infrastructures (North Westerly Manner). Thereon, with the households in Gunjur Medina Salam medium to low exposure (South Easterly Manner). In addition a 50 cm to 1 m rise in

sea level will result in the total inundation of the FLS infrastructure. Meanwhile, the indicators used in the social vulnerability assessment were chosen, while taking into consideration their short comings and the inadequate data constraints on the ground.

### 4.3. The results of the susceptibility mapping

Below is a map showing the susceptibility of the households according to classes.

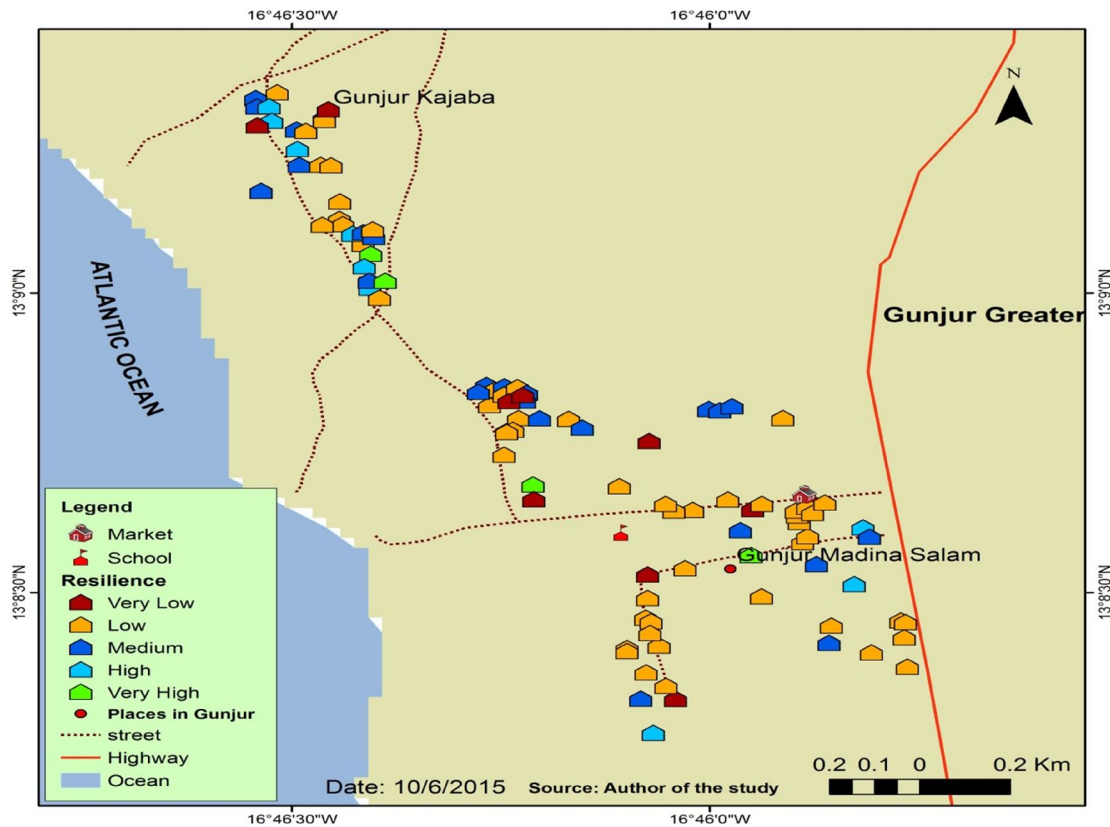


**Map 4.2 Susceptibility map of the study area**

With regards to generating the susceptibility map, three (3) indicators were used, namely: children under 5 years, elderly above 65 years and last but not the least the head of the household. Children under 5 are more prone to sickness and mal-nutrition, while the elderly above 65 are more dependent on people as they are getting older. Meanwhile, the assumption is that male-headed households are less vulnerable than female-headed households; though this is not true in all cases as there are exceptions. Considering the generated susceptibility map, we can see that a considerable number of households have high to medium susceptibility. While the remaining portion a low and a few very high susceptibility.

#### 4.4. The results of the resilience mapping

Below is a map showing the resilience of the households according to classes.



**Map 4.3 Resilience map of the study area**

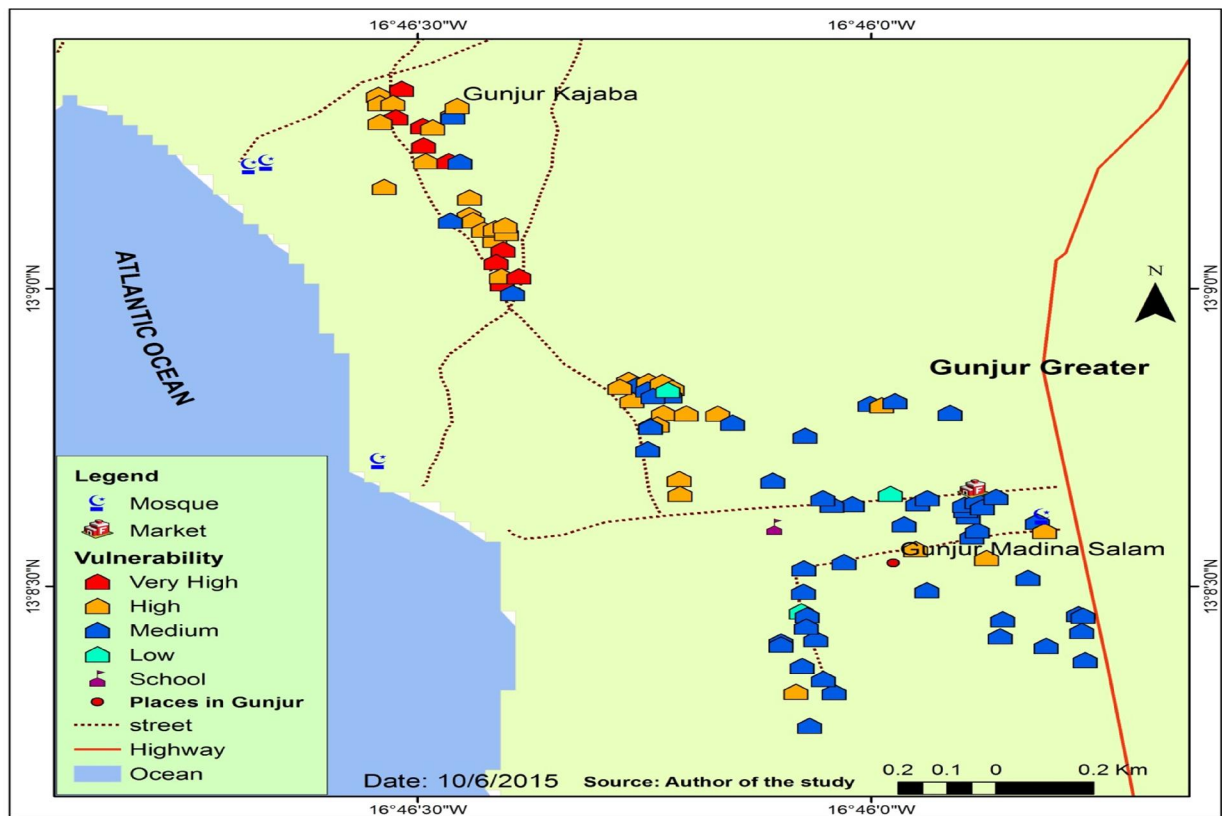
Observably, three (3) indicators were used to generate the resilience map, namely, house roof material, house wall material and livestock availability at household level. To some extent, the building materials portray the economic situation of a household and thus the level of lack of resilience. A more fortunate household will go for a house made of cement and covered in zinc or concrete roof. Likewise, it was observed that 79% of households live in clay/ mud houses, not by choice but as a result of poverty and unfortunate circumstances.



Furthermore, the availability of livestock, e.g. goats, sheep, chicken (poultry) is very important at the community level. Since it is a form of “animal banking” to cater and safeguard against a “rainy day.” Livestock can be sold to pay school fees, buy a motor bike, buy food, and repair the house or simply to pay a debt, to mention a few. Thus, from the map generated we can observe that the majority of households have a low resilience level, while some households have a medium resilience and a few with high resilience. Whereas a small number of households registered very high resilience and very low resilience.

#### 4.5. The results of the vulnerability mapping

Below is a map showing the vulnerability of the households according to classes.



**Map 4.4 Vulnerability map of the study area**

Finally, the social vulnerability map was generated by overlaying individual layers of exposure, susceptibility and resilience (capacity) using Raster Calculator in ArcGIS. From the map generated, we can observe that a small number of households have very high and low vulnerability. While a considerable number of households have high to medium vulnerability. Notwithstanding, as coastal erosion is a slow and creeping hazard, at the rate things are going, if the community does not benefit from alternative livelihood projects and a strong intervention in coastal erosion adaptation, the social vulnerability will no doubt

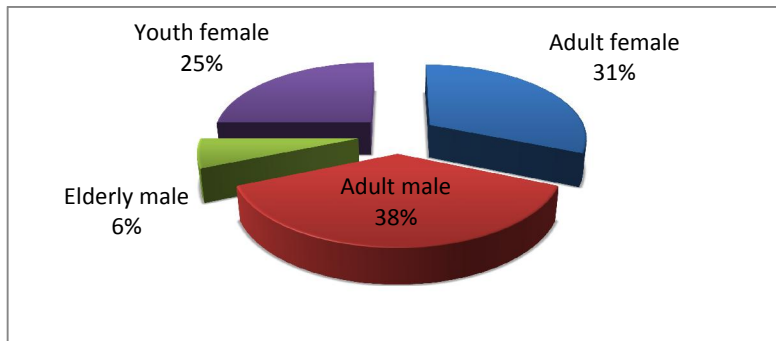


increase over time; hence the need for urgent adaptation and mitigation measures amidst a changing climate and variability.

#### 4.6. The Focus Group Discussion (FGD) Outcome

##### 4.6.1. PARTICIPANTS CHARACTERISTICS

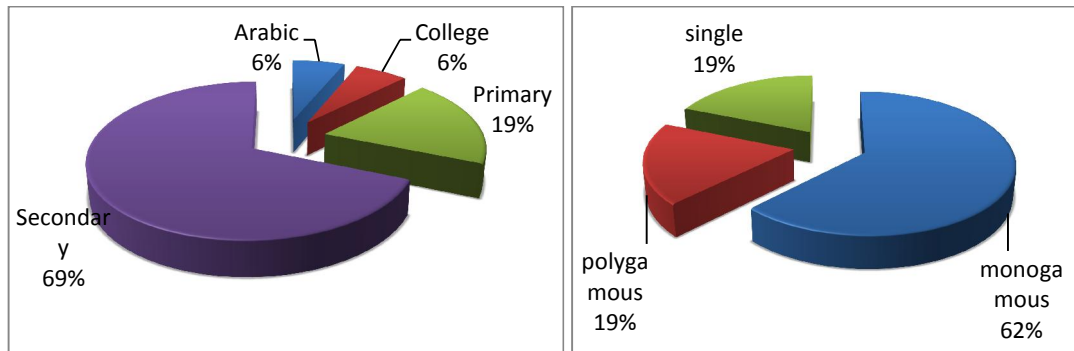
The majority of the participants during the Focus Group Discussion (FGD) were females at 56%. Hence, when tackling vulnerability to the negative impacts of coastal erosion, amidst a changing climate, women should not be left behind. Furthermore, gender mainstreaming must be done in all development policies, programmes, projects and activities at the international, regional, national and local levels. Largest age bracket group observed is adult male at 38%. Figure 4.42 presents the age bracket of the FGD participants.



**Figure 4.42 Age bracket of FGD participants**

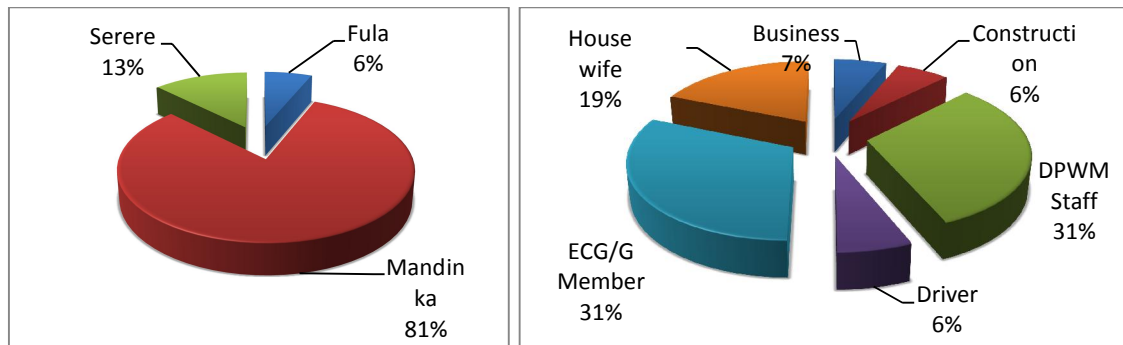
Most of the FGD participants have secondary education level. Since the majority of the participants have only stopped at secondary education and have not proceeded to higher education, one can assume that their capacity to adapt to the negative impacts of climate change will be very limited. Furthermore, considering that education is the key solution to Africa's problems and much needed sustainable development, a country or a continent that is half educated does not help our status quo amidst a changing climate and dire circumstances.

Figure 4.43 and 4.44 presents the literacy level and marital status of the FGD participants respectively.



**Figure 4.43 Literacy Level of FGD members      Figure 4.44 Marital Status of FGD**

In addition, the majority of the participants are in a monogamous matrimonial situation. However, the 19% polygamous marital situation is more likely to be negatively affected by the negative impacts of coastal erosion amidst a changing climate due to the fact that community members who belong to polygamous families are more often vulnerable as a result of thin availability of shared resources, pressured by large numbers of people within the polygamous set-up. Thus it is not unique to see some children not going to school because of the inability of the father to pay schools fees as a result of the many responsibilities to cater for the up-keep of his wives, children and other domestic matters. Figure 4.45 and 4.46 presents the ethnicity and occupation of the FGD participants respectively.



**Figure 4.45 Ethnic Group of FGD members      Figure 4.46 Occupation of FGD members**

Most participants are from the Mandinka ethnic group, which happens to be the largest in The Gambia. Any intervention of climate change awareness, adaptation and mitigation measures in the near future in the village should target all ethnic groups. Furthermore, in the inception of any possible project, the project beneficiaries or target group should be part of the initial design, plan and implementation of the project to ensure a sense of ownership within the

community and thus ensure sustainability long after project completion. Or else such projects can be termed as “white elephant” projects.

Understandably, most participants in the FGD are engaged in working for Environmental Concern Group of Gunjur (ECG/G) and Department of Parks & Wildlife (DPWM) at 31% (through government community partnership) respectively. This shows that people are willing to ensure environmental protection and a positive change in attitude when given better alternatives and properly sensitized on the benefits of a healthy and clean environment and the resultant demerits if we do not take precaution. Thereon, participation is encouraged, a sense of community ownership inculcated and partnership strengthened.

Interestingly, all participants are Muslims. Thus, any future intervention in the community to address the negative impacts of coastal erosion and awareness-raising in matters relating to climate change can be channeled through the well-respected religious and traditional leaders. This will ensure a well receptive audience willing to act for the common good.

#### **4.6.2. Focus Group Deliberation**

Indeed, although the immediate impact of coastal erosion is felt on individuals, households and families affected, their combined effects are felt as an aggregate of individual household effects. The nature and extent of the effects on the community will depend on how the community is organized socially, economically and culturally. Furthermore, during the FGD, the answers that were given by the participants received a 100% general consensus.

#### **4.6.3. Historical aspect of coastal erosion, its negative impacts and associated problems in Gunjur**

- Observed 60 years ago;
- Loss of football field near the beach;
- Road to the beach eroded;
- Some canteens were lost, others relocated;
- Loss of agricultural lands due to salt intrusion;
- Loss of ground for parking boats;
- Salt intrusion in wells;
- Coastal erosion is a major threat;
- Malaria and diarrhea are predominant health problems as a result of stagnant water, poor sanitation and hygiene; and

- Serious impacts of coastal erosion since early 90's.

#### **4.6.4. Perception of climate change**

- All respondents have heard the words “Climate change” and believe that there is a link between Climate change (CC) and coastal erosion.
- **Causes of CC:** deforestation, bushfires, air pollution and desertification
- **Impacts:** decrease in rainfall, loss of biodiversity habitat and spread of diseases.
- Associated links between Climate change, land occupation and coastal erosion include the following:
- Settlement and agriculture lead to deforestation, cutting of mangroves and sand mining
- Air and water pollution contributes to climate change
- Global warming leads to melting of glaciers, which causes exacerbated coastal erosion.

#### **4.6.5. How they cope with coastal erosion/ adaptation**

- Sensitization leading to awareness-raising
- Tree-planting at community level
- The community is not equipped to face coastal erosion
- The community copes by using sand bags, tree-planting, stopping beach sand mining and undertaking tree-planting

#### **4.6.6. Climate change and manifestations**

- Salt intrusion in coastal farmlands (for example, rice fields)
- Fishermen now go deep into the sea and thus spend more money on fuel for transport
- Relocation of some canteens at FLS

#### **4.6.7. Justification**

- Global warming
- Coastal erosion
- Migration of fish
- Loss of employment

#### **4.6.8. No discrimination**

- There is no discrimination; however, the status quo increases the unemployment rate at community level. For example, increase in the cost of fuel and input results to fishermen reducing the number of laborers in the artisanal fisheries sector;
- Nonetheless, some assistance from relatives and friends is rendered in kind or cash, such as a bag of rice;
- Loss of some fish smoking stores, salt intrusion in wells and so forth as previously mentioned.

#### **4.6.9. The perception of coastal erosion**

- Obviously, coastal erosion negatively affects household assets directly and indirectly
- For example, loss of fish smoking stores, loss of income as a result of unemployment among others
- Yes coastal erosion negatively affects food and nutrition security of the household
- For example, fishermen, fish mongers and farmers due to the lost of associated income and agricultural lands as a result of salt intrusion, to mention a few.
- Yes coastal erosion worsens poverty. The resultant loss of assets and income contributes to the cycle of poverty.

#### **4.6.10. Effects on the human and financial capital of the community**

- Increase in cost of health treatment;
- Quality of treatment questionable;
- Affordability is another bottleneck;
- Relocation applies when considering the loss of canteens and fish smoking stores

- Due to the loss of fishermen's income; the fishermen do not have money to give to their wives for "susu".

Meanwhile, the ECC/G environmental group of the community engages in the following;

- **Tree-planting** from July to September
- **Beach cleaning** from October to December
- **Sensitization and village cleaning exercises** from January to June

## **Chapter 5: Discussion, Conclusion and Recommendations**

### **5.1. Discussion**

The importance of the Fish Landing Site (FLS) to the thousands of people who live in Gunjur cannot be over emphasized, as most of their sustenance comes from the FLS. However, the FLS does not only serve Gunjur but also other towns like Brikama and Serrekunda. This is palpable with the findings of (Royal Haskoning, 1999) that mentions Gunjur as the major Fish Landing Site in Gambia with a total fishing of 8,526 tons per annum.

Meanwhile, one of the health concerns at the FLS is with regards to the women fish smokers who are exposed to a lot of smoke on a daily basis. Moreover, coastal erosion being a physical hazard is a threat to the sustenance and livelihood of thousands of people who reside in Gunjur. In addition, a 50 cm to 1 m rise in sea level will result to the inundation of the FLS and as a result a great loss of all of the livelihood and properties.

In terms of literacy in the FLS, observably, 58% have some form of education whilst 42% are illiterate. Out of the 58% who are educated, 63% are males and 37% females. Meanwhile, 30% have secondary level education, 12% primary, 15% Arabic (Dara) and as earlier said 42% illiterate. There is therefore, an urgent need to accelerate the promotion of girls' education and to ensure that students proceed from secondary to tertiary education (Gambia Education Policy, 2004).

Whereas, 94% depend on only one source of income, whilst 3% on hired labour and 3% on traditional music (e.g. Kora player). Hence, the urgent necessity to diversify livelihood activities so as to reduce future potential risk and vulnerability (a function of exposure, sensitivity and adaptive capacity). Without doubt, 94% agree and ascertain that the area is prone to coastal erosion. As evident in the findings of Royal Haskoning (1999) and Delft Hydraulics (1992) that Gambia is vulnerable to coastal erosion and sea level rise, especially rural coastal communities who are resource poor.

As one can comment in the FLS, 97% of the households want to continue staying in Gunjur because of ancestral heritage, cultural ties, social network and ownership of properties. Also, 88% do not have strategy to cope with coastal erosion. Thereon, as the cost of coastal erosion

adaptation is very expensive, hence, the pressing prerequisite for government and development partners to intervene (Royal Haskoning, 1999).

With regards to awareness on Climate Change at the FLS, 85% are unaware of climate change. Thus an urgent necessity for awareness on climate change and environmental protection needs to be created. Notably, 85% and 81% in the FLS and household level respectively, have observed some changes to their environment in the past few years in terms of rising temperatures, decrease in the amount of rainfall, late onset of rainfall, reduction in cold days and nights and the subsequent increase in warm days and nights (thus decrease in the diurnal range). All of which is corroborated in (IPCC, 2007), which reports that temperature is increasing (high certainty) as a result of anthropogenic factors such as the emission of Greenhouse Gases (GHG's) and the resultant enhanced Green House Effect and global warming.

The findings of the country's meteorological agency show a significant increase in temperature during the last 60 years, variability in rainfall and changes in the planting time for farmers during the rainy season as a result of late onset of rainfall (Gambia National Water Policy, 2006). Thus, authorities of meteorological stations, the Department of Water Resources and the Department of Agriculture must establish a network to advice farmers on the period to start sowing their seeds, best Sustainable Land Management Practices, improved water harvesting reservoir techniques and other pertinent matters.

Furthermore, 97% and 94% who have not received any assistance from the government and NGOs respectively at the FLS, shows that the people need more input from the NGOs, Community Based Organization (CBOs) and government. However, the distance to the nearest health center being 45 minutes is relatively too far especially for sick people seeking treatment. Thus, it will be wise and favourable to have such a facility nearby. This finding is similar to that of PAGE (2011): rural communities are sometimes far away (distance wise) from accessing health care service. Thus, it advocates for rural communities to have closer health facilities that deliver quality services.

Majority of the people interviewed at the household level were the wives and leaders, followed by the brothers of the household leaders. Meanwhile, the largest ethnic group



among the interviewees was the Mandinka (42%). This majority is obvious in The Gambia National Population Census Report (2013). Thus, any future intervention on awareness-raising on climate change should target all these respective ethnic groups or tribes. So as to ensure that meaningful strides are realized in the sphere of community environmental awareness and subsequent protection.

Most people (51%,) are in a monogamous marriage, polygamous (27%), single 18%, free union 2%, whilst the divorced and widowers remains is 1% each. Thereupon, as with several polygamous families, the availability of resources is very limited due to its high demand and thin availability as a result of its populous family set-up. Thus, it is not unique to see some children not going to school because of the inability of the father to pay schools fees as a result of the many responsibilities to cater for the up-keep of his wives, children and other domestic matters. Even though the polygamous way of life is among the minority within the community, its vulnerability should not be understated nor ignored.

Nonetheless, there are merits of a polygamous set-up, such as more hands to help in the farm and social support but it also means more mouths to feed amidst dwindling natural resources; for a community that is so dependent on such natural resources, for example, 91% of respondents use firewood for cooking (which is gathered by women). Thereon, a polygamous as well as a monogamous family is less vulnerable to coastal erosion and other negative impacts of climate change when their economic status is much more fortunate or favourable.

Concerning children under the age of five (5), one can see that the level of susceptibility is high amongst the households, with 79% of households having at least one (1) child less than five (5) years. Furthermore, children under 5 years do not have fully developed immune system and are more prone to mal-nutrition and sickness. This high fertility rate is corroborated with statistics from (GBoS, 2003) that indicated a high fertility rate of 4.2% in The Gambia. In addition, 20% of the population of the country is children under five years of age.

Regarding elderly above sixty-five (65 years), 70% of the households have none. Therefore, one may be curious as to why is it that many people are not getting past the age of 65. It could be because of inadequate health facilities, environmental circumstances, diet, life style or a combination of some or all of the factors.

Meanwhile, it is apparent in GBoS (2003) that the average life span in the country for men and women is 56 years and 59 years respectively. In addition, 87% of the household leaders are males and the remainder 13% are females. This is good, in some cases, a female headed household may thrive against all odds when the female household leader is well educated and has a consistent source of good income.

At the household level, 62% had some form of education and 38% are illiterate. Moreover, out of the 62% who are educated, 65% are males and 35% females. Whereas, out of the 38% who are illiterate, 39% are males and 61% are females. Observably, the percentage of literate males exceeds that of female while the percentage of illiterate females exceed that of males. Hence as in the FLS, the urgent need to ensure that more girl children go to school (Gambia Education Policy, 2004). In addition, the literacy level shows that most respondents did not get beyond secondary school. However, “half-educated” people in most cases do not have the ability or potential to properly adapt and mitigate. In most situations what happens is that the community in question copes with the hazard, except that external help comes to sensitize them properly and to give them, guidance and support; wherein best adaptation and mitigation practices are made manifest.

Thereon, as most of them are paid in cash with a low average monthly income, meaning (“resultant hand to mouth”), few will have the ability to be able to save for a “rainy day.” In turn, this depicts, to some extent, their socio-economic status and insufficient capacity to adapt to a changing climate. The majority of people who dropped out of school did so because of financial constraints, marriage and the need to work to support themselves and their families. Also, 51% had some form of employment, 48% unemployed and 1% unemployed due to being a student or too old. Out of the 48% who are unemployed, 60% are women and 40% are men. It is thus, urgent for government to ensure a country-wide basic educational system that is available, affordable and accessible, especially to the rural poor. Moreover, the high rate of unemployment means greater dependency on a single household

“bread winner.” This further worsens poverty and lessens the capacity to anticipate, cope and recover from the impacts coastal erosion.

The majority of the people who are unemployed are simply jobless, students, too old or as a result of family obligations and incapacity. Hence, the training in alternative livelihood activities such as bee-keeping (honey production), “tie and dye”, batik work, handy-crafts making, eco-tourism and so forth will help to diversify livelihood activities and create meaningful and gainful employment. This in turn will reduce dependency and the social vulnerability of women and thereby increase the capacity to anticipate, cope and recover from the impacts of coastal erosion amidst a changing climate.

To a large extent, well-educated mothers determine a bright future for their children, who will ultimately be the future leaders, since they spend most of their time with their mothers and not fathers. Thus, well-educated mothers will be better equipped intellectually and morally to discipline and ensure a good upbringing of the younger generation, amongst other pertinent issues. This entails a younger generation that is more aware, involved and better equipped to mitigate and adapt to a changing climate and variability.

Most people are engaged in agriculture (threatened by salt intrusion), followed by petty trading, business, student learning, agriculture and petty trading, construction, fish mongering, fishing, driving and services. As visible in (PAGE, 2011) that states that 70% of the labour force is employed in the agricultural sector, two thirds of which are women and that the sector’s contribution to GDP stands at about 30%.

Furthermore, most people are self-employed at 70%, In addition, 66% are paid for work rendered through cash payment. Since the employment opportunities are insufficient in the community, majority of people take it upon themselves to be self-employed so as to be able to take care of their families. Meanwhile, the most pronounced prevailing disease is malaria (66%), followed by fever, diarrhea and skin infection.

Thus, one can anticipate that there exists a lot of stagnant water within the community for mosquitoes to lay eggs. Other issues of concern are hygiene, water and sanitation; when considering the problem of diarrhea, to mention a few. This finding is supported by (NAPA, 2007), wherein it states that while accurate predictions cannot be made amidst a changing climate, it is possible that the incidence of malaria, dengue and yellow fever will increase.

Further corroborated by (WHO, 2015) that underscored malaria as the number one killer disease in Sub-Saharan Africa.

At the household level, with regards to travelling distance to receive treatment for sickness, 42% travel up to 3km, 22% less than a kilometer, 20% more than 5km, and 16% less than 5km. Furthermore, in the near future, it is important for the government to ensure that members of the Gambian rural community have state of the art health facilities at their disposal. This finding is similar to that of PAGE (2011); it was noted that rural communities are sometimes far away (distance wise) from accessing health care service. Thus, (PAGE, 2011) advocates for rural communities to have closer health facilities that deliver quality services.

Furthermore, 79% used clay/ mud as wall material, cement (17%) while 4% of the households used a combination of clay & cement. The 79% that use clay as a wall material do so not by choice but as a result of poverty. Since the clay is free, whereas, the cement has to be purchased; not everybody can afford the latter. Thus the building material to some extent shows the economic situation of the household and the level of lack of resilience.

Moreover, 61% of the residents use non-protected wells as a source of drinking water and other domestic purposes. In terms of wash/rest room facilities, 64% use uncovered pit latrine. To some extent, the poor sanitation and hygienic conditions could explain the prevalence of diarrhea.

Relatedly, 91% of respondents use firewood for cooking while the minority use charcoal, saw dust and natural gas. Wherein, women spend a considerable time gathering firewood for cooking at the household level. Consequently, this indicates a high demand and pressure on natural resources and the subsequent level of deforestation within the community. Most people used the “R” lamps that use batteries for electricity/ lightening at night because of the unavailability of electricity.

Meanwhile, some people in Gunjur Greater enjoy electricity, however, the people along the coast e.g. in Gunjur Kajaba, Gunjur Njie Kunda and Gunjur Madina Salam are yet to benefit from electricity. Most households (97%) own land either through inheritance or acquisition of user rights due to the affordability of land in the rural areas as compared to urban areas. With regards to household land evolution; 86% indicated that it remains the same, 13% confirmed that their land is becoming smaller (for example, have possibly sold part of the land as a

result of financial obligations) and 1% pointed out that their land is becoming bigger (for example, bought an additional adjacent plot of land as a result of financial well-being).

Whilst none of them have cattle, 13% have sheep, 35% have goats, 2% have donkeys for transport and manual labour, 1% have horses, 80% of them have chickens, 3% have pigs and 5% have ducks. Chickens is mostly reared due to the fact that it is not so hard to acquire and rear at the village level. Also, the poultry meat is a source of protein and at the same time a source of income for a household. In addition, the presence and ownership of livestock at household level is very important as it is a means of saving money (e.g. animal banking), whereas livestock can be sold in terms of financial needs to secure a loan, buy food, pay school fees and among others. Hence the unavailability of livestock at household level in the village reduces their resilience to coastal erosion.

In terms of personal assets, 97% of them have GSM cell phones while 25% have radios. Thus, awareness-raising on climate change through a community radio may not be effective in the village since only 25% have radios. However, public awareness can be created through drama, public announcement system (P.A. System) and traditional oral historians, e.g. griots. Furthermore, since 97% of the households have cell phones, an opportunity can be exploited, by sending and disseminating text messages on awareness creation early warning, and information on planting commencement dates for farmers from meteorological agencies to members of the community and the rural populace.

This will be of immense benefit not only to the literate but also the non-literate population. For example, assuming a farmer is illiterate; a literate member of his household such as the son or daughter who may be going to school, can read the message and relay it to the farmer and other household members. Moreover, the majority of people who own cell phones and have access to GSM telecommunications networks is mainly due to the affordability, accessibility and availability of quality and competitive service from the four (4) GSM companies operating in the country namely - Gamcel, Africell, Comium and Qcell.

Notably at the household level, 77% indicated that the area where they live is prone to coastal erosion, 19% are not affected by coastal erosion while 4% have no idea on whether their residence is prone to coastal erosion or not. Moreover, 77% see coastal erosion as a threat, while 19% of the residents who are not affected by coastal erosion, are the people who live

closer to the main highway, which is farer from the FLS. Nonetheless, the remaining 4% are simply unaware of the situation at hand.

Whilst a few have noticed coastal erosion as far back as 30 to 35 years (mostly the old age), some have noticed coastal erosion since 5 years, 10 years, 12 years, 15 years and so forth. However, it is important to note that those who have been residents in the village for a longer period, were the ones who perceived the rate of coastal erosion from the medium to long term (for example, >15 years ago). Furthermore, at the household level like in the FLS, 94% of the households do not want to leave; thus prefer to continue staying in the village due to ancestral heritage, cultural ties, social network, properties fishing activity and among others.

Regarding possible causes of exacerbated coastal erosion, the main factor underscored was nature while others highlighted God as the driver of coastal erosion. Other factors mentioned are deforestation, increase in rain, sea expansion, sand mining and the wind, while some had no idea. Furthermore, 59% declared that they have no idea of climate change, whilst 41% are aware of climate change.

However, most people who are aware of climate change, do not have a basic understanding of the topic at hand. In addition, it shows the urgent necessity for a well strategized massive public awareness and clarification on climate change and environmental-related issues.

As far as coping strategies to coastal erosion is concerned, 74% do not have coping strategy, 14% buttressed on tree planting and a few highlighted the usage of sand bags and the halting of sand mining along the coast. Related to coastal protection measures, the adaptation cost in terms of physical and ecological engineering measures is very expensive (in the millions of U.S Dollars). Hence, communities such as Gunjur and several others need the timely intervention of the government and the support of development partners.

At the household level, 88% do not receive assistance from the government to mitigate their situation whereas 59% benefited from some form of NGO assistance (for example, scholarship and provision of bicycles to children). This is an indication that more intervention is needed from the government. Nonetheless, at the household level, the NGO's are helping, however, with more support, they can do better for the people of Gunjur.

Meanwhile, the social vulnerability map shows that a small number of households have very high and low level of vulnerability. While a considerable number of households have high to medium level of vulnerability. This is convincing, when considering the different levels of

exposure, susceptibility and resilience. Notwithstanding, as coastal erosion is a slow and creeping hazard, at the rate of the current situation, if the community does not benefit from alternative livelihood projects and a strong intervention in coastal erosion adaptation, the social vulnerability of the community will no doubt increase over time; hence the need for urgent adaptation and mitigation measures amidst a changing climate and variability.

Furthermore, the study provide strong evidence that social vulnerability to coastal erosion is a reality, very important and of great concern. Observably, during the research, it was noted that majority of publications on coastal erosion concentrates more on the physical and ecological aspects of coastal erosion. Hence, the necessity for more research to be conducted on the social dimension of coastal erosion, if any meaningful adaptation and mitigation measures are to be realized.

Moreover, the key finding during the social vulnerability assessment is that women are more vulnerable than men. This is true when considering factors such as the high unemployment rate, illiteracy rate, the percentage of women with no ownership of land, reliance on rain-fed agriculture and the heavy dependence on scarce natural resources like firewood. Meanwhile, social dimension of coastal erosion is very important and thus needs further research and better still to be imbedded in adaptation and mitigation measures.

Thereupon, in order to reduce social vulnerability, exposure and susceptibility must decrease considerably, resilience built and strengthened so as to enhance human security amidst a changing climate and rising sea levels. This is further corroborated in the findings of (Smith 2009; Zou, 2008; Finan *et al.*, 2002), which stressed on the importance of social vulnerability to coastal erosion amidst a changing climate and rising sea levels. It was underscored in their findings that sea level rise and its consequences must be seen as a social problem and the subject of policy-relevant, human-centered, and interdisciplinary domain. While adaptation will be based primarily on changes in technology and social organization. Moreover, vulnerability to the impacts of climate change, including the higher socio-economic burden imposed by present climate-related hazards and disasters, is very likely to be greater on coastal communities of developing countries than in developed countries due to inequalities in adaptive capacity IPCC (2007).

Nonetheless, Smith (2009) did not hesitate to mention that the topic of social vulnerability to coastal erosion is a fairly new area that scientists are now exploring. It further underscored that majority of literature on coastal erosion focuses more on the physical and ecological

dimension and tend to down play the social aspect. It was buttressed that for any meaningful coastal erosion adaptation and mitigation measures to be met, the social vulnerability aspect must be properly researched and factored in to help avoid sea level rise from triggering an unprecedented humanitarian catastrophe.

## **5.2. Conclusion**

Measuring vulnerability is a key to effective risk reduction and the promotion of a culture of disaster resilience. Thus at the end of the study, it was observed that Gunjur is socially vulnerable to coastal erosion. Meanwhile, women are more socially vulnerable to the impacts of coastal erosion. Furthermore, most households are resource poor and simultaneously vulnerable to a slow and creeping hazard, i.e. coastal erosion amidst a changing climate and variability. Nonetheless, this vulnerability is not solely dependent on social but also on physical, ecological and economic dimensions.

Finally, social vulnerability to coastal erosion is not limited only to the set of indicators assessed. The reason for this restriction is the absence and lack of accurate data. However, the indicators used appear to be relevant in assessing the vulnerability of the community to coastal erosion. As a result, the study revealed that social vulnerability to coastal erosion in Gunjur is a reality. Since the hazard is slow and creeping, such a social vulnerability is expected to get worse over the years if there is no timely intervention from the government and development partners.

In order to help reduce the level of social vulnerability to coastal erosion in Gunjur, the following recommendations could be put in place at the government level;

- Beach nourishment project
- Construction of breakwaters and groins
- Coastal research & monitoring
- Policy formulation on climate change, integrated coastal zone management, wetlands and mangrove conservation
- Enhance basic health care availability, accessibility and affordability
- Construction of roads and drainage
- Provision of pipe borne water and affordable electricity supply
- Provision of cold trucks for the Gunjur FLS
- Enhance alternative livelihood projects for rural coastal communities



- Provision of mosquito nets to communities and malaria prevention medicine to health centers and hospitals

At the level of institutions, the following recommendations could be put in place;

- inter-agency collaboration to help rural coastal communities to adapt to coastal erosion
- a designated community dump-site
- massive awareness on environmental protection and climate change
- microfinance credit facility to community members

At the level of community, the following recommendations could be put in place;

- tree and mangrove planting
- diversification of livelihood activities at community level

**Table 5.1 Recommendations**

Outputs	Activity	Stakeholders	Resources	Timeline
Beach nourishment project	Using soft engineering methods to nourish the eroded part of the country's coast	Government Development partners, e.g. Global Environment Facility (GEF)	High	Medium
Breakwaters & groins coastal protection	Construction of breakwaters & groins (hard engineering) to reduce the rate of coastal erosion	Government Development partners, e.g. GEF	High	Medium
Coastal research & monitoring	M&E of the state of coastal erosion and research to address the situation	Government, e.g. NEA Development partners, e.g. UNDP	High	Long-term
Policy on climate change, integrated coastal zone management, wetlands and mangrove conservation	Review and/or develop policy on climate change, coastal zone management, wetlands and mangrove conservation	Government, e.g. NEA, Department of Forestry (DOF), Department of Water Resources (DWR), & Department of Parks and Wildlife Management (DPWM)	Medium	Short-term
SMART and well integrated Natural Resource Management (NRM) policies	Formulation & implementation of SMART and well integrated policies to ensure efficient management of natural resources which enhances adaptation and builds resilience	Government, e.g. Ministry of Environment, NEA, DPWM, DOF, Fisheries, Department of Agriculture (DOA) etc.	Medium	Long-term

M.O.U (on-going) with NEA for technical & financial support to the community's Environmental Concern Group (ECG)	Training workshops for capacity building, provision of cleaning equipment ( e.g. wheel barrows, spades, cutlass, dust bins) for community cleaning activities and provision of books, posters & other resource materials	National Environment Agency (NEA) Researcher	Medium	Long term
Massive awareness on environmental protection & Climate change	Sensitization on environmental protection & Climate change	Government, e.g. Ministry of Environment & NEA NGOs Traditional oral communicators, e.g. Griots Community Radio	Medium	Long term
50 community members sensitized on Climate change	Two (2) days sensitization workshop on Climate change for 50 community members, i.e. early March 2016	Researcher	Low	Short term
Tree planting & mangrove planted	Planting of trees, e.g. coconut trees along the coast	Government, e.g. Department of Forestry (DOF) NGO's & Community Based Organizations (CBO's)	Medium	Medium
Mosquito nets and malaria prevention medication	Distribution of mosquito nets and provision of malaria prevention medication in health centers and hospitals	Government, e.g. Ministry of Health & Social Welfare (MoHSW) NGO's	Medium	Long-term

Enhance basic health care availability, accessibility and affordability	Improve basic health care availability, accessibility & affordability	Government, e.g. Ministry of Health & Social Welfare (MoHSW) NGO's	High	Long-term
Roads & Drainage	Construction of Roads & Drainage	Government, e.g. Ministry of Works & Construction National Roads Authority (NRA)	High	Medium
Pipe borne water & electricity	Provision of clean drinking water and electricity	Government, e.g. National Water & Electricity Company (NAWEC)	High	Medium
Designated community dump-site	Identify and designate a suitable and proper dump-site	Government, e.g. NEA Local Government Authority (LGA) e.g. Brikama Area Council (BAC)	Low	Short-term
Microfinance credit facility to community members e.g. farmers and fishermen	Provision of low interest (soft) loans, e.g. to farmers, fishermen and fish smokers	Government, e.g. Ministry of Finance and Economic Affairs (MoFEA) Private Sector e.g. commercial banks NGO's Village Development Committee (VCD)	Medium	Long-term
Cold Trucks	Availability of cold trucks to transport fish from the Fish Landing Site to other regions of the country	Government, e.g. Ministry of Trade & Industry Private Sector	High	Medium

		Village Development Committee (VCD)		
Enhancing alternative livelihood projects for rural coastal communities	Promoting projects that enhance livelihood of rural Gambian coastal communities, e.g. horticulture, bee keeping & eco-tourism	Government, e.g. Ministry of Environment, NEA, & DPWM Development partners e.g. UNDP & GEF	High	Medium
Diversification of livelihood activities at community level	Training on alternative livelihood activities & provision of kick-start funds to community members	Government, e.g. Department of Community Development (DCD) NGO's Private sector Village Development Committee (VCD)	Medium	Medium

### **5.3. Policy Implications**

The research will have implication in terms of advocating for policy makers, decision makers, and regulators to see the necessity to recognize that adaptation measures should take into consideration differentiated impacts on men and women and the effectiveness of adaptation measures (e.g. adaptation planning and adaptation finance). GHG emissions (at both international and national levels) as a form of mitigation should ensure that mitigation efforts take into account needs of the community and household level, as well as the industrial sectors. Therefore, intervention measures should be tailored in such a way that they do not negatively impact the poorest and most vulnerable groups. Mitigation planning and financing should incorporate gender perspectives.

The study has identified that women are especially vulnerable. Thus, gender mainstreaming must be considered in all development policies, programmes, projects and activities at the international, regional, national and local levels. When it comes to mitigation finance, it is crucial to incorporate gender perspectives in the various climate financing instruments, mechanisms and processes, and thereby prevent an unlimited adverse impact on social development, poverty alleviation and gender-based equality. Thus, the community and household sectors should be strengthened and supported by government and development partners, so as to ensure that they are not reinforcing existing gender inequalities. In addition, the unique experiences and roles of women in productive, reproductive, and community management activities means that their involvement is imperative for the success of any coastal erosion adaptation effort.

Thereupon, most significant risk from climate change occurs where there are large groups of people exposed to a climate-related hazard and where there is high social vulnerability. Moreover, understanding vulnerability factors and the populations that exhibit these factors are critical for crafting effective climate change policies and response strategies. They are also important to the emerging study of climate justice, which is the concept that no group of people should disproportionately bear the burden of climate impacts or the costs of mitigation and adaptation.

#### **5.4. Limitations**

The study undertaken in the rural coastal village of Gunjur underscored the key elements of social vulnerability of the community. Nonetheless, many key aspects are not tackled in this study because of time constraint in data collection. Thus, several variables in the questionnaire, and the focus group guide were not deeply assessed. Furthermore, the lack of accurate secondary data for the study area at local level equally accounts for its limitations. Meanwhile, most of the available literature on coastal erosion focuses more on the physical and ecological aspect and less on the social dimension. Also, all the features in the MOVE theoretical framework are not fully used in the vulnerability assessment.

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**Appendix of Gunjur FLS Questionnaire**  
**I- IDENTIFICATION**

Country : <b>THE</b>	
<b>GAMBIA</b>	
101. REGION	<div style="border: 1px solid black; padding: 5px; display: inline-block; margin-right: 10px;">WCR</div> 104. VILLAGE / <u>  <b>GUNJUR</b>  </u> ..... /
102. District	<div style="border: 1px solid black; padding: 5px; display: inline-block; margin-right: 10px;">KOMBO SOUTH</div> 105. CODE District..... / <u>          </u> /
103. Surveyer	<div style="border: 1px solid black; padding: 5px; display: inline-block; margin-right: 10px; width: 150px; height: 30px;"></div> 106. CODE Surveyer..... .... / <u>          </u> /
DATE ..... /__/__/ : /__/__/ : /__/__/	
Beginning ..... /__/__/ : /__/__/	
End..... /__/__/ : /__/__/	

**SECTION II: Situation**

200- Number Order	201-sex? 1-M 0-F	202-How old are you?	203-Age Bracket  1=Adult male 2=Adult female 3=Youth male 4=Youth female 5=Elderly male 6=Elderly female	204-What Is your status? <i>1=present resident; 2= absent resident ; 3=Visitor</i>	205-Where are you from ? 1=Wolof ; 2=Serere ; 3=Manjago ; 4=Jola ; 5=Karoninka ; 6=Fula ; 7=Mandinka ; 8=other	206-Marital status? 1=single; 2=Monogamous ; 3=polygamous ; 4=divorced ; 5=widow/widower ; 6=free union	207-Where do you live?  1= Gunjur 2=Sanyang 3= Berending 4=Madina Salam 5=Tanji 6=Serrekunda 7= other	208-How far is your residence?  <i>1 = less than 1 km; 2 = between 1 and 3 km; 3 = between 3 and 5 km; 4= more than 5 km.</i>	209-What is your family size?	210-How many people depend on you?
1	/__/_	/__/_	/__/_		/__/_	/__/_	/__/_	/__/_	/__/_	/__/_

**SECTION III : Education & Employment**

300- Number order	301-Are you educated? 1 –yes 0-no	302— school level? 1=no level ; 2=Primary; 3=Secondary; 4=University; 5=Professional; 6=Other	303- Why did you dropped? <i>1 aged ; 2 too far ; 3 expensive ; 4 work; 5 useless; 6. failure ; 7 marriage; 8 other</i>	304-What is your main activity?  <i>1 Agriculture 2 Petty Trading 3 Fish monger 4 Taxi driver 5 Fishing 6 Fish smoking 7Restaurant business 8 Shop Keeper 9 other</i>	305- Your employer?  <i>1 Self employed; 2 public ; 3private; 4 Government ; 5 NGO</i>	306 –How are you paid?  <i>1 salary ; 2 Cash ; 3 wages; 4 commission ; 5 other;</i>	307-Majority of your customers come from where?  1= Gunjur 2=Sanyang 3= Berending 4=Madina Salam 5=Tanji 6=Serrekunda 7= other	308-What is your average income per month?	309-Is your current job your only source of income?  1 yes 2 no  <b>If no what else?</b>  .....
1	/__/_	/__/_	/__/_	/__/_	/__/_	/__/_	/__/_		/__/_

**SECTION IV: Reasons and awareness of climate change**

401	Is the area prone to coastal erosion? (1=yes, 0=no) i.e. Is the sea getting closer or farer?	/_____/_____/
402	When have you been aware?	/_____/_____/
403	Why do you want to leave / stay?	/_____/_____/
404	In your opinion what are the causes?	/_____/_____/
405	What are your strategies to continue doing business here?	/_____/_____/
406	Are you aware of climate change?	/_____/_____/
407	Have you noticed any change of your environment referring to the past?	/_____/_____/
408	Do you have any assistance from the authorities?	/_____/_____/
409	Are there any NGO's involved on the field?	/_____/_____/
410	How many are they ?	/_____/_____/
411	Are You insured ?	/_____/_____/
412	How much do you pay for the premium?	/_____/_____/
413	Do you want some benefit from an insurance?	/_____/_____/

## Appendix of Gunjur Household Questionnaire

### I- IDENTIFICATION

Country : <b>The Gambia</b>			
101. REGION	<div style="border: 1px solid black; padding: 5px; display: inline-block;">KOMBO SOUTH WCR</div>	104. CODE REGION.....	/ _____ /
102. District	<div style="border: 1px solid black; height: 30px; width: 100%;"></div>	105. CODE District.....	/ _____ /
103. Surveyer	<div style="border: 1px solid black; height: 30px; width: 100%;"></div>	106. CODE Surveyer.....	/ _____ /
DATE .....			
. /__/_/ : /__/_/ : /__/_/			
Beginning .....			
/__/_/ : /__/_/			
End.....			
/__/_/ : /__/_/			

**SECTION II: Household Situation**

200- Number Order	201-sex? 1-M 0-F	202-How old are you?	203-What Is your status? <i>1= present resident; 2= absent resident ; 3=Visitor</i>	204-Your links with the household leader? 1=leader; 2=wife ; 3=daughter ; 4=brother/ sister 5=nephew/niece; 6=grandson/granddaughter ; 7=father/mother ; 8=son's wife ; 9=brother's wife ; 10=son of other member 11=no link ; 12=other parent	205-Where are you from ? 1=Wolof ; 2=Serere ; 3=Manjago ; 4=Jola ; 5=Karoninka ; 6=Fula ; 7=Mandinka ; 8=other	206-Marital status? 1=single; 2=Monogamous ; 3=polygamous ; 4=divorced ; 5=widow/widower ; 6=free union	207-Children under 5yrs? 1=None 2=1 3=2 4=3 5=4 6=5 7= >5	208-Elderly above 65yrs? 1=None 2=1 3=2 4=3 5=4 6=5 7= >5	209-Head of Household? 1=Male 2=Female
1	/	/	/	/	/	/	/	/	/

**SECTION III : Education**

300- Number order	301-Are you educated? 1 -yes 0-no	302— school level? 1=no level ; 2=Primary; 3=Secondary; 4=University; 5=Professional; 6=Other	303- Why did you dropped? <i>1 aged ; 2 too far ; 3 expensive ; 4 work; 5 useless; 6 failure ; 7 marriage; 8 other</i>
1		/	/



**SECTION IV : Employment**

<b>400-number order</b>	<b>401-Are you employed?</b> 1=yes 0=no	<b>402-if not why</b> 1 jobless; 2 seasonal break ; 3student; 4 family Obligation ; 5 too old/too young ; 6 Incapacity ; 7 other.	<b>403-What is your main activity?</b> 1 Agriculture 2 Petty Trading 3 manufacturing 4 Construction 5 business 6 Services 7 Education 8 health 9 Administration 10 other	<b>404- Your employer?</b> 1 Government ; 2 public ; 3private; 4 self employed	<b>405 –How are you paid?</b> 1 salary ; 2 Cash commission; 3 wages; 4 not paid ; 5 other;
1	/ __ /	/ ___ /	/ __ __ /	/ __ /	/ ___ /

**SECTION V : Health**

<b>500-number Order</b>	<b>501-Type of frequent illness in the area?</b> 1= accident ; 2 = diarrhea; 3= fever; 4= malaria ; 5= teeth ; 6 = nose ; 7= skin ; 8 = eyes ; 9= other	<b>502-Have you been consulted?</b> 1=yes 0=no if 502=0 → end if 502=1 → 503, 504, 505	<b>503-Where do you go to be consulted?</b> 1 traditional doctor; 2hospital; 3Health Centre ; 4 Other	<b>504-Distance from your home?</b> 1 = less than 1 km; 2 = between 1 and 3 km; 3 = between 3 and 5 km; 4= more than 5 km.	<b>505-What was the main problem during your visit there?</b> 1 no problem; 2 waiting time too long; 3 Personnel non-qualified ; 4 Too expensive ; 5 no drugs there ; 6 other
1	/ ___ /	/ __ /	/ __ /	/ __ /	/ ___ /

**SECTION VI: Assets and household characteristics**

601	Which materials make up the roof of your house?	1=concrete ; 2=Slate ; 3=Zinc ; 4=other ;	/ _ /
602	Which materials make up the walls of your house?	1=Bricks of cement ;      2=mud/clay; 3=wood ;      4 other	/ _ /
603	What are the main sources of water provision?	1= public tap ;      2= personal tap ; 3=Neighbour's tap;      4=Protected well ; 5=non protected well ;      6=other	/ _ /
604	Which kind of wash room does the household use?	1=none ;      2= flush toilet with septic tank ; 3= covered latrine ; 4= uncovered latrine; 5=improved pit latrine 6=other	/ _ /
605	Main source of energy for cooking?	1=gas ; 2=Charcoal      3=fire wood; 4=other	/ _ /
606	Main sources of energy for lighting?	1=electricity ; 2=solar ; 3=candle ; 4=rechargeable lamps; 5=other	/ _ /
607	How much time is needed to go to....	Minutes	The nearest water source? / _ / The nearest market? / _ / The nearest primary school? / _ / The nearest secondary school? _ / _ / The nearest Health center? _ / _ / The nearest tarred road? _ / _ /

608	Are you the owner of the house?	1=yes ; 0 =no	/ ___ /
609	How many separated rooms do you have? Number of people per room? children under 5 years?.		/ _____ /
610	Did the household use its own lands?	0 = no ; 1 = rent ; 2 = free; 3=yes	/ ___ /
611	Land evolution with regard last year?	1=Smaller; 2=same; 3= bigger; 4= no answer	/ ___ /
612	Do you have any livestock?	1=yes 0-No if 613=0 → 620	/ ___ /
613	Number of cattle?		/ ___ / ___ /
614	Number of sheep?		/ ___ / ___ /
615	Number of goats?		/ ___ / ___ /
616	Number of donkeys?		/ ___ / ___ /
617	Number of horses?		/ ___ / ___ /
618	Number of chickens?		/ ___ / ___ /
619	Other		/ ___ / ___ /
620	Do you have the following at home?	1=yes 0-no	A cart _____ / ___ / A bicycle _____ / ___ / A motor bike _____ / ___ / A car _____ / ___ / A table _____ / ___ / chairs ___ / ___ / a fridge ___ / ___ / A television _____ / ___ / A radio _____ / A private telephone ___ / ___ /

**SECTION VII: Reasons and awareness of climate change**

<b>701</b>	<b>Is the area prone to coastal erosion? (1=yes, 0=no)</b>	/ _____ / _____ /
<b>702</b>	<b>When have you been aware?</b>	/ _____ / _____ /
<b>703</b>	<b>Why do you want to leave / stay?</b>	/ _____ / _____ /
<b>704</b>	<b>How long have you been in this situation?</b>	/ _____ / _____ /
<b>705</b>	<b>In your opinion what are the causes?</b>	/ _____ / _____ /
<b>706</b>	<b>What are your strategies to live here?</b>	/ _____ / _____ /
<b>707</b>	<b>Are you aware of climate change?</b>	/ _____ / _____ /
<b>708</b>	<b>What do you think about it?</b>	/ _____ / _____ /
<b>709</b>	<b>Have you noticed any change of your environment referring to the past?</b>	/ _____ / _____ /
<b>710</b>	<b>Do you have any assistance from the authorities?</b>	/ _____ / _____ /
<b>711</b>	<b>Are there any NGO's involved on the field?</b>	/ _____ / _____ /
<b>712</b>	<b>How many are they ?</b>	/ _____ / _____ /
<b>713</b>	<b>Are You insured ?</b>	/ _____ / _____ /
<b>714</b>	<b>How much do you pay for the premium?</b>	/ _____ / _____ /
<b>715</b>	<b>Do you want some benefit from an insurance?</b>	/ _____ / _____ /

## Appendix of Gunjur Focus Group Discussion

### A) Part of holding the focus group

<b>Country: The Gambia</b>	
<b>Region : WCR</b>	
<b>District : Kombo South</b>	
<b>Name of the leader :</b>	
<b>Name of note taker :</b>	
<b>Date of discussion realization :</b>	
<b>Starting hour</b>	
<b>Ending hour</b>	
<b>Language used in discussion</b>	

### Participants characteristics

N°	Sex	Age	Age Bracket	Education level	matrimonial situation	Ethnic group	Occupation	Religion <sup>6</sup>
01								
02								
03								
04								
05								
06								
07								
08								
09								
10								
11								
12								
13								
14								
15								
16								
17								

### P = Participant

<sup>1</sup> 1 = single, 2 = Married, 3-Divorcee, 4- Widow or widower

<sup>2</sup> 1 = Male, 2 = Female

<sup>3</sup> 1 = 18-24 years, 2 = 25-34 years, 3= 35-44years, 4= 45-54 years, 5 = 55-64 years, 6 = 65 and plus

<sup>4</sup> 1 = Non educated, 2 = Primary school, 3 = Secondary school, 4 = University, 5 = other

5 1 = Agriculture, 2 = Trader, 3 = Fisherman-, 4 = Handicraft making, 5 = Civil servant, 6 =other

## B) INTRODUCTION

Hello, you are all welcomed to this focus group discussion. My name is \_\_\_\_\_ .My colleagues here with me are called \_\_\_\_\_ . I'm a student who wants to know more about the social impact of coastal erosion in your community. Thank you for agreeing to participate in this meeting despite your busy schedule.

Thus we shall discuss about coastal erosion and their impacts. You are invited to discuss freely, but please one after another. There is no right or wrong answers, all answers are welcome. The information you provide is very important. That is why we ask you to answer honestly and truthfully to questions. During the discussion, my colleague will try to take notes. You will be designated by the numbers in front of you in the allocation of speech.

Because he cannot log everything and as we do not want to lose any of your ideas, we would like to record our discussion with permission. I want you to know that anything said will remain confidential and will be treated anonymously. Thank you.

### C. Perception and Attitudes regarding coastal erosion and climate change.

Themes	Questions	Responses
<b>1- Historical aspect of coastal erosion in the area</b>	1.1 Since when have you been experiencing the negative impacts of coastal erosion and the types of associated problems in your community?	
	1.2 Do you think that coastal erosion is a major problem? Why?	
	1.3 Effects on your health?	
	1.4 According to you what are the causes?	
	1.5 Can you tell us the year since you noticed the serious impact of coastal erosion?	
	1.6 According to you what are the consequences?	
<b>2. Perception on climate change</b>	2.1 Have you ever heard the word climate change?	

Themes	Questions	Responses
	2.2 Is there a link between climate change and coastal erosion?	
	2.3 What is your perception about climate change?	
	2.4 What is the link between climate change, land occupation and coastal erosion?	
<b>3. How they cope with coastal erosion/ adaptation</b>	3.1 What do you do to face coastal erosion?	
	3.2 Are you equipped to face coastal erosion? Have you some propositions or solutions?	

Themes	Questions	Responses
<b>4. Climate change and manifestations</b>	4.1 Socially what have changed with the environment (parents, neighbours in the locality)?	
	4.2 If yes, what is the justification of these changes?	
	4.3 Have you noticed discrimination of your children at school or within your neighbours?	
	4.4 Do you have assistance from your parents and neighbours?	
	4.5 If yes, which kind of assistance?	
4.6 Due to the prevailing situation of coastal erosion, can you tell us what you have gained or lost?		



Themes	Questions	Reponses
<b>5-The perception of coastal erosion</b>	5.1 Do you think that coastal erosion affects household assets?  If yes how? (list the effect or impacts)	
	5.2 Do you think coastal erosion affects food and nutrition security of the household ?  If so, how ? (list and describe the effects or impacts)	
	5.3 Do you think coastal erosion worsens poverty and living conditions of the household?  If so, how ? (list and describe the effects or impacts)	

**D) Coastal Erosion Impacts on the community subsistence means**

The objective of this part of the interview with the community is to assess the impact of coastal erosion on the community. Indeed, although the immediate impact of coastal erosion is felt on individuals, households and families affected, their combined effects are felt as an aggregate of individual household effects. The nature and extent of the effects on the community will depend on how the community is organized socially, economically and culturally.

Themes	Questions	Reponses
<b>6- Effects on the human capital of the community</b>	6.1 In which way is coastal erosion link to health problems in your community?	
	6.2 If so, how? (describe the effects or impacts with emphasis on the implications on cost, quality and quantity of labour)	
	6.3 Do you think that coastal erosion have caused an increase in the number of displaced (relocated or migration) people in your community? justify	
<b>7- Effects on the financial capital of the community</b>	<i>Evolution of savings (“susu” &amp; local bodies) global community</i> 7.1 Do you think that coastal erosion has affected the level of savings and “susu” in your community?	
	7.2 If so, how? (explain and give evidence and examples)	
<b>8- Adaptation</b>	<ul style="list-style-type: none"> <li>▪ How have the people around the coastal area been able to adapt to coastal erosion?</li> <li>▪ What are the adaptation techniques/ methods that they have used?</li> </ul>	

**Other Comments :**